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IC-CCDS - 2023

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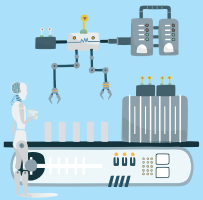
Department of Computer Science and Engineering (Cyber Security)



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PREFACE

Thakur College of Engineering and Technology (TCET) was established in the academic year 2001-02 with a clear objective of providing quality technical education in tune with international standards and contemporary global requirements. Currently, the institute runs 14 UG, 3 PG and 3 Ph. D. (Tech) programs with a strength of 3942 students and 200+ faculty members. In last twenty-one years of its existence, the institute has marked its presence at different levels and is recognized and awarded by different certifying and accrediting bodies of India. Moreover, the institute is conferred an autonomous status for 10 years from the academic year 2019-20.

To continue the journey of excellence, the Institute initiated research culture by organizing annual Conferences and Workshops from the year 2010 with the objective of providing a common platform to nurture young minds of the 21st century. The International Conference on Communications, Computing, and Data Security-ICCCDS 2023 is an initiative of TCET that offers multiple platforms for all the stake holders under one roof to contribute their original research work. International Conference on Communications, Computing and Data Security-(ICCCDS) aims to bring together researchers, engineers and scholar students to exchange and share their experiences, new ideas and research results about all aspects in the field of Electronics Engineering, Communication Engineering, Computing and Data Security. The objective of ICCCDS 2023 was to advance high-caliber research in the area of Communications, Computing, and Data Security.

ICCCDS has seen participation from various scholars at the National and International level. The excellent contribution of researchers is documented in the form of Proceeding which contains 82 selected research papers on various topics such as Wireless Communication & Networking, Deep Learning, Speech Processing, IoT and IoT in education, machine learning, Robotics and cyber security. The papers are scrutinized and reviewed at multiple levels to ensure the research standards. The IEEE standard paper format was recommended, and the review process is done by internal and external experts. Furthermore, the Institute has taken due care to check the plagiarism level and ensures to align with the International Standards with the help of Turnitin software.

The organization of ICCCDS was a team effort of Department of Electronics & Telecommunication, Department of Electronics & Computer Science Engineering, Department of Internet of Things and Department of Computer Science and Engineering (Cyber Security), TCET. Therefore, I would like to take this opportunity to thank the Management of Thakur Education Group for providing their constant support and world class infrastructural facilities. I am also thankful to the leadership team of TCET, especially our Principal, Dr. B. K. Mishra, for guiding us in this pursuit. The team of faculty and staff of E&TC Department has always been active and supportive for successful conduction of the event. Further, I am grateful to all the authors who have contributed to this conference by presenting and publishing their research papers and articles. I also wish to thank the members of the Review Committee for carrying out the arduous task of the peer review process. Finally, I wish to thank all who are directly or indirectly involved in the compilation of the conference proceedings.

Convener

Dr. Payel Saha,
Professor

HOD, E&TC Department

CONTENT

Tracking People Across Multiple Cameras

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***Abstract*— Tracking people through image recognition is an important topic in the field of computer vision research. In recent years, the accuracy of person recognition using machine learning models has been remarkably improved. On the other hand, in the case of person tracking with multiple cameras, recognition accuracy is degraded due to differences in viewpoints, and IDs are reassigned due to occlusion.This research aims to improve the accuracy and efficiency of multi-camera person tracking.**

Keywords—person-reidentification, network-camera

I. INTRODUCTION

Recently, multiple-person tracking is dominated by tracking by detection, which uses two detectors: Person Detection and Person Re-Identification (Re-ID). For Re-ID, a tracking method that extracts feature from a person's appearance using a deep learning model (DeepSORT) has become the mainstream. Re-ID using appearance features is more robust to changes in the amount of state due to increased undetected time than the conventional method (SORT), which uses a Kalman filter to estimate a person's location and re-identify a unique ID. On the other hand, in image-based evaluation, environmental factors such as detection angle, light intensity, and posture degrade the accuracy of the person detector, which has the disadvantage of increasing the probability of undetected or false detection in person tracking using multiple cameras in different installation environments that do not have interference areas with each other. To address this situation, this paper proposes a person tracking method based on tracking by detection by combining a person detector and Re-ID.

II. EXPERIMENT

The system consists of a person detector, a re- identifier The re-identification is determined by the similarity of image features and IoU using the Kalman filter.

1. Detect people from frame.
2. Extracting features from cropped images
3. Similarity judgments of features similarity by cosine similarity judgments.
4. Prediction and IoU evaluation by Kalman filter for detections with low similarity.

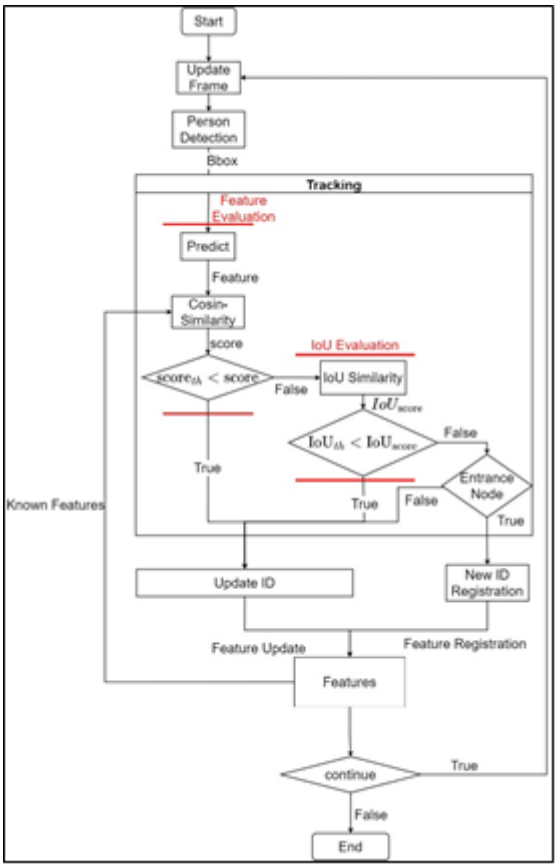

Fig. 1 System Flow

A. System

B. Conditions

In the experiment, an indoor environment is assumed, and only the camera at the entrance is given the role of updating features.This time, using two cameras(NodeA, NodeB), NodeA is set as the entrance camera and NodeB as the tracking camera, and only the features acquired by NodeA's camera are registered in the tracklet.

Fig. 2 Sample of persons

III. RESULTS AND CONCLUSION

Fig. 4 and Fig. 5 is feature similarity score in NodeA., B.

In Fig. 3 Tracking score of using feature similarity only in NodeA, Persons overlap with each other, resulting in a lower score value and a new ID. On the other hand, in tracking by features and IoU evaluation, the same ID is used for tracking even when the evaluation by features is low. In Fig. 5 Tracking score of using feature similarity and IoU in NodeB, Due to differences in the camera environment for A-2, IDs with low scores in the feature evaluation can be correctly tracked.

Table. 1 MOTA metrics also shows high performance in the evaluation by the MOTA index, which represents the continuity of IDs.

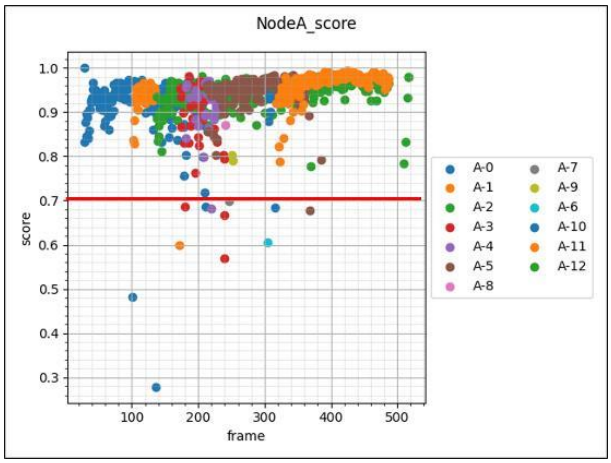

Fig. 3 Tracking score of using feature similarity only in Node

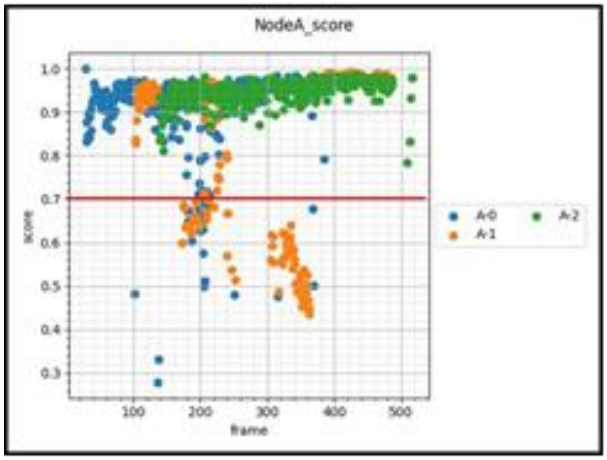

Fig. 4 Tracking score of using feature similarity and IoU in NodeA

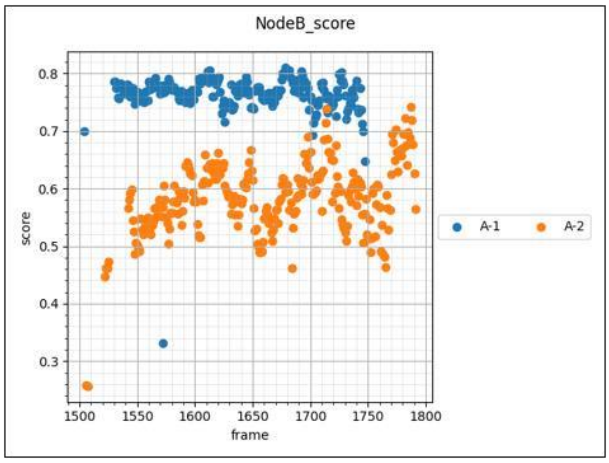

Fig. 5 Tracking score of using feature similarity and IoU in NodeB

	feature similarity only	feature similarity and Kalman filter
MOTA	0.577	0.870
Idf1	0.746	0.894
Idp	0.792	0.919
idr	0.706	0.882

Table. 1 MOTA metrics

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Real-Time Assembly Mistake Identification

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***Abstract*— This paper presents a method of real-time mistake identification in assembly process at factory floors. The proposed method uses a convolutional neural network (CNN) to identify the different parts to be assembled. The process starts by first identifying the correct sequence which is trained. Later, each step in the assembly process is identified and checked against a correct sequence in real-time. Upon identification of a wrong sequence, an alarm is raised immediately and correct part is recommended. The system can also identify the time taken by the worker to assemble each part. Thus, the proposed system can identify which workers need dedicated training to bring efficiency in assembly task.**

Keywords— Image processing, Convolutional Neural Network, Efficiency Estimation

I. Introduction

Robots have been used in factories to automate assembly of products. However, there are still scenarios where the products have to be assembled manually. In certain cases, robot automation is not possible due to factors like cost of induction of robot automation technology, technical factors, or environmental factors. In such cases, products have to be assembled manually by factory workers. There is a risk of faults in manual assembly. This may arise from several factors like lack of concentration, lack of appropriate training, pressure of high volume of work, strict deadlines, too much work load, environmental conditions, and so on. Mistakes result in reassembly, which in turn consumes time.

Such mistakes cause faults in the products. These products eventually reach the customers who return it back to the companies. This causes monetary and brand value losses. Hence, it is essential to identify the faults in production line in real time, and the problem has gained attention recently [1-13]. To this end, purpose of this study is to develop a system to identify mistakes in real-time, and to evaluate worker efficiency in assembly operations using image processing. The process uses a CNN based product identification. The main advantage of the proposed method is that it is inexpensive to incorporation, and accuracy is high. Moreover, it can easy be integrated in the current workspace.

II. Experiment

This section explains the overall experiment setup. The overall process is explained in the following steps:

1. First, the parts are identified and pictures of each part is recorded from different angles.
2. The workspace where the assembly process is carried out is recorded.
3. The correct sequence of assembly process is recorded by an efficient worker.
4. When the assembly starts, each part is identified by a CNN module. This part is indexed sequentially.
5. All the parts are eventually identified.
6. If the sequence is found to be mistaken, an alarm is raised.
7. The time in assembly of each part is recorded.

In the experiment, a set of seven colored blocks where used. The correct sequence of the process was pre-determined.

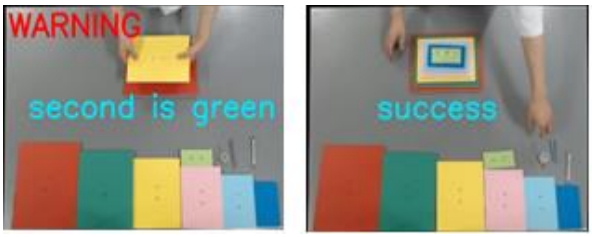

Fig. 1 Result of identification of assembly fault

III. Results and Conclusion

As shown in Fig.1, the “success” is displayed when the worker has correctly assembled the parts. However, in Fig.1 (right), a warning has been displayed. In this case, the worker made a mistake by picking up a yellow colored plate and started assembling it while he was supposed to pick up the correct green plate. Hence, the system could immediately identify the fault and raise the alarm. There were two benefits of this alarm. First, the worker could not only correct the mistake and stop the faulty assembly process, but he was also suggested the correct part (i.e. the green plate). The experiment was conducted four times. The time required to assemble each part was recorded each time.

Figure 2 shows the time taken in assembly of each part by the worker in the four experiments. The black line denotes the average time required to assemble the particular part by the worker. The time was recorded for all the seven parts.

It can be seen from Fig.2 that the worker took most of the time in assembling part-2 on average. This data is crucial for the company as it can focus on providing specific training to the worker to be efficient in assembling that part. Moreover, it can also be seen from Fig.2 that the fourth batch of part-3 took the most time. This could be

a result of different shift. The four shifts were conducted at different times. Hence, the system can also identify which shifts of the work are the most efficient, and which shifts cause fall in efficiency. The company could target these shifts to improve efficiency.

In conclusion, we presented a system which could identify faults in assembly process while also recommending the correct parts. The proposed method uses a convolutional neural network (CNN) to identify the different parts to be assembled. The process starts by first identifying the correct sequence which is trained. Later, each step in the assembly process is identified and checked against a correct sequence in real-time. Upon identification of a wrong sequence, an alarm is raised immediately and correct part is recommended. The system can also identify the time taken by the worker to assemble each part. Thus, the proposed system can identify which workers need dedicated training to bring efficiency in assembly task.

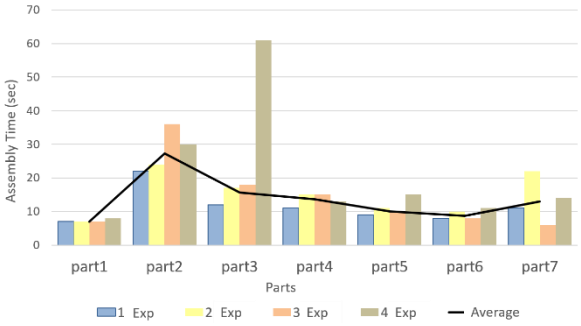

Fig. 2 Assembly time of each part

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Review Of Environmental Monitoring and Application of Wireless Sensor Network In Environmental Monitoring

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***Abstract*: Environmental monitoring is the process of measuring and tracking various environmental factors such as air and water quality, soil health and biodiversity. These measurements are used to assess the overall health of the ecosystem and identify potential pollution and conservation issues. This article describes various methods and technologies used in environmental monitoring and their applications and limitations. One of the most common methods of environmental monitoring is the use of sensors. Sensors can be used to measure various environmental factors such as temperature, humidity and air quality. These sensors can be deployed in a variety of environments, from remote areas to urban areas, and can be used for real-time or long-term data collection. Another important method of environmental monitoring is the use of remote sensing techniques such as satellite imagery and aerial photography. These techniques can be used to monitor large areas of land and water bodies, providing valuable information on land use, vegetation and water quality. A wireless sensor network (WSN) is a network of sensors and small, low-power devices with wireless communication capabilities. These devices, also called "nodes", are typically deployed in large numbers and used to collect and transmit data about the environment in which they are deployed. WSN applications include industrial process monitoring and control, environmental monitoring, military and civilian monitoring. WSNs are distinguished by their ability to operate in harsh environments, their low cost, and their ability to transmit data over long distances. These typically consist of a large number of sensor nodes, gateways, and a central control unit that manages the network.**

Keywords: Environmental Monitoring, WSN, Flood Detection, Communication, Nodes, Natural Calamities.

I. INTRODUCTION

Environmental monitoring is the process of measuring and tracking various environmental factors such as air and water quality, soil health, and biodiversity. These measurements are used to assess the overall health of an ecosystem and identify potential pollution or conservation concerns. In this article, we will discuss the various methods and technologies used in environmental monitoring, as well as their applications and limitations. One of the most common methods of environmental monitoring is the use of sensor technology. Sensors can be used to measure a wide range of environmental factors, such as temperature, humidity, and air quality. These sensors can be deployed in a variety of environments, from remote wilderness areas to urban centres, and can be used to gather data in real-time or over extended periods.

Another important method of environmental monitoring is the use of remote sensing technology, such as satellite imagery and aerial photography. These technologies can be used to monitor large areas of land or water, and can provide valuable information on land use, vegetation cover, and water quality. In addition to these technologies, a variety of field techniques are also commonly used in environmental monitoring. These may include soil and water sampling, as well as the use of biological indicators such as the presence or absence of certain species of plants or animals. One of the key applications of environmental monitoring is in the identification and assessment of pollution or conservation concerns. For example, monitoring data can be used to identify sources of pollution, such as industrial facilities or agricultural operations, and to track the spread of pollutants through an ecosystem. Similarly, monitoring data can be used to identify areas of high conservation value, such as wetlands or old-growth forests.

However, environmental monitoring also has its limitations. For example, sensor technology can be expensive and may require significant maintenance, and remote sensing technology may be limited by cloud cover or other atmospheric conditions. In addition, the data collected through environmental monitoring may be complex and difficult to interpret, requiring the expertise of trained scientists and analysts.

II.TYPES OF ENVIRONMENTAL MONITORING

There are several types of environmental monitoring that are used to measure and track different aspects of the environment. These include:

- **Air quality monitoring:** This type of monitoring measures the concentration of pollutants in the air, such as particulate matter, ozone, and sulphur dioxide. This information is used to assess the health of the air and identify sources of pollution.
- **Water quality monitoring:** This type of monitoring measures the chemical, physical, and biological characteristics of water, such as pH, temperature, dissolved oxygen, and the presence of pollutants. This information is used to assess the health of rivers, lakes, and other bodies of water and identify sources of pollution.

- **Soil quality monitoring:** This type of monitoring measures the chemical, physical, and biological characteristics of soil, such as pH, nutrient content, and the presence of pollutants. This information is used to assess the health of soil and identify potential contamination or degradation.
- **Biodiversity monitoring:** This type of monitoring measures the presence and abundance of different species of plants and animals in an ecosystem. This information is used to assess the health of an ecosystem and identify areas of high conservation value.
- **Climate monitoring:** This type of monitoring measures temperature, precipitation, and other meteorological variables to understand the changing climate.
- **Noise monitoring:** This type of monitoring measures sound levels in an environment and can be used to assess the impact of noise pollution on wildlife, human health, and quality of life.
- **Light monitoring:** This type of monitoring measures the amount and quality of light in an environment, and can be used to assess the impact of light pollution on wildlife and human health.
- **Chemical monitoring:** This type of monitoring measures the presence of specific chemicals in the environment, such as pesticides, heavy metals, and other pollutants.
- **Radiation monitoring:** This type of monitoring measures the amount of ionizing and non-ionizing radiation in an environment, and can be used to assess the impact of radiation on human health and the environment.

These are some of the most common types of environmental monitoring, but there are many other ways to monitor the environment as well, depending on the specific goals and needs of a monitoring program.

III. FACTORS IN ENVIRONMENTAL MONITORING

There are several factors that are considered when designing and implementing an environmental monitoring program. These include:

- **Objectives:** The primary goal of the monitoring program should be clearly defined in order to determine what environmental factors need to be measured, and how often and where the monitoring should take place.
- **Resources:** The cost, personnel, and equipment required to conduct the monitoring should be taken into consideration when designing the program.
- **Detection limits:** The sensitivity of the monitoring equipment or methods should be considered in relation to the environmental factors being measured.
- **Precision and accuracy:** The level of precision and accuracy required for the monitoring data should be considered in order to ensure that the data is of sufficient quality to meet the objectives of the program.
- **Data analysis and interpretation:** The methods used to analyse and interpret the monitoring data should be designed and implemented in a way that allows for meaningful conclusions to be drawn from the data.
- **Quality assurance and quality control:** A quality assurance and quality control plan should be implemented to ensure that the monitoring data is accurate and reliable.
- **Compliance and regulations:** The monitoring program should be designed and implemented to comply with any relevant regulations or guidelines for environmental monitoring.
- **Communication and dissemination of results**: The results of the monitoring program should be communicated to relevant stakeholders, including the public, and should be made available in a format that is easily understood.
- **Long-term sustainability**: The monitoring program should be designed with a long-term perspective in mind, with plans for continued data collection and analysis in order to build a comprehensive understanding of the environmental factors being monitored.

By taking these factors into account when designing an environmental monitoring program, scientists and researchers can ensure that the monitoring data is of high quality, and that the results of the monitoring can be used to inform decision-making and protect the environment.

IV. WIRELESS SENSOR NETWORK

A WSN is a collection of sensor nodes organized in a cooperative network. Sensor nodes are small, cheap, and have short communication distances. A sensor node is a fundamental part of every WSN. Sensor node costs range from a few dollars to hundreds of dollars, depending on the complexity of the individual sensor nodes. A sensor node typically consists of four subsystems.

In recent years, sensor networks have been utilized for a variety of uses. In some cases, e.g. fire protection on Skyscrapers, sensors are connected by wires. However, wired networks are rare and large-scale applications are not found. Most of the time the mission is wireless environment. As a result, the sensor network uses wireless communication to transmit the collected data. Hence the name Wireless Sensor Network (WSN). Formally, the wireless sensor network (WSN) in its simplest form. The shape (probably smaller size and Low complexity devices called nodes that can detect this

Communicate your environment and the information you collect From the monitored field via wireless connection. Data is possibly forwarded over multiple hops to the sink available locally or connected to other networks (e.g. Internet) gateway.

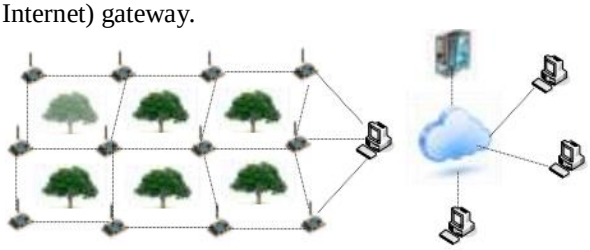

Fig. 1 Environment monitoring using sensor networks [10]

Usually, a sensor node consists of four sub-systems as presented in Figure 2, are as follows:

- A computing sub-system: responsible for main functions such as processing the communication protocols and control of onboard sensors.
- A sensing sub-system: environment characteristics are sensed through a wide range of sensors (temperature, humidity, light, gas, etc…).
- A communication subsystem: a short radio range used to communicate with neighbouring nodes.
- A power supply sub-system: this includes a battery source which feeds computing, onboard sensors, and communication subsystems.

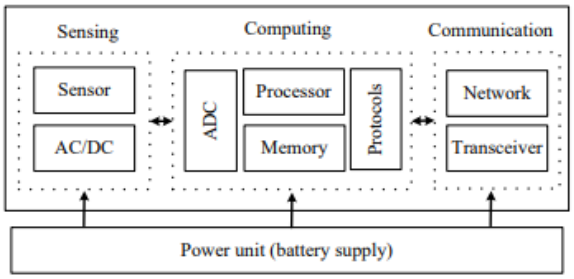

Fig. 2. Sensor node architecture [10]

V. RELATED WORK

Many scientists have provided many references for research on IoT agriculture, ecological cycles, indicator systems, and environmental monitoring.

Ekstrom compared the performance of his two models with a standard logistic regression model using Monte Carlo simulations. Approaches to model correlated binary responses, and cluster-specific and population-mean logistic regression models [1].

Magdalena used the associated land-cloth biota to demonstrate the application of the Air Purity Index method in assessing environmental pollution and assessing general ecological conditions in the mountain reserve of the Gorce National Park (Western Carpathians, Poland). [2].

Dollar et al. tested the value of the Wetland Coverage Trends (WET) index as a renewable indicator of wetland trends and its use in global and regional level assessments and national reporting. They extended this indicator to include regional trends in Latin America and the Caribbean and a global anthropogenic wetness index [3].

Rybak and Ryabichina aimed to develop and test hardware and software systems for real-time monitoring of atmospheric conditions. They presented the results of creating and using an automated air monitoring system using a pollutant transport model [4].

Pohrebennyk et al. We experimentally determined the parameters of heavy metal contamination in soil. Using the example of Rozdil SMCE "Sirka" they showed the most important problems with the monitoring system in the area of mining and chemical companies in the liquidation phase. They also assessed the impact of mining and chemical companies' Environmental pollution status (soil, water, waste management status) [5].

Krasovskyi et al. studied the development of modern information technology to help identify the location and results of amber production in Western Siberia Satellite-based environmental monitoring methods and his GIS tools [6].

Myrontsov and Okhariev proposed ways to integrate human impact and environmental state data into decision-making information support systems in the field of environmental management and local environmental security [7].

Chen and Yan studied an environmental ecological evaluation based on copula functions and an indicator system for environmental evaluation of independent innovation capacity of environmental bioindustrial clusters. At the same time, they took the Wuhan Guanggu Biolake Environmental Bio-industry Cluster as the research object and conducted a related test on the independent innovation capacity evaluation system of the bio-industry cluster [8].

Duane et al. Emergy Accounting (EA) and Life Cycle Assessment (LCA) methods were used to examine the environment, capital expenditures, and ecosystem services of a typical city.

Wetland Park of Beijing Green Lake Urban Wetland Park (GLUWP) [9].

Paper presents the smart IOT based system for environmental parameter monitoring. Transceiver is designed for the measurement of environment humidity and temperature data [12].

The data from these studies are not comprehensive and the results of the studies are still questionable and thus cannot be generally recognized and disseminated and applied. To estimate the crucial environmental factors for high agricultural productivity, the wearable environmental monitoring system becomes extremely important. The primary cause Sunlight, soil quality, temperature, and air pressure/humidity all need to be routinely checked. Many agricultural sensors in vast farm areas can detect these data. The utilisation of sensors supports farmers in monitoring the health of their plants so that they may fix issues based\son the data gathered and produce plentiful crops. Several sensors and regulating devices are employed to detect important metrics and cause the controller to carry out its instructions. The soil, rainfall, temperature, sun

radiation, atmospheric pressure, and position are all monitored using different kinds of sensors [11].

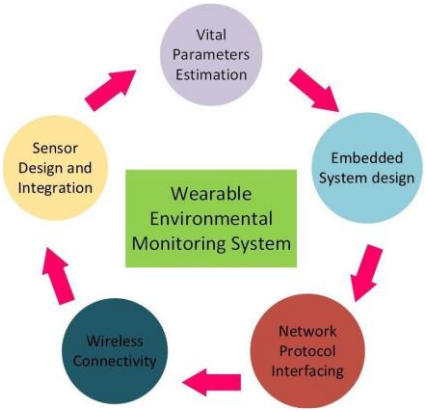

Fig 3. Roles of Wearable EMS.

VI. COMMUNICATION PROTOCOL FOR WSN

A communication protocol in a wireless sensor network is a set of rules and conventions that govern how nodes in the network transmit and receive data. These protocols are designed to ensure efficient, reliable communication between nodes and to conserve the limited resources of the sensor nodes, such as energy and bandwidth. There are different types of communication protocols that can be used in wireless sensor networks, such as those for routing, medium access control (MAC), and transport.

Routing protocols are responsible for finding the best path for data to travel from the source node to the destination. Examples of routing protocols include AODV, DSR, and DSDV.

MAC protocols are responsible for controlling access to the shared wireless medium, such as radio frequency (RF) spectrum. Examples of MAC protocols include CSMA/CA, TDMA, and FDMA.

Transport protocols are responsible for ensuring that data is delivered reliably and in the correct order. Examples of transport protocols include TCP and UDP.

The figure below illustrates the different layers of the OSI model and how they relate to the communication protocols used in wireless sensor networks.

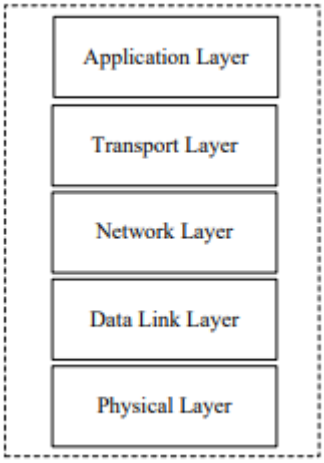

Fig. 4 Sensor Network Stack Architecture

The application layer is where the data is generated and consumed, while the transport layer is responsible for reliable data transfer. The network layer is responsible for routing the data, and the data link layer is responsible for medium access control. The physical layer is responsible for the actual transmission of data over the wireless medium.

It is important to note that the choice of communication protocol will depend on the specific requirements of the wireless sensor network, such as the type of sensor nodes, the environment in which they operate, and the desired level of security and reliability.

VII. WIRELESS SENSOR NETWORK FOR ENVIRONMENTAL MONITORING

Wireless sensor networks (WSNs) are increasingly being used in environmental monitoring to collect data on various environmental parameters, such as temperature, humidity, air quality, and water quality. These networks consist of a large number of small, low-power sensor nodes that are deployed in the environment to collect data. The sensor nodes are typically wireless and communicate with one another and with a central base station to transmit the collected data. WSNs can be used in a wide range of environmental monitoring applications, such as:

Air quality monitoring: WSNs can be used to measure pollutants such as carbon monoxide, nitrogen oxides, and particulate matter in the air.

Water quality monitoring: WSNs can be used to measure water parameters such as pH, dissolved oxygen, and turbidity.

Soil monitoring: WSNs can be used to measure soil moisture, temperature, and nutrient levels.

Forest monitoring: WSNs can be used to monitor the health of forests by measuring parameters such as temperature, humidity, and soil moisture.

Wildlife monitoring: WSNs can be used to track the movements of wildlife and monitor their habitat conditions.

Flood Monitoring: Wireless sensor networks (WSNs) can be used in flood detection to provide early warning of potential flooding events. Flood detection WSNs typically consist of a network of sensor nodes that are deployed in areas prone to flooding, such as riverbanks and coastal regions. The sensor nodes measure various parameters such as water level, precipitation, and soil moisture, and transmit the data to a central base station or server.

Fig 5 Applications of the environmental monitoring [12]

WSNs have several advantages over traditional monitoring methods, such as:

- **High spatial and temporal resolution:** WSNs can provide detailed data on environmental conditions at a high resolution.
- **Low cost:** WSNs consist of small, low-power sensor nodes that can be deployed at a low cost.
- **Real-time monitoring:** WSNs can provide real-time data on environmental conditions.
- **Scalability:** WSNs can be easily scaled to cover large areas.
- **Flexibility:** WSNs can be easily reconfigured to meet changing monitoring needs.

WSNs in environmental monitoring can leverage various communication protocols such as Zigbee, Z-Wave, and 6LoWPAN, that can optimize the performance of the sensor nodes, in terms of energy consumption, reliability and security.

VIII. CHALLENGES OF WIRELESS SENSOR NETWORK IN ENVIRONMENTAL MONITORING

Wireless sensor networks (WSNs) have many advantages over traditional monitoring methods, but they also face several challenges when used in environmental monitoring applications. Some of these challenges include:

Limited energy resources: Sensor nodes in WSNs are typically powered by batteries, which have a limited energy capacity. This can be a significant challenge in remote and hard-to-reach areas where it may be difficult to replace or recharge batteries.

Limited communication range: Sensor nodes in WSNs typically have a limited communication range, which can be a problem in large-scale monitoring applications where nodes need to communicate over long distances.

Interference: WSNs operate on the same wireless spectrum as other devices, such as cell phones and Wi-Fi routers, which can cause interference and negatively impact the performance of the network.

Harsh environmental conditions: Environmental monitoring applications often take place in harsh conditions, such as extreme temperatures, humidity, and dust. These conditions can damage the sensor nodes and impact their performance.

Security: WSNs can be vulnerable to security attacks, such as eavesdropping and tampering. This is a significant concern in environmental monitoring applications where the data collected is sensitive and the integrity of the sensor network is critical.

Data management: Collecting and managing large amounts of data generated by WSNs can be a significant challenge. This includes storing, processing, and analyzing the data, as well as ensuring the data is accurate and reliable.

Scalability: As the number of sensor nodes in a network increases, the complexity of managing and maintaining the network also increases. This can be a significant challenge in large-scale monitoring applications.

Reliability: Environmental monitoring applications typically require high levels of reliability and availability. WSNs can be affected by various factors, such as node failures, network congestion, and communication disruptions, which can negatively impact the reliability of the network.

To overcome these challenges, researchers are working on new technologies such as energy harvesting, mesh networks, and secure communication protocols, to improve the performance and reliability of WSNs in environmental monitoring applications

IX. Conclusion

Wireless Sensor Networks have recently received a lot of attention in the context of environmental monitoring, as shown in the literature. Both indoors and outdoors, people are exposed to air pollutants emitted by homes, appliances, factories, vehicles, and more. This paper covers the WSN-based environmental monitoring research area. A variety of such systems have been recently developed and implemented, driven by the need to obtain air quality estimates at the lowest possible cost. This paper presents an overview describing existing environmental monitoring systems. This article points out several research-oriented issues that need to be addressed before any environmental monitoring application can be effectively put into practice.

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Vehicle to Vechicle Communication For Crash Avoidance System Based on CAN Bus

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***Abstract*—This paper gives the specific utility of wireless conversation ,car wi-fi verbal exchange additionally called as vehicle-to -car communication .The paper first offers an advent to the car wireless conversation . It explains the era used for automotive wi-fi communication in conjunction with the various automotive package replying wireless conversation . Car-to -car conversation is the wireless transmission of information among motor vehicles in a actual time. The main aim of V2V conversation is to prevent injuries by means of permitting automobile in transit to ship function and velocity statistics to each other. The cars motive force may additionally genuinely acquire a warming must there be a danger of a coincidence or the vehicle itself may take preemptive actions as braking to slow down**

Keywords—Vehicle to Vehicle(V2V), CAN Bus

I. INTRODUCTION

.

Today embedded systems are inventions that have made the world to think and bring out different innovations and developments in the field of automobiles. Embedded System is basically a system of hardware and software designed for control and access of data. As a system it includes a controller as the brain. Today embedded systems applications are popular and their development has become a boon to automobile industry. Applications in the form of home appliances, automobiles, entertainments, consumer electronics, medical and telecommunication etc., are every day in the mode of development. Mechanical systems in automobiles are largely replaced by electronic systems. Today Automobile industry is making great use of embedded systems. Ranging from wiper controls to complex anti-lock brake controls and air bags, embedded systems have gained the overall control of recent automobiles. The expeditious increase in the vehicle populace around the globe, Particularly in India has prompted inquire about in the specialty of Intelligent Transportation System (ITS). Vehicle-To-Vehicle (V2V) communication is a framework intended to transmit data amongst vehicles and different objects on the road in real time. V2V communication is more effective than current automotive original equipment manufacturer embedded system for lane departure, adaptive cruise control, blind spot detection, rear parking sonar and backup camera because V2V technology enables ubiquitous 360-degree awareness of surrounding threats. The main objective of the project is to alert the driver when he closes to the front vehicle. The idea is that, if collision avoidance systems can work between vehicles, then every car on the road will be safer by avoiding accidents before they can ever happen. The importance of autonomous or semi-autonomous vehicles for intelligent transport systems (ITS) is increasing.V2V technologies are simple to implement primarily because of their reliance on wireless communication. Having low power and information rate, ZigBee happens to be utilized broadly in V2V communication. In this paper, propositions are initiated towards enhancing road safety and handling traffic congestion. Cars on the same direction in highway usually keep a safe distance one another with a similar speed. However, due to the driver's distraction, long-time driving fatigue, flake out, or even a sudden deceleration of the previous car, a serious collision accident may occur if the driver can not react in time to brake. On the other hand, drivers need the mirrors to know other approaching cars from two-side or from the rear end. Even the driver check around carefully, he cannot take an immediate respond, except push the horn, to a sudden approaching car and an accident is thus unavoidable. Therefore, developing a frontobstacle warning system and a rear end collision avoidance system subject to all directions are important in collision avoidance. For the front-end collision avoidance subsystem, Ultrasonic sensor is adopted to measure the distance with respect to the previous car. For rear-end end collision avoidance subsystem, the currently available ultrasonic sensors for vehicles are adopted for approaching cars with relatively low speed. While the rough reading of distance data cannot be applied directly, an intelligent approach is proposed to process the raw distance readout of sensors to produce appropriate warning signals. When there are more electrical control devices in the modem cars, such as power train management system, antilock braking system (ABS), and acceleration skid control (ASC) system, etc., the functionality and wiring of these electric control units (!XU) are getting more complicated.

II. EASE OF USE

A. Literature survey and technological survey

CAN (Controller Area Network) protocol-

1) CAN stands for **Controller Area Network** protocol. It is a protocol that was developed by **Robert Bosch** in around 1986. The CAN protocol is a standard designed to allow the microcontroller and other devices to communicate with each other without any host computer. The feature that makes the CAN protocol unique among other communication protocols is the broadcast type of bus. Here, broadcast means that the information is transmitted to all the nodes. The node can be a sensor, microcontroller, or a gateway that allows the computer to communicate over the network through the USB cable or ethernet port. The CAN is a message-based protocol, which means that message carries the message identifier, and based on the identifier, priority is decided. There is no need for node identification in the CAN network, so it becomes very easy to insert or delete it from the network. It is a serial half-duplex and asynchronous type of communication protocol. The CAN is a two-wired communication protocol as the CAN network is connected through the two-wired bus. The wires are twisted pair having 120Ω characteristics impedance connected at each end. Initially, it was mainly designed for communication within the vehicles, but it is now used in many other contexts. Like UDS, and KWP 2000, CAN also be used for the on-board diagnostics.

2) **Why CAN?**

The need for a centralized standard communication protocol came because of the increase in the number of electronic devices. For example, there can be more than 7 TCU for various subsystems such as dashboard, transmission control, engine control unit, and many more in a modern vehicle. If all the nodes are connected one-to-one, then the speed of the communication would be very high, but the complexity and cost of the wires would be very high. In the above example, a single dashboard requires 8 connectors, so to overcome this issue, CAN was introduced as a centralized solution that requires two wires, i.e., CAN high and CAN low. The solution of using CAN protocol is quite efficient due to its message prioritization, and flexible as a node can be inserted or removed without affecting the network.

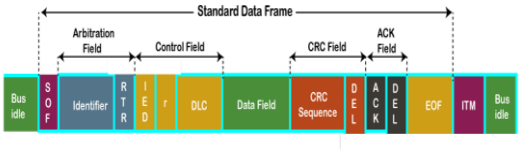
3) **Applications of CAN protocol**

Initially, CAN protocol was designed to target the communication issue that occurs within the vehicles. But later on, due to the features it offers, it is used in various other fields. The following are the applications of CAN protocol:

- Automotive (passenger vehicles, trucks, buses)
- Electronic equipment for aviation and navigation
- Industrial automation and mechanical control
- Elevator and escalators
- Building automation
- Medical instruments and equipment
- Marine, medical, industrial, medical

4) ***CAN Framing***

Let's understand the structure of the CAN frame.



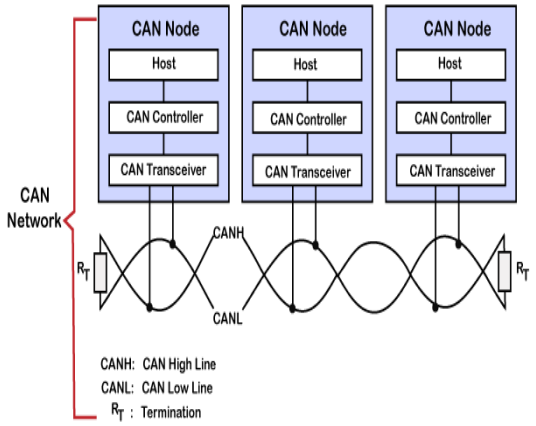
- **SOF:** SOF stands for the start of frame, which indicates that the new frame is entered in a network. It is of 1 bit.
- **Identifier:** A standard data format defined under the CAN 2.0 A specification uses an 11-bit message identifier for arbitration. Basically, this message identifier sets the priority of the data frame.
- **RTR:** RTR stands for Remote Transmission Request, which defines the frame type, whether it is a data frame or a remote frame. It is of 1-bit.
- **Control field:** It has user-defined functions.

1. **IDE:** An IDE bit in a control field stands for identifier extension. A dominant IDE bit defines the 11-bit standard identifier, whereas recessive IDE bit defines the 29-bit extended identifier.
2. **DLC:** DLC stands for Data Length Code, which defines the data length in a data field. It is of 4 bits.
3. **Data field:** The data field can contain upto 8 bytes.

- **CRC field:** The data frame also contains a cyclic redundancy check field of 15 bit, which is used to detect the corruption if it occurs during the transmission time. The sender will compute the CRC before sending the data frame, and the receiver also computes the CRC and then compares the computed CRC with the CRC received from the sender. If the CRC does not match, then the receiver will generate the error.
- **ACK field:** This is the receiver's acknowledgment. In other protocols, a separate packet for an acknowledgment is sent after receiving all the packets, but in case of CAN protocol, no separate packet is sent for an acknowledgment.

- **EOF:** EOF stands for end of frame. It contains 7 consecutive recessive bits known End of frame.

Now we will see how data is transmitted through the CAN network.



A CAN network consists of multiple of CAN nodes. In the above case, we have considered three CAN nodes, and named them as node A, node B, and node C. CAN node consists of three elements which are given below:

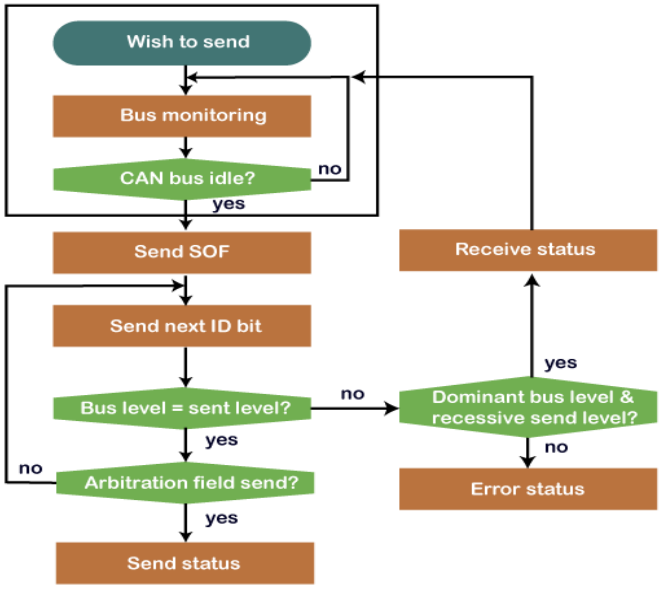
- A host is a microcontroller or microprocessor which is running some application to do a specific job. A host decides what the received message means and what message it should send next.
- CAN controller deals with the communication functions described by the CAN protocol. It also triggers the transmission, or the reception of the CAN messages.
- CAN transceiver is responsible for the transmission or the reception of the data on the CAN bus. It converts the data signal into the stream of data collected from the CAN bus that the CAN controller can understand.

In the above diagram, unshielded twisted pair cable is used to transmit or receive the data. It is also known as CAN bus, and CAN bus consists of two lines, i.e., CAN low line and CAN high line, which are also known as CANH and CANL, respectively. The transmission occurs due to the differential voltage applied to these lines. The CAN uses twisted pair cable and differential voltage because of its environment. For example, in a car, motor, ignition system, and many other devices can cause data loss and data corruption due to noise. The twisting of the two lines also reduces the magnetic field. The bus is terminated with 120Ω resistance at each end.

5) ***CAN Communication Principle***

As we know that the message is sent based on the priority set in the arbitration field. For the standard frame, the message identifier is 11 bit, while for the extended frame, the message identifier is 29 bit. It allows the system designer to design the message identifier at the design itself. The smaller the message identifier, the higher, would be the message priority.

Let's understand how arbitration works through a flow chart.



The sender wants to send the message and waiting for the CAN bus to become idle. If the CAN bus is idle, then the sender sends the SOF or the dominant bit for the bus access. Then, it sends the message identifier bit in the most significant bit. If the node detects the dominant bit on the bus while it has transmitted the recessive bit, it means that the node has lost the arbitration and stops transmitting further bits. The sender will wait and resend the message once the bus is free.

B. *Maintaining And Features*

Here's a list of some of the HC-SR04 ultrasonic sensor features and specs—
for more information, you should consult the sensor's datasheet:

- Power Supply :+5V DC
- Quiescent Current : <2mA
- Working Current: 15mA
- Effectual Angle: <15°
- Ranging Distance : 2cm – 400 cm/1″ – 13ft
- Resolution : 0.3 cm
- Measuring Angle: 30 degree
- Trigger Input Pulse width: 10uS TTL pulse
- Echo Output Signal: TTL pulse proportional to the distance range
- Dimension: 45mm x 20mm x 15mm

III. APPLICATION

Vehicle safety-

Vehicle safety is the highest chority in most of the industrialized countries. The reason is the aver increasing number of traffic crashes due to the growing number of vehicles.

Advantages-

Avoid collisions-

1) Whenever a possible accident occure ,the driver is alerted.

2) Allowing vehicle in transit to send position and speed data to one another accidents.

features and specification-

A) Ultrasonic Sensor-

The Ultrasonic Sensor sends out a high-frequency sound pulse after which instances how lengthy it takes for the echo of the sound to mirror again. The sensor has two openings on its front.

Tiny speaker to transmit opening ultrasonic waves

Microphone to acquire the ultrasonic waves

The ultrasonic sensor calculates distances by -

The velocity of sound is approximately 341 meters in keeping with 2d in air. The ultrasonic sensor uses this data together with the time difference among sending and receiving the sound pulse to decide the space to an item. It makes use of the subsequent mathematical equation:

Distance = $Time\ x\ \ Speed\ \ of\ \ Sound$

B) CAN BUS-CAN2515 bus module-Up to 1Mb/s bus velocity As much as 1000 meter bus period General and extended information and far off frames One-shot mode
Interrupt output
SPI interfaceTJA1050 line driver
5V Operation
CAN stands for Controller place network and it's far regularly notion of as mostly an car verbal exchange bus seeing that it's far the standard for use with cars to attach all of the electronics and sensors together and is delivered out to the outside global via the ODB-II interface.

a) The CAN bus is in truth an excellent conversation bus for lots applications that use more than one disbursed MCUs which need to interact with every other including in manufacturing facility automation or robotics.

b) The important thing capabilities of the CAN bus is that it uses best 2 wires for bus communications and all MCUs connect with these same 2 wires. The CAN bus hardware handles moving the messages via the bus with collision prevention and errors correction with out requiring any MCU overhead. The messages use message content material based IDs as opposed to MCU IDs, so all CAN bus hardware can get entry to and filter the messages that are of hobby to its related MCU (node)Equations

The equations are an exception to the prescribed specifications of this template. You will need to determine whether or not your equation should be typed using either the Times New Roman or the Symbol font (please no other font). To create multileveled equations, it may be necessary to treat the equation as a graphic and insert it into the text after your paper is styled.

Number equations consecutively. Equation numbers, within parentheses, are to position flush right, as in (1), using a right tab stop. To make your equations more compact, you may use the solidus (/), the exp function, or appropriate exponents. Italicize Roman symbols for quantities and variables, but not Greek symbols. Use a long dash rather than a hyphen for a minus sign. Punctuate equations with commas or periods when they are part of a sentence, as in:

C) AT mega 328-

Virtual RISC (AVR) microcontroller. It supports processing of 8-bit data. ATmega-328 has 32KB internal flash memory.

ATmega328 has 1KB of electrically erasable programmable read-only memory (EEPROM). This feature shows that the microcontroller can still store data and provide results even when it is no longer powered. In addition, the ATmega-328 has 2KB of static random access memory (SRAM). Other features will be explained later. The ATmega 328 has several features that make it one of the most popular devices on the market today. These features consist of advanced RISC architecture, good performance, low power consumption, true timer counter with separate oscillator, 6 PWM pins, programmable, programming lock for software security, throughput up to 20 MIPS etc. More details about the ATmega 328 are described later in this section.

Limitation-

Depending on the vehicle model and the complexity of the system, the cost of installing the V2V communication systemin the vehicle is expected to be high.

IV. SCOPE FOR FUTURE WORK

The system introduced is only a warning system. It is not integrated with the mechanics of the vehicle. It can provide feedback to the vehicle so that the vehicle automatically brakes or changes lanes when vehicles get too close to it

V .CONCLUSION

Communication has opened up many new opportunities for the automotive industry. In this paper, we propose a technology to improve traffic congestion and road safety. We have also analysed situations such as

collisions, delays and redundancies, etc., which can be improved or overcome by simply transmitting warning messages. The system under consideration has been developed for two small car models.

the first model is used as a prototype to control the distance between the car and the car in front, as well as the distance between the obstacles in front, and to initiate automatic braking. In collision avoidance systems used to reduce traffic accidents, the lidar sensor is attached to the vehicleand the signals are transmitted via the CAN protocol. Here, there are two nodes connected via the CAN protocol: the control unit and the motor unit. Whenever the distance is measured with the LIDAR sensor, the distance is displayed in node 1 and the data is transmitted to node 2. When the measured distance is above the range of 30 cm, the motor runs continuously, and when the measured distance is below 30 cm, an emergency occurs, then automatic vehicle control takes place and the motor stops operating. This motor is controlled by pulse width modulation technology and an H-bridge is connected, which has external hardware to rotate the motor. In the future, the RADAR sensor can be placed on all sides of the vehicle to detect all directions. The user can set the range in which the distance should be measured. This sensor can be used in two modes ON /OFF modes. When driving on the highway, the sensor can be set to ON and in traffic or when parking the vehicle, the sensor can be set to OFF. Since the cost of the sensor is higher compared to the RADAR sensor, this sensor can be installed in lower priced equipment. This sensor can be installed in lower priced vehicles to prevent accidents and save the lives of occupants.

ACKNOWLEDGMENT

Throughout the journey of this work till the date, we realized more strongly how muchselfless effort. So, we should not forget them while praising flower. It is matter of gratification for usto pay our respects and acknowledgements to all those who have imparted knowledge and help us tocomplete our final report.

First, we would like to acknowledge the great contribution and support received in thisendeavor from our project guide Prof. S. B. Mandlik for this depth knowledge, guidance and inspiration for will be of great importance to clarify and kind of problem likely to be me in the future.We express our sincere thanks to project coordinator, Prof. A. H. Ansari for his valuableguidance we also thanks to our Head of Department Dr. S. L. Kurkute for their encouragement and support.We obliged towards all the staff members, librarians, our friends and most important our family those supported directly and indirectly. Last but not least we are very much thankful to our principal and the college forcooperation and support in the entire course. We will keep our improvement curve on the rise and there by enhanced the reputation of our college..

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IR Wireless Underwater Communication System

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***Abstract* – One of the biggest difficulties in the realm of technology is underwater wireless communication. Since there are more vehicles and gadgets developed underwater, which require high bandwidth and consequently high capacity for communication, wireless underwater communication is of tremendous interest [1]. It was put forth and has gotten the most attention in the past 10 years. Two communication systems are used that uses infrared radiation to send and receive information. Each system has a transmitter and a receiver that transfer data and transform it after it has been received. The near infrared band of free space light wave propagation is the intended transmission medium [3]. The method may end up being a significantly less expensive option than installing and maintaining lengthy, heavy physical lines that cross rivers and the oceans. IR transmission requires incredibly little power to operate. This system appears workable in terms of achieving high data rate transmission with minimum propagation latency for short-range communication [4].**

Keywords – wireless communication, underwater communication, infrared.

I. INTRODUCTION

Underwater wireless communication is a method of information transmission and reception that uses electromagnetic radiation without the use of wires or optical fibres in an underwater environment. Since the 1850's Submarine Communication Cables have established and maintained communication across seas and Oceans. However, the installation and upkeep of these cable costs an exorbitant amount of money. The IR Wireless Underwater Communication System helps transmit data underwater without the need for physical cables. Using Infra-red technology, this system can wirelessly send and receive data. Mobile data communications transfer data at high speed of frequency such as 800 MHz, 900 MHz, 1900 MHz, 2600 MHz. The frequencies used in mobile data communications is so high that they cannot travel underwater. Hence, when the wave clashes the surface water they get completely destroyed. The principle of Electromagnetic waves is when you increase the frequency, the waves will carry more data because of increased bandwidth. But due to the increased frequency and bandwidth the data will attenuate more and we won't be able to transmit data in longer distances. And if water surfaces, the communication gets totally destroyed [5,6]. The submarines sailing underwater are 60 m, 70 m, 80 m, 90 m and 100 m deep. The communication of submarines is of very high importance such as to follow orders, to give instructions or even to communicate with each other. So, here we take the help of extreme low frequencies, super low frequencies and very low frequencies. These frequencies can travel underwater because they have high wavelengths and low frequencies. The frequency range is 3 Hz – 300 Hz for extreme low frequencies and super low frequencies. The frequency for very low is 3 kHz – 30 kHz. The Infra-red has very low frequency and high wavelength. But there are several major issues such as the waves here are very difficult to transmit hence we require specific antennas which have high power transmission. Also it is very difficult to receive waves because of high wavelength we have to use antennas of high length. Due to this the submarines have to travel with antenna at very slow speed through which they can receive the signal. Because the frequency is low the bandwidth is also low. Therefore, the data transmission is very slow. In very low frequencies the data transferred is at a rate of 200 – 300 bits/second. For e.g. the information of full page will require 4 – 5 minutes of 700 – 1000 words. Hence, the communication is very slow. Later there has been an improvement in the technology where we invented a device which worked as an antenna, separated it from the submarine and placed it at the surface from where it communicates at high frequencies through satellites and again the received signals are travelled back to submarines. Besides these we require a more advanced way to communicate underwater. In this paper, we will further discuss how Infrared can be used underwater for wireless communication [7,8].

II. LITERATURE SURVEY

Abhishek Sharma, et al [1] This paper examines the monitoring of various events occurring in an aquatic environment. These factors have contributed to the importance of underwater wireless communication. For the transfer of data, electromagnetic, optical and acoustic waves are frequently used. Wireless communications are significantly impacted by the study of potential methods. These days, this technology is employed for experimental observation, oceanographic data gathering and analysis, underwater navigation, disaster avoidance, and tsunami early warning.Muhammad Tahir, [2] This paper mainly emphasis on physical characteristics that can be seen through electromagnetic radiation, such as sea surface topography, sea surface temperature, sea ice cover and surface wave spectra. The difficulties that electromagnetic waves encounter in an underwater

environment are also covered, including how radio frequency interacts with sea surfaces and how the sea surface emits radio and microwave energy.

III. METHODOLOGY

The Hardware Specifications used are:

Arduino UNO Rev3

Infrared (IR) Sensor

LCD Display

Breadboard

Computer Keyboard

Power Supply

Cables and Connecting wires

The Software Specifications used are:

Arduino Compiler

Programming Language: C

Arduino UNO Rev3:

Arduino Uno Rev3 is a microcontroller board based on the ATmega328P, an 8-bit microcontroller with 32KB of Flash memory and 2KB of RAM. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

Clock Speed : 16 MHz

Length : 68.6 mm

Microcontroller : ATmega328P

Operating voltage : 5v

USB : 14

Digital I/O Pins : 6

Analogue Input Pins : 6

Flash Memory : 32 KB

SRAM : 2 K

EEPROM : 1 K

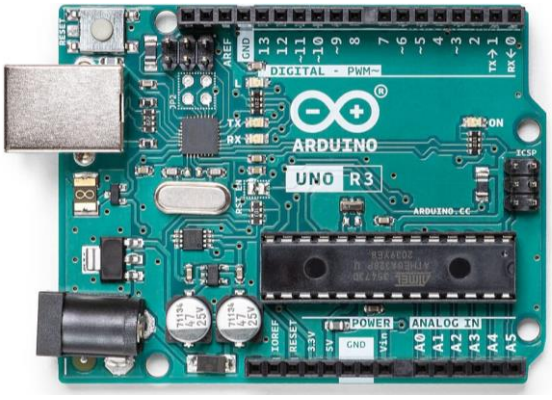

Fig-3.2: Arduino UNO Rev3

Infrared (IR) Sensor:

The IR sensor module includes five essential parts like IR Transmitter, Receiver, Operational amplifier, trimmer pot (variable resistor) & output LED. The pin configuration of the IR sensor module is discussed below.

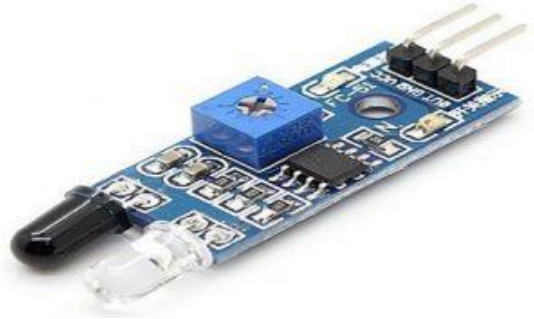

*Fig-**3.3: Infrared (IR) Sensor***

VCC Pin is power supply input

GND Pin is power supply ground

OUT is an active-high o/p

The main specifications and features of the IR sensor module include the following.
The operating voltage is 5VDC

I/O pins – 3.3V & 5V

Mounting hole

The range is up to 20 centimeters

The supply current is 20mA

The range of sensing is adjustable

Fixed ambient light sensor

Basic Block Diagram:

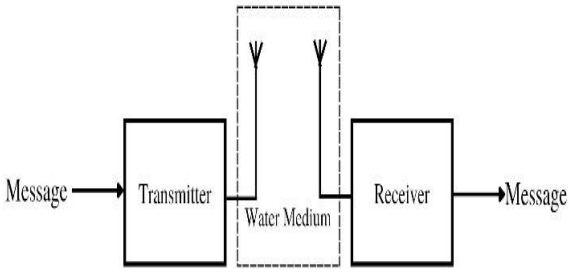

Fig-3.1: Basic Block Diagram

Transmitting Block:

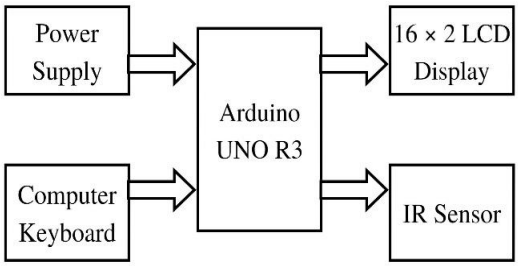

Fig-3.2: Transmitter

Receiving Block:

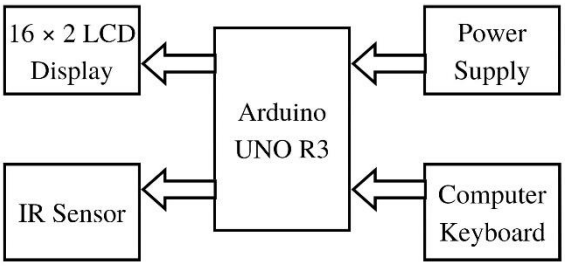

Fig-3.3: Receiver

IV. Procedure

Here, in this work we suggest IR wireless underwater communication system that allows for wireless message transmission even underwater. To do this, our system uses IR sensors which works both as IR transmitter and receiver. Our system concentrates on IR communication with two Arduino-controlled circuits with power supply on each end. Keyboards are connected on both units i.e. transmitting unit and receiving unit for input. The communicating agents on both units are IR sensors. The system has a 16×2 LCD Display attached for the display of the communication messages. We utilise a water barrel to show how IR signals can be used for underwater communication as they travel through the container. The confirmation key used in system communication is returned to the sending unit by the receiving unit. With the use of IR communication, wireless communication is thus effectively executed at a line-of-sight range of around 3 – 4 metres underwater.

V. Results and Discussion

Our technology is capable of sending and receiving messages underwater. The method may end up being a significantly less expensive option than installing and maintaining lengthy, heavy physical lines that cross rivers and the oceans. IR transmission requires incredibly little power to operate. Low propagation loss can be used to produce high data rates. Due to the fact that the signal cannot flow through a room or a chamber, it is a secure method of transferring data between equipment in an underwater environment. The utilisation of connection wires is a need for wired communication. Communication in IR wireless networks does not require complex maintenance procedures or physical infrastructure. As a result, the price is lower.

VI. Future Scope

Recently, there has been a latest research on QKD known as Quantum Key Distribution where the communication is done with the help of light and Q bits. Because here the communication is based on Q bits the information is very secured and cannot be hacked. In normal communication where the bits are 0s or 1s we get the received message after breaking the encryption. Q bits consist of anything such as 0s or 1s or superposition of 0s and 1s where after receiving the message they get destroyed. Hence, it becomes impossible to hack these communications and maybe use them in the upcoming future.

VII. Conclusion

Despite significant advancements, there is still much room for research in this field of underwater wireless communication because a large segment of the ocean floor has not yet been explored. The main goal is to get past the current constraints, implement cutting-edge technology for oceanographic research, and deal with how the environment affects how well underwater wireless communication systems perform so that they can compete with the challenges of the future through efficient audio and video signals transmission, etc. Additionally, the above-mentioned system appears workable in terms of achieving high data rate transmission with minimum propagation latency for short-range communication. In further future, if we use QKD then maybe a highly secured communication will be possible through light at very high speed data transmission.

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Real Time Dense Air Quality Monitoring System with WSN

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***Abstract*: Air pollution is one of the important issues that have been frequently mentioned around the world. Heavy transportation results in poor air quality which damages Human respiratory system. Various Air Quality Monitoring Techniques are used nowadays, but this techniques are steeply-priced and provides low resolution sensing information that may have an effect on the accuracy of actual time records. Similarly, monitoring stations are normally much less densely populated. The density of the air in the environment increases due to temperature and humidity and they increase due to greenhouse gases like carbon dioxide, methane, nitrous oxide, ozone and some artificial chemicals such as chlorofluorocarbons (CFCs). Harmful Particulate matters like PM1, PM2.5 and PM10 are also one of the problems which result in Poor Air quality. So, this paper implements the way of alerting the people regarding the increase of poor air quality in the surrounding area, by using Real Time Dense Air Quality Monitoring System which consist of various sensors like PMS5003, DHT11 and MQ135. The ESP8266 a Wi-Fi (Wireless Fidelity) module will help us to connect and relay the data to the web application. The collected data will be stored on the Database which is created using MongoDB Database Services. The client will be able to access the quality of the air around him/her and will be able to take expected measures in order to protect their health. The Central Pollution Control Board will be greatly affected by it.**

Keywords: Air pollution, Real Time, poor air.

I. INTRODUCTION

The cities are gradually becoming aware of the health and economic effects of air pollution. Poor air quality causes over three million deaths every year. 96% of people in big cities are exposed to pollutant ranges which are above harmless limits. Air pollution quantity is 2% of gross home product in developed international locations and 5% in growing countries [1]. For these reasons, a lot of the cities and regions are looking for the real-time monitoring of environmental and weather parameters [2, 3]. Within the past, the usage of environmental statistics sensors turned into in maximum instances a right of public administrations. The primary problems were due to the goal criticisms in telling particular answers to the values of pollutants and aerosol since collecting values from a totally constrained wide variety of sensors for a whole metropolis does not suggest that those values are valid for the entire city. In reality, it is realistic to have massive differences in a few values when the air quality is measured on an unnecessary visitor's street instead of in a lawn, as an instance, within the returned of a house positioned at the identical road. Currently, there is a deeper understanding of the environmental parameters (for instance, PM10 (Particulate count), SO2 (Sulfur dioxide), PM2.5, CO (Carbon Monoxide), CO2 (Carbon dioxide), H2S (Hydrogen Sulfide), NO (nitric oxide), O3 (Ozone), NO2 (Nitric dioxide) and NOx (Nitric monoxide and dioxide)) and what kind of pollutant they may be inspired through the metropolis's systems, what the reasons of high values of pollution and aerosols are, the motives for the registered excessive values, and the dynamic of their diffusion/propagation, and many others. That is why cities have a need to understand how much pollution affects the quality of the air in the city, in order to properly regulate vehicles, as well as other activities, and give citizens awareness that they are living in a city that keeps them informed and is technology oriented and focused on citizens health and quality of air around them [4].

In order to protect the citizens of the country and to help the citizens to make them aware of the harmful pollutants surrounding them a WSN based Real Time Dense Air quality monitoring system have been developed. The density of the air increases at higher altitudes but at the lower altitudes the factors which cause sudden increase in the density of the air are temperature and humidity but these factors fluctuate from their normal conditions because of the Greenhouse gases. Let us first understand what the greenhouse gases are and what their main source of origin are. A greenhouse gas (GHG or GhG) is a gas that absorbs and emits radiant energy in the thermal infrared spectrum, resulting in the greenhouse effect. [5] Water vapour (H2O), carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), and ozone are the principal

greenhouse gases found in Earth's atmosphere (O3). Without greenhouse gases, the average temperature of the Earth's surface would be roughly 14 °C (57 °F), rather than the present average of 15 °C (59 °F).

The sensory devices which has been used will help to detect some of the greenhouse gases like carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O). In order to calculate the amount of the pollutants present in the surroundings one can use a PMS5003 sensor which will help to detect the pollutant particles quantity which will come in handy for detecting the pollutants density of the air in the premises. Further in order to protect a home or an industry from unconditional fires an MQ135 gas sensor will help to detect the smoke and alert the clients/residents/workers, etc. The methodology sections contain all the information related to the sensors and other devices and the result section shows some practical outputs. The Basic Idea of this project is to help the citizens to understand and get alerted against the dangerous pollutants which can cause illness, headache, unnecessary sneezing issues, etc. and this product will also come handy when deciding the to buy an air purifier; the device will work as a great asset in order to know the reasons to buy the Air purifiers that is the person really need it or not.

II. LITERATURE SURVEY

The Literature survey is divided into two sections in which first section contains the following points: -

1. Fine particulate matters
2. AQI (Air Quality Index)
3. Wireless Sensor Network

Section-I

1.) Fine particulate matters

Since the Industrial Revolution, air quality has gradually deteriorated and is worsening due to climate change caused by rising greenhouse gas emissions. Taiwan's smoking population is declining year by year, yet the number of diseases such as lung cancer is rising, and poor air quality could be a contributing factor in this trend, with particle issues having the most serious health consequences. Total suspended particulates (TSP), 10 m particulate matter (PM10), coarse particulate matters (PM2.5– 10), and tiny particulate matters (PM2.5) are the four types of particle matter that make up "smog," as illustrated in table 1.The fine particulate matter is in particular mentioned on this examination.

Table No. 1

Particle size (µm)	**Name**	**Description**
	Fine particulate matters (PM2.5)	Entering the bloodstream directly through alveoli
2.5–10	Coarse particulate matters (PM2.5–10)	Being inhaled by the human respiratory system
< 10	10 µm particle matters (PM10)	Through the nasal cavity to the throat
< 100	Total suspended particulates (TSP)	Beach sand being suspended in the air

Three biggest sources of fine particulate matters (PM2.5): natural, primary and derived. Forest fires or volcanic eruptions are examples of natural supplies. Incomplete combustion in factories produces primary supply of fine particulate matter, which contains a variety of harmful compounds such as organic carbon, dioxin, and heavy metals like oxycarbide and oxysulfide, which are emitted by factories and the petrochemical industry, are derived sources of fine particulate matter. Due to daylight, secondary toxic pollutants such as oxycarbide and oxysulfide, as well as nitrate and sulphate, are often produced. As illustrated in Fig. 1, fine particulate matter specifically invades human blood circulation via alveoli, demonstrating their microscopic diameters. As demonstrated in Fig. 2, fine particle matters penetrate the bloodstream and produce inflammation in organs such as the heart, blood vessels, brain, and reproductive system, which is exacerbated by the fact that fine particulate matters are hazardous chemicals including heavy metals [6].

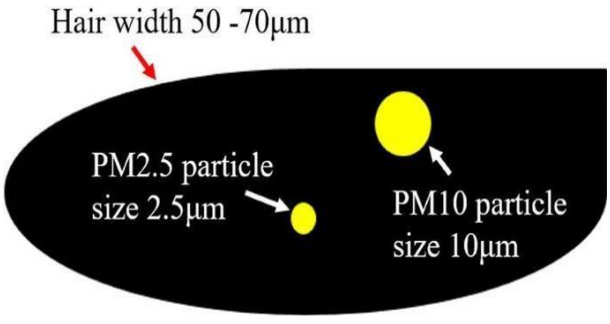

Figure 1: Diagram of Particle Matter size

Fine particulate matters mainly invade human's blood circulation through alveoli, indicating their tiny sizes.

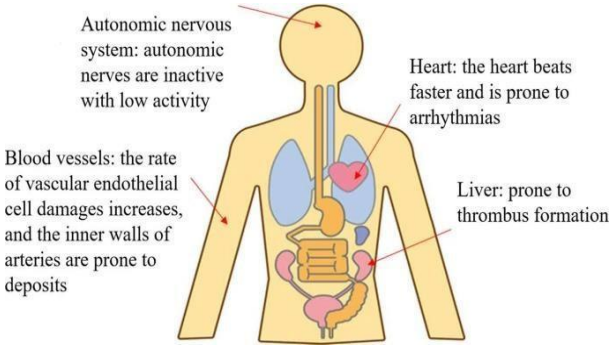

Figure 2: Effects of fine particulate matters entering the human body.

After entering the blood, they cause inflammation in organs, such as hearts, blood vessels, brains, and reproductive systems.

2.) Air Quality Index (AQI)

Because of the rapid advancement of global technology, air quality has deteriorated globally in recent years. WHO held the first worldwide conference on "air pollution and health" in Switzerland at the end of October 2018 to remind people of the permanent effects of air pollutants on human health, highlighting that children and adolescents are the most seriously harmed by air pollutants.

PM2.5 has been classified as a high-risk cancerogenic substance on a global scale. The Pollution Standard Index (PSI) was formerly utilised by Taiwan's environmental protection management; however, this system could not monitor PM2.5, hence the brand new AQI was established in July 2014. The addition of O3 and PM2.5, as well as more judicious assessment, distinguishes AQI from PSI; for example, when calculating the days of air pollutants, AQI has 50 days more than PSI, indicating that AQI is more accurate in estimating air pollutants.

The AQI refers to the classification of CO, O3, PM2.5, PM10, SO2, and NO2 concentrations in the air, as determined by data from the Environmental Protection Agency on that day, and the particular classifications of results on human fitness are presented in table 2. In Eq. 1, the computed results for various pollutant concentrations and air quality sub-indices are provided, where all values are compared to calculate the most cost, after which the maximum value of the facts is about the AQI of that day, as shown in Equation. 1 [7].

$$IAQIp = \frac{IAQIHi - IAQILo}{BPHi - BPLo}(Cp - BPLo) + IAQILo \qquad (1)$$

AQI index	NO2 (ppb)	SO2 (ppb)	O3 (ppm)	O3 (ppm) [1]	PM10 (µg/m3)	PM2.5 (µg/m3)	CO (PPM)
Good (0–50)	0–53	0–35	0–0.054	–	0–54	0.0–15.4	0–4.4
Normal (51–100)	54–100	36–75	0.055–0.07	–	55–125	15.6–35.4	4.5–9.4
Unhealthy for sensitive groups (101–150)	101–360	76–185	0.071–0.085	0.125–0.164	126–254	35.5–54.4	9.5–12.4
Unhealthy for all groups (151–200)	361–649	186–304	0.086–0.105	0.165–0.204	255–354	54.5–15.4	12.5–15.4
Very unhealthy (201–300)	650–1249	305–604	0.106–0.2	0.205–0.404	355–424	150.5–250.4	15.5–30.4

Table No.2

IAQIp: Indoor air exceptional sub-index of polluting object P; Cp: Pollutant item P mass awareness; BPHi: Excessive price of pollutant attention, similar to CP in

the table of indoor air outstanding sub-indices and pollutant object awareness indices. BPLo: In the table of indoor air fine sub-indices and pollutant object awareness indices, the low price of pollutant awareness, similar to CP. IAQIHi: In the table of relevant pollutant object concentration indices, the indoor air high-quality sub-index, namely, the indoor air fine sub-index, is relevant to BPHi.

IAQILo: Inside the table of relevant pollutant item attention indices, the indoor air great sub-index, meaning, the indoor air first-class sub-index relevant to BPLo.

The index is divided into six equal levels based on the degree of hazard and air pollution, namely good, normal, unhealthy for sensitive groups, unhealthy for all groups, very unhealthy, and harmful, which are represented by green, yellow, orange, red, purple, and maroon, respectively. The six classifications, as well as the colours associated with them, represent diverse physiological impacts. Using AQI level evaluation standards, this study looked at the air quality levels at which people can go outside, the air quality levels at which people are advised not to go outside, and the air quality levels above the purple level at which people are advised not to go outside.

3.) Wireless Sensor Network

WSNs (Wireless Sensor Network's) has emerged as Powerful Technology that plays an important role in revolutionizing the world by its sensing technology. The primary Goal that was met by WSNs was to increase the coverage area of our sensing units. The WSNs technology not only helped to increase the coverage area but also helped to reduce the Energy consumption while communicating with other nodes. WSNs technology is very affordable. The Energy efficiency of the WSNs can be further increased by using certain energy efficient techniques such as Multipath Routing, Relay Mode Replacement, Sink Mobility, and Energy conserving routing algorithms and various cluster architectures which also improves Network Scalability. As we are collecting the data from certain personal areas the data off that should be remain confidential and this can also be achieved by using WSNs which uses certain cryptographic techniques such as Symmetric Cryptography, Asymmetric Cryptography and Hybrid Cryptography. Since WSNs have some constraints regarding battery power, computation, and communication the usage of the type of cryptographic techniques differ, so we can say that WSNs also provide flexibility in choosing the Security Techniques as per the need. WSNs also provide a variety of simulation tools where we can simulate our Wireless Sensor Network Prototype where we will be able to see the results before implementing it practically. The different simulation tools available are NS-2, OMNet++, GloMoSim, OPNET, SENSE, TOSSIM and GTSNetS. So, this are the most important aspects which are met by WSNs and that is the reason we are using it in our Project. The WSN (Wireless Sensor Network) architecture is shown in Fig. 3:

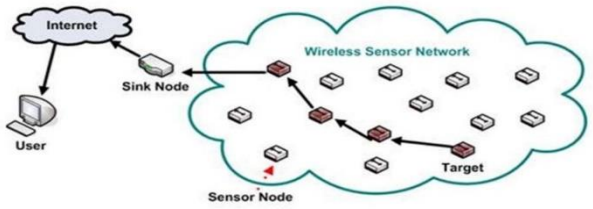

Figure 3: Wireless Sensor Network Architecture.

Section-II

Real Time Air quality monitoring is one of the important projects that will help the society to stay safe and prosper in future in order to achieve greater heights in world development. So, that's why there had been many inventions since the start of the age of IOT. To monitor the quality of the air for various applications the engineers and scientist have discovered various ways till today and by studying there flaws some advancements were made in this Project which has been explained in the Methodology section.

The students from the Electronics and Communication Dept. of Acropolis Institute of Technology and research, M.P, India tried to develop an IOT Based Air Pollution Monitoring System in which they will monitor the Air Quality which is mostly effected by various harmful gases like CO2, smoke, NH3 and benzene. An alarm will get triggered when the air quality goes down beyond a certain level. Everything will be monitored on a Web server specially designed for this particular function. To get a better visual status they will use LCD screens as the web server will mostly do the data storing processes. In this IOT project, you can monitor the pollution level from anywhere using your computer or mobile. The Authors of the research are as follows Poonam Pal, Ritik Gupta, Sanjana Tiwari, Ashutosh Sharma.

This research helped us to understand the basic concept of linking the LCD (Liquid Crystal Display) with the project in order to clearly see the output of the project and make it easy for others to understand the calculated values with certain reference levels. The main problem that this Project contains is that they do not have any remote displays. How will people travelling far from their homes will be able to see the monitored data of their home. So to overcome this certain measures are taken, which is explained in the Result section.

To carry out further development in the proposed project regarding the Real time air monitoring, we look the next paper which consist a project named as "Snap4city"

which was made by the students of University of Florence located in Italy. This project was made in order to monitor the air pollution quality in a city of Europe called as Helsinki. Now this project is used in number of cities and areas in Europe. The students who developed this project are Claudio Badii, Stefano Bilotta, Daniele Cenni, Angelo Difino, Paolo Nesi, Irene Paoli and Michela Paolucci. The "Snap4city" project focused on providing the accurate and instant data of the dense air quality at any point of the city so that the required measures can be taken as soon as possible. Certain algorithms were created and optimized for data interpolation (creating regular data from scattered) and in present day also the results of the algorithms are compared with the real values in order to evaluate the data interpolation and enhance its accuracy. While evaluating the errors which are obtained are minimized through maintenance for algorithms as well as devices (mostly the sensors and real time data processors).

One can see the Framework of this project in Figure.4 and can examine the working of the project and understand its structure. As we can see that they have also used IOT applications in order to analyse real time data. Some cities were taken under real time dense air quality surveillance.

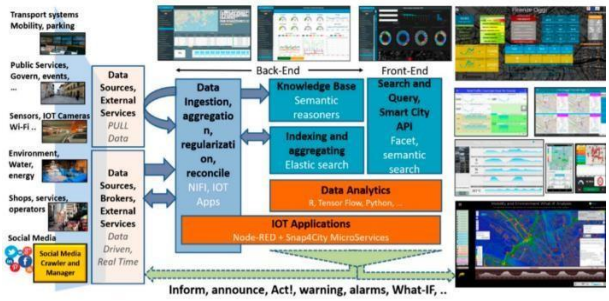

Figure 4: Overview of Snap4City Functional Architecture.

One can see in the Snap4city architecture that it consist two main elements which are functional and they are addressing data ingestion and data analytics. IoT Applications in Node-RED, other tools such as CKAN for open data (https://ckan.org), and Web Scraping tools are used in this architecture to perform Data ingestion and Aggregation. The Sanp4city consist some backhand tools which are used to manage the user activities and other tasks such as monitoring and controlling the flow of the data assisting process management providing security and platform setup. To manipulate the data, certain Data Transformation tools are required and they are developed by the data driven flows in Node-RED exploiting a suite of Snap4City Micro Services. All the data and services are accessible via the Advanced Smart City API which are used by Front End Tools such as Dashboards and Digital Apps. Snap4city architecture also consists of Lab development and management layers that provides online tools to developers for implementing ingestion and data processing processes such as data analytics algorithms, IoT Applications, and Web and Mobile Apps.

Now the next Technical paper was made on the project named as "Real Time Localized Air Quality Monitoring and Prediction through Mobile and Fixed IoT Sensing Network". The paper was made by DAN ZHANG (Department of Computer Science, The State University of New York (SUNY) Korea, Korea) and SIMON S. WOO (Computer Science and Engineering Department, Department of Applied Data Science, Sungkyunkwan University, Suwon, Korea). The researchers of this Project used a very simple, unique and amazing method to monitor air quality of a particular region. They used some moving and fixed IOT sensors. The Moving IOT sensors were placed on vehicle (those vehicles were used which mostly passes by the targeted region) and fixed sensors were attached to those areas were moving sensors range was less. In this they were able to analyse the full spectrum of dense air quality in Real time method. They collected the real-world data by using various Machine Learning Algorithms which provided better approach in effective measuring and predicting air quality. As various IOT devices were used as well as different advance programming was used to monitor the air quality in the area, it some or the other way laid a foundation for smart city. One can see the way they applied their project in Real application.

Figure 5: Songdoon Google Map indicating the fixed sensor locations.

They chose Songdo, Incheon, Korea as the location for their experimental study, as Songdo has been established as one of South Korea's smart towns. As illustrated in Fig.5, the Songdo region is physically split into 100 zones, 10 ten grids, with latitudes ranging from 126.616 to 126.700 and longitudes ranging from 37.348 to 37.401. The red dots represent data collecting points using mobile and fixed sensors. With more sensors in the future, they will be able to divide this area into multiple grids, allowing for a greater resolution service to the public. On the map, three fixed sensors are each

highlighted with a yellow star. The density of data collection points is higher at the fixed sensor position, as can be shown. Three automobiles were mounted with their mobile IoT box and navigated the road from December 10th to December 14th, 2018 and from December 17th to December 19th, 2018, in order to cover the entire Songdo area as much as possible. At both the pre-deployment and post-deployment stages, all of the sensors are calibrated every day. Table 1 contains the specifics, such as time intervals and the amount of data instances obtained, and they used the names Car0, Car1, and Car2 to distinguish the three mobile IoT sensors. Dataset: Datasets are collected in the same format by both stationary and mobile sensors. Every minute, the fixed sensors collect air quality data from the three selected locations in the Songdo area (shown as yellow stars in Fig. 5). The data collection time periods for each stationary sensor span the entire day, essentially from morning to night. The air pollution data is collected by mobile sensors for only a few hours per day, however the entire dataset includes all hours of the day. Figure 5 depicts the geographical locations of various sensors, with each icon representing a sensor. The grids' horizontal and vertical lines are cut according to latitude and longitude, and equally spaced to produce grids of the same size. The longitude and latitude of the sensor box, as well as the timestamp, temperature, humidity, and CO2, PM2.5, and PM10 concentration values, are all included in each data instance. Fig.6 shows the observed time series data of PM2.5 and PM10 gathered from moving sensors over the entire region. They took the data from all of the moving sensors at the same time and averaged it. The timeline is on the X axis, and the pollutants' observed values are on the Y axis; the amount unit for PM10 and PM2.5 is g/m3.

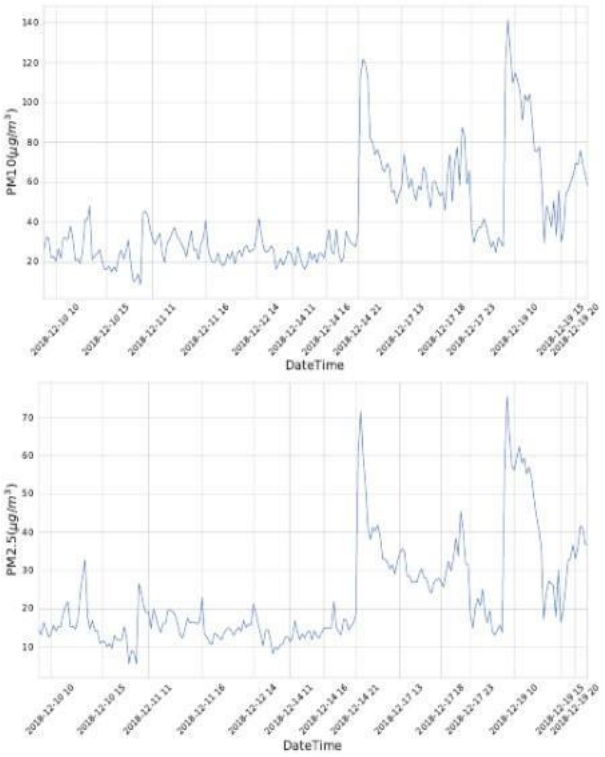

Figure 6: Real Micro Dust data Graph.

DAN ZHANG and SIMON S. WOO thought of a nice technique to mobilize the sensors through which the Coverage area will also increase but this method will be mostly effective in places like Cities and places which contain area for vehicular mobilization, what about the places such as Clothes Manufacturing companies, wood cutting industries, etc. which does not have large amount of Vehicle Mobilization. This problem can be eliminated by creating a network of Sensors which will communicate with each other and even if the Central Gateway is not in range the data collected from one sensor will be transferred to the other sensors and from there it will get transferred to the Central Gateway. An Illustration of this can be seen in Fig.3.

IV. METHODOLOGY

This Monitoring technology is useful in situations where air quality must be closely monitored, as well as for people who want to monitor pollution levels in their respective homes.

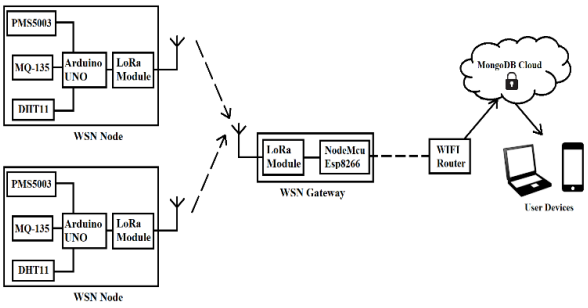

Figure 7: Block diagram of the air quality monitoring system.

The Fig.7 shows the Block diagram of the air quality monitoring system. To implement the wireless sensor network, LoRa modules were used for communication and creating nodes and gateway, the gateway uploads the data collected by the sensor nodes to Mongo DB database. Arduino uno is the main controller for the nodes and NodeMCU ESP8266 is used for the gateway so that it can connect to Wi-Fi for sending data to the database and Ai thinker Ra-01H LoRa module for LoRa radio communication. The node collect data related to air quality like particulate matter density for PM1, PM2.5 and PM10, Harmful gas density, temperature, and humidity. PMS5003 is used for particulate matter measurement MQ135 gas sensor and DHT11 for temperature and humidity sensing. A wireless sensor network is created in order to increase the coverage area of the sensing modules. LoRa modules act as Transreciever which is used to setup a communication link between the nodes. The Monitoring Project's Prototype can be seen in Fig 8.

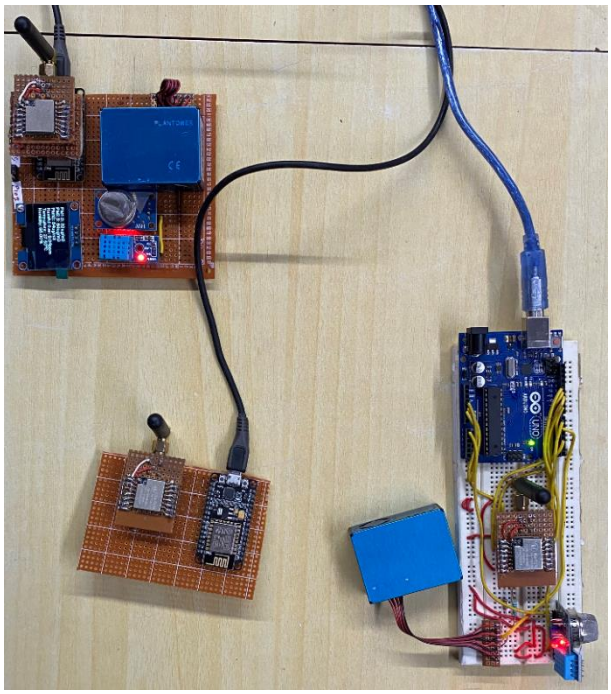

Fig 8: Project Prototype

5. Components Used:

1.] PMS5003:

PMS5003 is digital universal particle concentration sensor that can detect different sizes of particles and determine their concentration. This sensor can pick up on three different particle sizes ranges which are 0.3 to 1.0um, 1.0 to 2.5um and 2.5 to 10um.[8]. The fig.9. Shows PMS5003 sensor.

Figure 9: PMS5003 sensor.

2.] MQ-135:

MQ-135 is a gas sensor that is sensitive to a large range of toxic gases it can detect gases like ammonia gas, sulfide, benzene series steam, toluene, hydrogen and smoke. This sensor can't tell difference between two gases but one can determine the collective density of the gases present in the surrounding air [9]. The fig.10 shows MQ-135 sensor.

Figure 10: MQ-135 sensor.

3.] DHT11:

DTHT11 is can detect temperature as well as the humidity of air around it. DHT11 humidity range is 30% to 90% and the range for temperature is 0°C to 50°C. Serial communication can be used to receive temperature and humidity measurements [10]. Figure 11 depicts the DHT11 sensor.

Figure 11: DHT11 sensor.

4.] Ra-01H (LoRa Module):

The Fig 12. Represents Ra-01H Lora Module. Ra-01H is simple and cheap LoRa Module by Ai Thinker that has frequency range of from 803 to 930 Mhz that can work in India without paying for frequency used between 865 to 867 Mhz the module is used in gateway and node and configured to work on 865Mhz frequency band

Figure 12: Ra-01H (LoRa Module)

5.] NodeMcu ESP8266 Module:

ESP8266 which is shown in Fig 13 will be embedded in the gateway that is going to be collecting all the information packet sent by sensor nodes on LoRa network. ESP8266 will be connected to a WIFI Router so that all the information collected by the system can be uploaded to the MongoDB database so that the data can be logged and it can be seen from the Secured Webapp that is made.

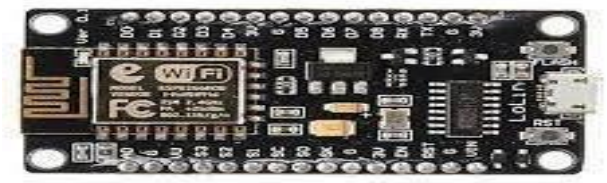

Figure 13: NodeMcu ESP8266 Module.

6.] Arduino UNO:

The fig.14 shows the Arduino UNO Module. Arduino UNO is used to collect all the data from the sensors the data is then arranged in to a packet form in which it also sending a preprogramed location of the node then that packet is transmitted on the LoRa network which will be received by the gateway.

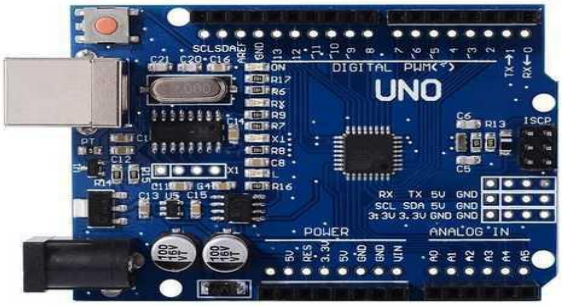

Figure 14: Arduino UNO Module.

VI. RESULTS

The Practical Outputs that we got can be seen in this section. This section also contains the Explanation of the outputs through which one can easily understand the results.

Figure 15: Calculated data Represented on the LCD Display

While testing two nodes were created one of the node had a display so that we can see what the real time air quality. The display in Fig 15 shows Particulate Matter (PM) density, the concentration of harmful gases like Co, Co2 and Nh4 then there is temperature and humidity of surrounding air.

Not everyone will have access to nodes with display and adding display on each node will increase the cost and it is not ideal. Since all the data is store in MongoDB a

secured https website was created so that all the monitored data can be accessed in-order to properly examine the data by the respective authorities. Some charts are also used to display which can be seen in Fig 16.

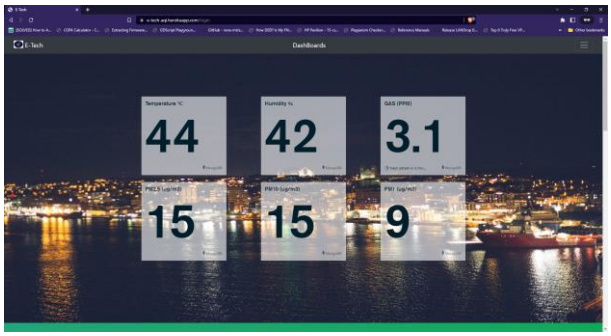

Figure 16: Data representation on Website application.

On top of the website latest values of the sensors collected which is shown in Fig 16 and updated on database this is just as helpful as the display on previous node. It shows the same thing the display on the node shows but more accessible since the website is hosted on web and can be accessed anywhere in the world.

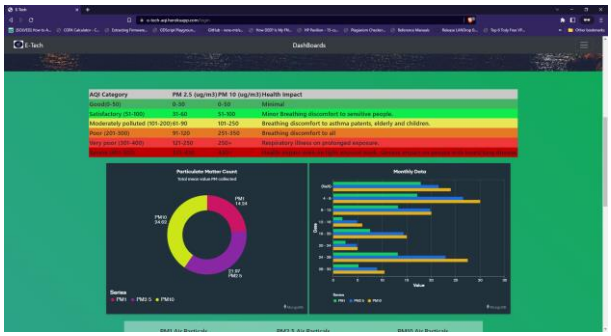

Figure 17: Data representation through Pie and bar charts.

Then under the latest values there is a pie chart which shows the concentrations of different sizes of Particulate Matter (PM1, PM2.5 and PM10) the next to that is monthly distribution of the different Particulate Matter as shown in Fig 17.

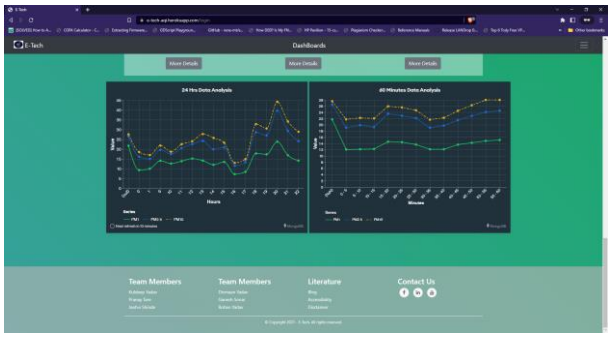

Figure 18: Hourly and minute wise distribution of data.

The website also has hourly and minute wise distributions of the Particulate Matter and it can be seen in Fig 18. These types of distribution can be repeated for the Gas concentration, such types of chart are good indication of how air quality can change monthly, yearly, hourly or minute wise these are helpful, if someone wants to find the cause of poor air quality in certain area or just study the effect of different process or machines on their environment then they may analyse the data present in the chart.

VII. CONCLUSION

As there has been increase in the Air Pollution in the world and the Particulate Matters and harmful greenhouse gases are one of the Major factors. So In order to identify the regions with high level of Particulate Matters the proposed technology plays an important role in the process of reducing and also assisting the government in taking further actions against poor Air Quality. “Real Time Dense Air Quality Monitoring System” will monitor the Particulate Matters as well as other parameters such as Temperature, Humidity and Gases in Real Time the authorities will get alert regarding the increase in the Particulate Matters. Future improvements can be done in order to increase the sensing capacity of the sensing modules which can be achieved by using high quality sensors with the customized Wireless Sensor Network made up of LoRa (Long Range) Modules. As a result of creating a Wireless Senor Network the coverage area has increased because of which the sensing modules can transfer the monitored data from any remote location in the premises. Further improvements will be done in-order to enhance the monitoring system like the monitoring system can be embedded with Air Purifiers. The Air purifiers will take action with respect to the collected data. The outputs that have been gathered so far are accurate because the sensing modules were placed in Practical Environments like Electronic Workshops, Colleges and also in some other manufacturing industries.

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Wireless Power Transmission Technology

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Abstract **- Wireless Power Transmission (WPT) is available includes various fields in many fields and is also a very active area of research students, scientists and other's due ability to provide new technology every day live There will be wireless transmission. It's a great future because it's technology transfer electrical energy from electrical energy electric charge source from the air gap wireless. In this paper, there is a wireless transmission technology presented together with the front border.**

I. INTRODUCTION

The concept of wireless (inductive) power transmission, has been known for over 100 years accurate and see Tesla's invention scrolling A key factor in wireless power transmission efficiency: can determine effective. A large part of the energy is transmitted by the generator must reach the receiver. There are two types of inductive coupling processes that can be implemented used for short distance wireless transmission standard inductive coupling and resonance inductive coupling. Generally standard faster inductive coupling contact distance because most of the magnet with current coils magnetic field decays quickly [1]. Inductive Resonant coupling offers high efficiency (95%) and can be used over longer distances (several meters), assuming the presence of a resonant coil which will significantly reduce energy loss transfer energy from one coil to another [2]. Wireless Power Transmission (WPT) can also be used directly run devices such as LED lights or a Television. Communication between medical devices placed in and out of the human body. The device has been known for a long time. An example could be provided by the diagnostic parameters sent by outwardly a lover. This paper is talking About a use such as WPT Includes cell phone or wireless charging Bluetooth headset. This paper talks about on one of such application of WPT which includes charging the mobile phone or a wireless Bluetooth earphone.

Section I discusses about the Introduction to Wireless Power Transfer. Section II discusses about the Literature Survey. Section III has main Proposed Methodology of our project. Section IV has Expected and resulting outcome. Section V has final Conclusion of our project Section VI has Acknowledgment. Section VII has the References which had been taken to make this paper.

II. WIRELESS POWER TRANSFER (WPT)

Inductive power transmission is also called wireless electrical conductor. It can be used in short intervals or even wireless remote. This is WPT technology provide efficient, fast and low maintenance costs compared to other technologies. It also allows migration electronics to charge their own batteries in a short time. Plug into a universal power cord. Loss of power WPT technology is very small compared to wire electrical conductor. General purpose WPT is to enable mobile devices to be consistent filled and missing the restriction of the cord set [9]. There are three main systems in WPT:

- Microwaves
- Resonance
- solar cells

Nikola Tesla was the first to conduct the experiment dealing with WPT. The idea is the earth itself fully rechargeable transmitter above [3]. When Tesla's experiment did not produce electricity. at that time, they were just passing by. This may be the idea used to solve the energy crisis [5]. Small and portable technology is part of everyday life Another problem arises in migration energy field. All mobile devices today are battery operated strong; everything must be charged with a wire charger [6]. WPT is now connected to a PDA instead of a cell phone. digital camera, audio recorder, mp3 player or laptop charging can take its power wirelessly. Although wireless transmission is possible in the daily life of humans, but this technology suffers. Some bugs require networking obstacles and hundreds of satellites and others electronic devices. [7]

III. LITERATURE SURVEY

This article analyzes the bibliography on wireless power Conducting research covering the years 2001-2013 using two databases (Web of Science and Scopus). We will report some differences found in the database used in this research [1]. Because there are so many in peer-reviewed journals, conferences, and Symposium contributions are not included. Four ten peer-reviewed journals, 90 et 122 papers including the word Wireless Power Transfer Published in 2001 as 2013 respectively [4].

A most prolific and highly influential author and country is defined. The four most productive countries like USA, South Korea, China, Japan and Singapore in two databases. 127 average quotes received by each of the

five most cited papers Scopus [5]. Bibliographic references are listed here the paper is important because it covers and analyzes it. Best research articles on wireless transmission coming from two dozen countries published in the world with advanced science technology magazine. Tesla invented this concept 115 years ago wireless transmitter. Many industrial applications it is based on technology. Since then, this technology is particularly
interesting. The interlocking wires are useless, even it's impossible. This paper proposes a descriptive questionnaire. A history of wireless energy technology. More specifically, two types of wireless power transmission, radiative and non-radiative, are investigated. In addition, the first standard (Qi) and other standards mentioned. Finally, key challenges and future projections.
Over 115 years ago Tesla invented the concept of (WPT) Many industrial applications based on this technology have been developed ever since. This technology is of interest especially where the interconnecting wires are inconvenient, or even impossible. This paper provides a survey that describes the history of wireless power technology. Specifically, two types of (WPT) radiative and non- radiative, are studied. Additionally, the formation of the first standard (Qi) and other standards are mentioned. Finally, the main challenges and future prediction of this technology are presented too.

IV. PROPOSED METHODOLOGY

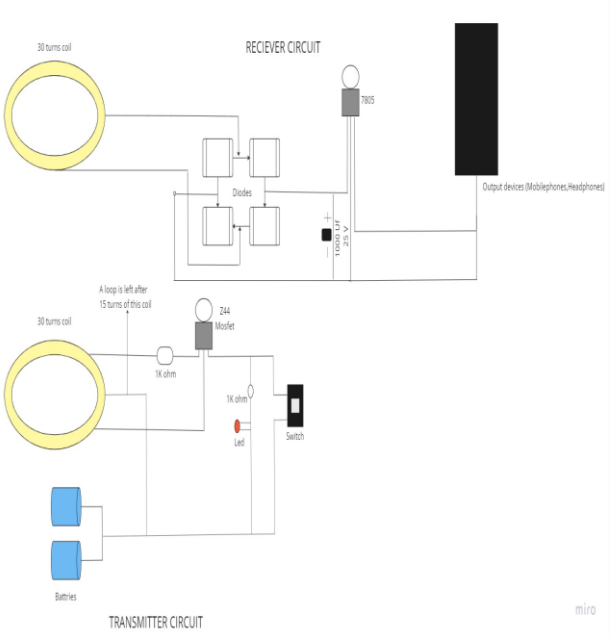

Fig1. Schematic Diagram

The method used to charge portable devices such as mobile phones is called inductive charging. Inductive charging uses an electromagnetic field transfer energy between two bodies. First, we make 2 coils, the receiving side is 30 turns, and after 15 turns, the circular loop is left in the conductor and continues with the remaining 15 turns, that is, there are 3 wires in the conductor and 2 wires in the receiver.

Now coming to the receiver circuit, the two ends of the coil are connected to the rectifier circuit and then the capacitor is connected to the other two ends of the rectifier circuit. Now finally the charger is connected to one of the capacitors, the other end for the 7805 regulator (for the security of the cell phone that makes the voltage no more than 5v) and the other end connected to the other end of the regulator pin. So, the project is ready and you can see that the phone will charge when it is opened and the mobile phone is connected.
This system represents the concept of a wireless mobile charging system. This system allows users to charge mobile phones wirelessly without plugging them in
adapter. We demonstrate a system using a charger panel that has an adapter circuit for charging mobile phones.

V. EXPECTED AND RESULTING OUTCOMES

Transmitter and receiver coils had the same number of turns. The radius of both the coils were 0.07m, while the input voltage provided was 18V. Following results were obtained when no of turns of the coil and distance was varied.

Input Voltage	Distance in (cm)	No. of turns in coil	Output Power (Watts)
18	3	15	0.0149
18	2	25	0.499
18	1	30	3.494

VI. RESULTING OUTCOME

Fig2. Real Time Output

VII. CONCLUSIONS

The concept of wireless power transmission is introduced. The application of technology that improves human life in today's world has been discussed [3]. The three previous competing standards for wireless power technology are at the fore when other standards are about to arrive [4]. Here are three wireless charging standards that will win the race to be determined by their latest great apps. The comparison table shows that the A4WP standard with a large magnetic field and a large charge range should be at the forefront of this technology, while

Qi and PMA are faster [9]. More applications in research with wireless power charging and the robotics industry will only exist in everyday life if wireless power increases.

ACKNOWLEDGMENT

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Stock Market Prediction Using Machine Learning

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***Abstract*— In Stock Market Prediction, the aim is to predict the future value of the financial stocks of a company. The recent trend in stock market prediction technologies is the use of machine learning which makes predictions based on the values of current stock market indices by training on their previous values. Machine learning itself employs different models to make prediction easier and more authentic. The paper focuses on using Regression and LSTM-based Machine learning to predict stock values. Factors considered are open, close, low, high, and volume.Stock market prediction has attracted much attention from academia as well as business. Due to the non-linear, volatile, and complex nature of the market, it is quite difficult to predict. As the stock markets grow bigger, more investors pay attention to developing a systematic approach to predict the stock market. Since the stock market is very sensitive to external information, the performance of previous prediction systems is limited by merely considering the traditional stock data. New forms of collective intelligence have emerged with the rise of the Internet (e.g. Google Trends, Wikipedia, etc.). The changes on these platforms will significantly affect the stock market. In addition, both the financial news sentiment and volumes are believed to have an impact on the stock price.**

Keywords- Close, high, low, LSTM model, open, regression, and volume.

I.INTRODUCTION

Stock market prediction is the act of trying to determine the future value of company stock or other financial instruments traded on an exchange. The successful prediction of a stock's future price could yield significant profit. The efficient-market hypothesis suggests that stock prices reflect all currently available information and any price changes that are not based on newly revealed information and thus are inherently unpredictable. Others disagree and those with this viewpoint possess myriad methods and technologies which purportedly allow them to gain future price information.

A correct prediction of stocks can lead to huge profits for the seller and the broker. Frequently, it is brought out that prediction is chaotic rather than random, which means it can be predicted by carefully analyzing the history of the respective stock market. Machine learning is an efficient way to represent such processes. It predicts a market value close to the tangible value, thereby increasing accuracy. The introduction of machine learning to the area of stock prediction has appealed to many researchers because of its efficient and accurate measurements [1].

The vital part of machine learning is the dataset used. The dataset should be as concrete as possible because a little change in the data can perpetuate massive changes in the outcome [2]. In this project, supervised machine learning is employed on a dataset obtained from Yahoo Finance. This dataset comprises of following five variables: open, close, low, high, and volume. Open, close, low, and high are different bid prices for the stock at separate times with nearly direct names. The volume is the number of shares that passed from one owner to another during the time period. The model is then tested on the test data.

II. LITERATURE SURVEY

Forecasting the way of stock prices is a widely deliberate subject in many fields including trading, finance, statistics, and computer science. Depositors in the stock market can maximize their yield by export or selling their investment if they can determine when to enter and exit a position. Specialized traders typically use essential and/or technical analysis to inspect stocks in making venture decisions. The vital analysis involves a study of company fundamentals such as proceeds and profits, market position, growth rates, etc. Technical analysis, on the other hand, is based on the study of historical price oscillations.

In [7], the paper investigates the use of machine learning models in predicting stock market indicators using historical data and Twitter sentiment analysis. The study finds that the support vector machine model with a radial basis function kernel outperforms other models in predicting the direction of the stock market movement with 74% accuracy. However, the authors note the limitations of the study, including potential biases in Twitter data and the study's limited scope.

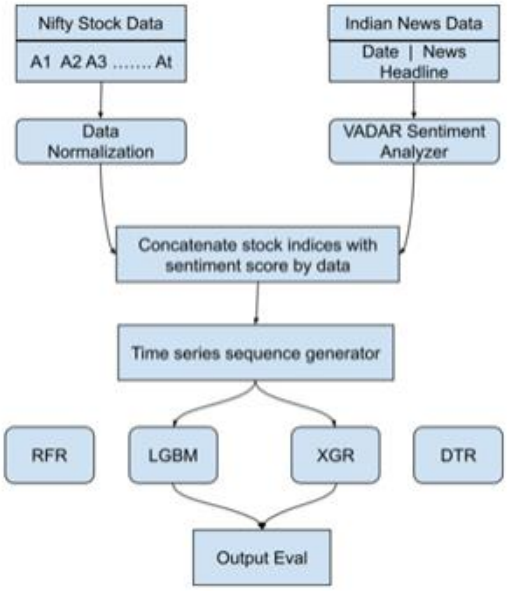
For [8], the CNN-BiLSTM-AM method is a machine-learning approach for stock price prediction. It combines a convolutional neural network (CNN), bidirectional long short-term memory (BiLSTM) network, and attention mechanism (AM) to analyze historical stock data and make predictions. The CNN is used to extract features from the input data, which are then fed into the BiLSTM network to capture temporal dependencies. The attention mechanism helps the model focus on important time steps in the input sequence. The result is a model that can predict future stock prices based on past performance.

In [9], the paper presents a method for predicting stock price movements based on the sentiment expressed in microblogs. The method, called "Collective Sentiment Mining of Microblogs," uses machine learning techniques to analyze sentiment from large volumes of microblogs and predict stock price movements for a 24-hour period. The model combines several sentiment analysis techniques and considers the sentiment expressed by multiple microbloggers. The results show that the proposed method can outperform traditional stock prediction models and demonstrate the usefulness of social media data in improving stock price predictions

In [10], the paper proposes a deep learning-based approach for feature engineering in stock price movement prediction. The method uses convolutional neural networks (CNNs) and long short-term memory (LSTM) networks to automatically extract relevant features from stock market data, such as price and volume, without manual feature engineering. The approach was tested on a large dataset of US stocks and compared to traditional machine learning models. The results show that the deep learning-based approach outperformed the traditional models and produced more accurate predictions. The paper demonstrates the effectiveness of deep learning-based feature engineering in stock price prediction.

In [11], the "Stock Market Forecasting Based on Text Mining Technology" paper proposes a method for predicting stock prices using support vector machines (SVM) and text mining technology. The approach involves analyzing news articles and other textual data to extract sentiment, named entities, and other relevant information, which is then used to train the SVM model. The paper compares the performance of the SVM method to other machine learning approaches and finds that it outperforms them in terms of accuracy. The paper demonstrates the potential of using text mining technology to improve stock price prediction, particularly in the context of news articles and other textual data

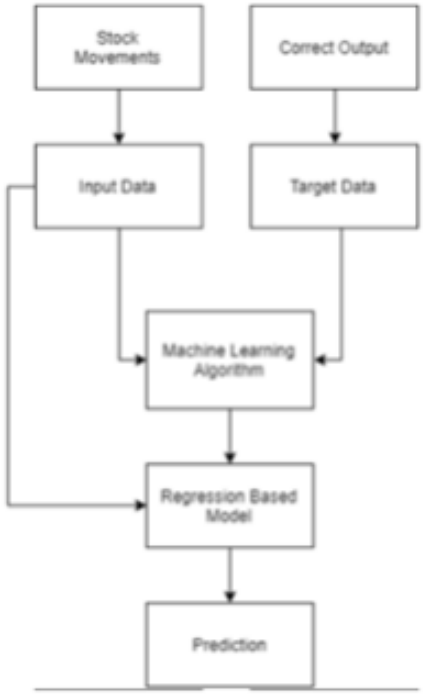
III.PROPOSED SYSTEM



The process that was followed was a simple process of applying sentiment analysis in the historical news dataset to analyze the news trend of good or bad. The other side was applied with different Arima model time series processes to catch the trend of the technical data and predict the future result for it. After both parts are done through the Time series sequence generator we will combine both the dataset and by merging the new dataset new models would be used for good prediction accuracy and results. The database used in the paper was of Historical Numerical data and News data for that duration. The Arima model was used for numerical data and the Sentiment analyzer was used for News data for getting the sentiments of the news for the better accuracy of the final output. By combining both the data through date time series the new dataset will form and would be applied for further models.

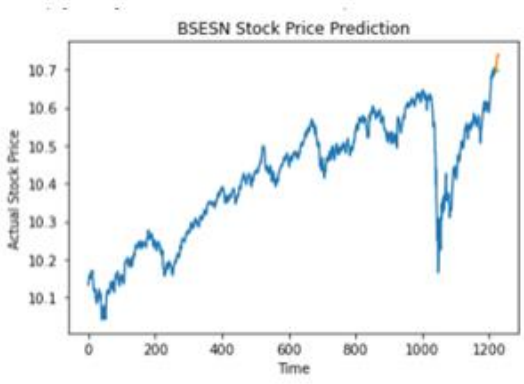
IV.SYSTEM DESIGN AND IMPLEMENTATION

Stock market prediction seems a complex problem because there are many factors that have yet to be addressed and it doesn't seem statistical at first. But by proper use of machine learning techniques, one can relate previous data to the current data and train the machine to learn from it and make appropriate assumptions. Machine learning as such has many models but this paper focuses on two most important them and made predictions using them.



Regression is used for predicting continuous values through some given independent values [5]. The project is based upon the use of linear regression algorithm for predicting correct values by minimizing the error function as given in Figure 1. This operation is called gradient descent. Regression uses a given linear function for predicting continuous values: Where, Vis a continuous value; K represents known independent values; and, a, b are coefficients. Work was carried out on CSV format of data through the panda library and calculated the parameter which is to be predicted, the price of the stocks with respect to time. The data is divided into different train sets for cross-validation to avoid overfitting. The test set is generally kept at 20% of the whole dataset. Linear regression as given by the above equation is performed on the data and then predictions are made, which are plotted to show the results of the stock market prices vs time [6].

V. RESULTS



We were successful in predicting the stock price for a future time stamp. The prediction for this was made by the ARIMA model. Using the concept of Euclidean distance to calculate the root mean square error. We found the metric value to be 0.02. This shows that the predicted value was not very far off the original trend. Also, we are on the way to searching and scoping with new models in the market which are related to prediction models and testing them by applying the models without data which can conclusively show us which model will be more accurate and which model should we recommend to our viewers or customers. Some models like the random forest, xgboost, and decision tree are related models to our project and will be perfect for executing them.

VI. CONCLUSION AND RECOMMENDATION

Hereby, it can be proposed that no trading algorithm can be 100% effective, not only 100%, it will typically never be close to 70% but to attain even accuracy of 40% or 35% is still good sufficient to get a good forecast spread. Although extreme attained accurateness was 39%, it was still able to closely forecast the predictable outcome and have coordinated against the company graph. Making our expectations more efficient, it can be done by including bulky data sets that have millions of entries and could train the machine more powerfully. Different activities of stocks can lead to diverse raises or lows in the forecast price, use these movements to magistrate whether a company should be traded in or not. No training Data can ever be stable, hence there is always some unevenness that can be seen in the above data spread, but to still forecast close to a consequence will also lead to a good approach if it has greater than 33% accuracy. While developing a strategy traders should always think to always have a nominal imbalance while still being above 33%accurate.

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[10] Long et al. Financial news of SZ002424 stock SVM and S&S kernel BOW

[11] Xie and Jiang Financial news, 20 Chinese stock prices SVM and specific sentiment dictionary

Sensor Network Based Rescue, Recovery and Rehabilitation

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***Abstract*—Natural disasters are caused by earthly processes that are inherently harmful. Natural disasters include earthquakes, volcanoes, floods, tsunamis, and other geological events. As a result of long-term climate change and rising temperatures, the Earth is becoming more vulnerable to them. Detection of such disasters has thus become a focus of thought and innovation in order to reduce the loss of human life. Natural disasters cannot be avoided because they are an inherent part of the natural environment in which we live. But, to the greatest extent possible, we can take precautionary measures at various levels of society to reduce the impact of these natural disasters on people and property. The proposed system is a sensor-based setup that detects anomalies in a specific area based on its natural structure, increasing the chances of detecting and rescuing vulnerable individuals.his electronic document is a "live" template and already defines the components of your paper [title, text, heads, etc.] in its style sheet.**

Keywords—Sensor network, Rescue, Wireless sensor networks, Detection, risk reduction, Technology

I. Introduction

India, the world's second most populous country, is particularly vulnerable to natural calamities. The Indian subcontinent also experiences periodic weather events due to its geographic location, seismic risk zone, and intertropical convergence point: large monsoon rains, floods, bouts of extreme heat, drought, and other calamities. In the event of a large-scale disaster, it is extremely difficult to locate survivors in a timely manner that allows them to be saved. During the rescue attempts we must be cautious to avoid putting rescuers in danger and causing extra casualties. As such the demand for better equipment to locate survivors beneath a rubble pile has skyrocketed.

The focus of these equipment are on unclouded detection of life and any impediments to the operation which went unnoticed in the initial inspection of the area of concern. Another point of focus is the maneuverability of such equipment throughout different landscapes. It has been observed that infrared sensors have been greatly beneficial in threat detection. An infrared sensor is an electronic device that emits light in order to detect objects in the environment. An infrared sensor can detect motion as well as measure the heat of an item. As such these sensors are very handy in detecting lifeforms and objects throughout an area. The goal of this research is the design and the development of equipment using IR sensors which would result in the rescue of a greater number of survivors.

II. Literature Review

Around 68 percent of India's territory is vulnerable to drought, 60 percent to earthquakes, 12 percent to floods, and 8% to cyclones, making it one of the world's most disaster-prone countries. According to a report by the United Nations Office for Disaster Risk Reduction, 321 natural catastrophes in India have claimed the lives of 79,732 individuals, affecting 108 crore people. The country ranks third in the world in terms of natural disasters, trailing only China and the United States. The National Disaster Response Force is one of the leading sections of the forces for handling disaster response and risk reduction. Several technologies are being included in rescue operations. This includes the map intelligence and data-base leveraging technologies. Radars, remote cameras, and antennae have been a constant in these operations. Infrared sensors have found use in several surveillance and detection systems. Infrared technology is being used in proximity sensors, IR imaging devices, optical power meters, sorting devices, missile guidance, remote sensing, flame monitors, moisture analyzers, night vision devices, infrared astronomy, rail safety to name a few. Because of their low power consumption, they may be used in a wide range of electronic devices, including computers, phones, and PDAs. MEMS are inertial sensors with high accuracy and low cost that are employed in a wide variety of industrial applications. This sensor makes use of micro-electro-mechanical systems, a chip-based technology. These sensors are used to both detect and measure external stimuli like pressure. They then react to the recorded pressure by performing a few mechanical operations. They don't need to make contact with an object to detect it, and there's no data leakage owing to beam directionality.

III. Proposed System

The Proposed system consists of a MEMS sensor-based system which notes the condition of the terrain and detects details of the abnormalities, noting and required details. Each year natural calamities cause loss of thousands of lives and billions worth of property in India.

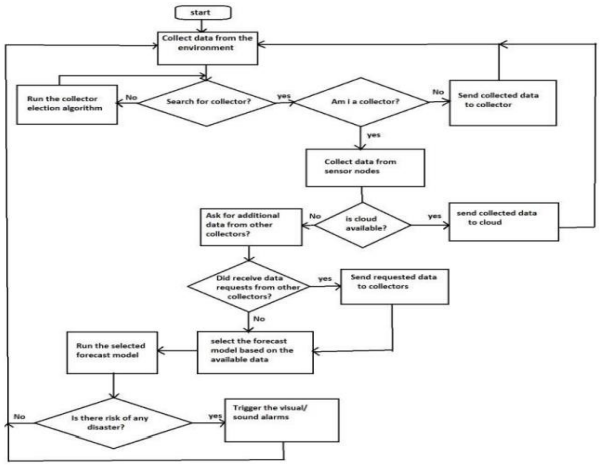

Fig. 1. Block diagram of proposed system

Although all these losses cannot be eradicated fully but the losses to lives and property can be minimized to barest minimum level, if the protective measures can be taken before the disaster arrives. This can be made possible with the help of communication technology employed on top of wireless sensor networks. The system development involves the various phases and of course,

All phases are equally important. Starting with the first phase of data collection, level one is to deal with the physical deployment of sensing devices in the riverbanks and implementation of an effective localization scheme depending on the situation and environment. At the second level data analysis takes place along with the central monitoring system. So basically, this sensor based system will be a simulation based in which all the detection is going to take place. These types of sensors can be placed at various locations such as apartment buildings and offices. Implementing sensors at those places can be very much useful because it can save so many lives by just giving the early signals of disasters by sensing the motions.

IV. Result And Disucssion

The proposed system is an infrared sensor-based setup which detects anomalies in a particular area in regard to its natural structure, therefore increasing the chances to detection and rescue of vulnerable individuals. Starting with the first phase of data collection, level one is to deal with the physical deployment of sensing devices in the riverbanks and implementation of an effective localization scheme depending on the situation and environment. At the second level data analysis takes place along with the central monitoring system. The expected outcome of this project is to give an early signal of the earthquake by sensing the motions of the earthquake. So basically, whenever the sensor will sense the motions of the earthquake it will produce the noise from the buzzer which will give an indication of the earthquake. Fig. 2 shows implementation of proposed system on breadboard.

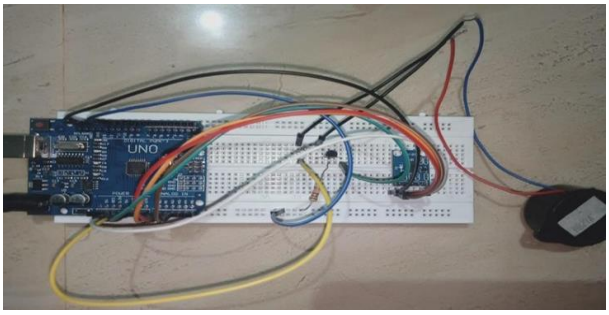

Fig. 2. Implementation of proposed system

V. Conclusion

There is a need for sensor systems to augment existing solutions and protocols for disaster detection and rescue execution. Over the past few years, wireless sensor networks have garnered a lot of interest. As technology emerges over the decades, WSN has come to the spotlight for its unattained potential and significance. It has been noticed that these wireless sensor network architectures help us a lot in determining the causes of natural and man-made disasters, as well as providing rescue and preventive measures if any area is affected by these disasters. The current generation of remote sensors opens up new avenues for real-time disaster risk analysis and management. As a result, these structures help to save many precious human and animal lives that would otherwise perish because of the effects of these disasters. Natural disasters claim thousands of lives and billions of dollars in property in India each year. Although none of these losses can be completely avoided, losses to lives and property can be kept to a bare minimum if protective measures are put in place prior to the disaster. This is made possible by the communication technology that is used on top of wireless sensor networks. In this endeavor, an economic sensor-based system is developed and implemented to track disasters. This system uses a MEMS (Micro Electro-Mechanical System) sensor to track movement and tilting and classify the event as a disruption or a calamity. The focus of the project is to make rescue systems reasonable and accessible.

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Smart Android Based EV Battery System

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***Abstract*—This article will review how the BMS module functions in electric vehicles, its components, and an example of how software may be used to make the BMS module smarter and remotely accessible. Working simulation of the EV battery charging with a steady supply of current. Monitoring the State of Charge, current, and voltage of the battery during its charging phase. Developing the Smart EV battery managing software using Android Studio Development and providing a clear interface for the driver for EV's battery information.**

Keywords—Android Studio, EV Smart System, BMS, mbatteryManager, Smart EV Battery Management System.

I. INTRODUCTION

EVs are the way of the future of mobility as the globe becomes more electrically advanced every day. [1] Nearly 26 million new electric cars will be put on the road just in 2018 alone, up from roughly 3.5 million in 2017. Although these figures don't fully convey how quickly and thoroughly we are moving toward this transformation, according to Bloomberg New Energy Finance (BNEF), electric vehicles and trucks may account for up to 65 percent of new vehicle sales by 2050, or 33 million units annually. EVs lack a combustion engine, but they do have an electric motor to power the wheels, a battery that must be charged, and a BMS module to keep an eye on the battery and the current supply to the motors. Running out of charge unexpectedly on an unknown road is the worst nightmare any EV owner can imagine. The technology has come far ahead from breaking down so one of the innovations has been done in creating an in-car software which tells the driver where the most power is consumed which is inefficient. The basic overview of (BMS) battery management system is that this system observes, monitors, controls, and optimizes an individual's performance or multiple battery modules in an energy storage system. [2] BMS consists of a different gateway that represents all the veins of EV, here veins refer to all parts where the current is flowing to power the part. The BMS module [3], which deals with battery packs, functions as the system's primary brain. It creates systematic and collinear lines using usual voltages and current measurements, which may be used to compute SOC and SOH. The EV has a data storage device on board that retains the information that, in adverse circumstances, may be analyzed and used to take action. Basic BMS deals with cell life accuracy and can restrict specific powers, immediately notify the driver, and isolate that cell by internally reducing the power to prevent short circuits if a cell part is destroyed. BMS will also direct the driver based on his driving abilities, or how he manoeuvres his vehicle. In an EV, the BMS is essentially the regulated electrical valve. Without it, the system is doomed to malfunction or the driver would have to do all of these tiresome tasks. BMS offers intelligent support as well. In addition, if the driver wants to travel, say, 100 kilometers and the charge is 62 percent, the computer calculates how the driver drives and the satellite traffic and will alert the driver if the power is insufficient to prevent the driver from breaking down in the middle of the vehicle. Out of 100 percent of charge, 20 percent is used as reserve, and if the battery drops significantly, the driver gets the notification and the computer itself shows the way to the nearest charging station where the driver can shut down for more range if he wishes to lower the power to non-essential features like the heating seat massage. If we extrapolate the numbers from gas-powered automobiles, where the typical tank size is roughly 40-70 litres and the typical range is 12 km, we get 280-300 km, which is much less than the 450 km range of EV cars. [4]

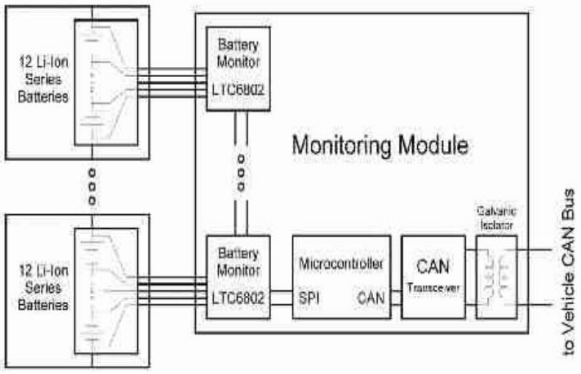

Fig. 1. Flowchart of Battery Management System

The diagram up above shows a BMS module. A contemporary EV's BMS system is made up of several branches that are all connected to the battery pack, along with a battery monitor to ensure correct voltage and current, a small but potent computer controller to do computations, and a CAN Bus controller for communicating with other controllers.

II. METHODOLOGY

A. Making the BMS module smarter

In order to make the BMS intelligent and self-sufficient, we must transfer the data onto a portable device that can update in real-time and be ready for unforeseen circumstances. Creating a functional prototype will be the first step toward our goal, but in order to do so, we must first understand how a BMS operates when it is under load. [5] In order to gain this knowledge, we require a simulation of various load situations in BMS. When designing our Smart Battery Managing Software, we chose to simulate the scenario in which the EV is docked and the battery is being charged. After understanding the results, we will use the information. In order to precisely assess various elements of the battery and present them to the driver, the simulation's BMS will be connected to the application and deliver the data with a less than 2-second latency.

B. Implementation for Battery Charging using constant current design simulation

We put into practice a circuit prototype for a steady-current battery charging. For the necessary components, we utilized the Simulink library and MATLAB Simulink software. Battery, Powergui, DC Voltage Source, Constant, Ideal Switch, Series RC Branch, Series RL Branch, Resistor, Mosfet, Bus Selector, From Tag, Go To Tag, Scope, Adder, PID Controller, PWM Generator (DC-DC), and Not Gate are the specific components used in this simulation.

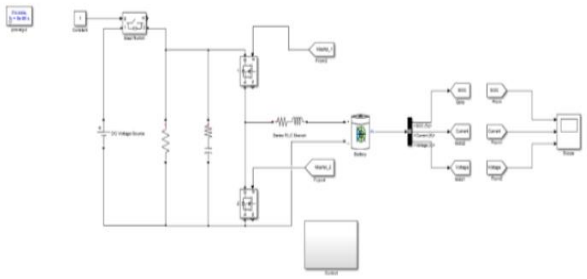

Fig. 2. Battery Charging Connection

The connections for each component are displayed in the aforementioned Figure (Fig. 2). [6] Make sure the type is set to variable type and the Solver is in automatic solver selection mode in the solver settings before we begin with the connections. The simulation type should be discrete, and the sample time is set to 5e-6 in the Powergui settings. When the battery is not draining, the DC voltage source is then utilized to power the load and charge the battery. Conversely, the DC power supply is unplugged when the battery empties. The voltage is 48V. The Li-ion battery parameters are then modified while maintaining the 24V nominal voltage, Battery response time is 1 second, initial SOC is 45 percent, and rated capacity is 40Ah. Then, we select an RL branch with 0.05 Ohms of resistance and 5.76 e-4 of inductance. The second MOSFET must be connected to the series RL branch, while the first one must be connected to the negative end of the battery terminal. Next, we choose the Series RC branch and set the resistance and capacitance values to 0.001 Ohms and 1000e-6, respectively. One load resistor is also used, and it is set to a random value. Then, we parallel-connect the load and the RC branch. The ideal switch's gaining pulse is then set to 1 to charge the battery, and it is connected to a constant value of 1. We utilize a bus selector to get the battery's individual parameter values, including SOC, Current, and Voltage. Then, as shown in the picture, we link these bus selector output terminals to the Go To tags to properly identify them. Since we must utilize these tags' connections across the whole circuit, we also need to make sure that their visibility is always set to global. After that, we attach the scope to the appropriate tags for each.

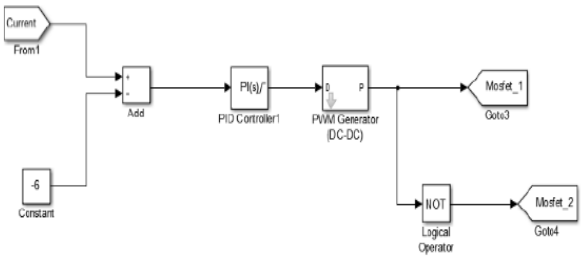

Fig. 3. Control Package Connection

We need to develop a control package for the battery charging when the exterior circuit is finished. In this package, a PID Controller is used to precisely manage the battery charging process and boost the battery's effectiveness. The source is set to internal, the parameters for proportional and integral values are set to 0.005 and 10, respectively, in the main section, and we alter the settings of this controller to PI. [5-7] Additionally, the integrator's value is modified to 0.54. The maximum limit of the output saturation limitations is set to 0.975, while the lower limit is set to 0. These are the parameter values that will be the duty cycle of the PWM generator (DC-DC). We change the values for the PWM generator by changing the switching frequency to 10e3Hz and sample time to 5e-6. Next with the help of the from to and Go to Tags, we connect the MOSFETs as an output in this package. Basically, we are creating pulses of both the MOSFETs in the control package. So, the output of the PWM generator in the control package will go to MOSFET 1 and the negative of that pulse will go to MOSFET 2, for which we will require a NOT Gate These are the parameter settings that determine the PWM generator's duty cycle (DC-DC). By altering the switching frequency to 10e3Hz and the sample duration to 5e-6, we modify the values for the PWM generator. The MOSFETs in this package are then connected as an output using the from to and Go to Tags. In essence, the control package's two MOSFETs are being pulsed. Therefore, MOSFET 1 will get the positive pulse from the PWM generator in the control package, and MOSFET 2 will receive the negative pulse, for which a NOT Gate is needed. In Fig2, the connections for the same are displayed. The next step is to attach an added to a "+" and "-" terminal. In this case, the positive (+) will represent the battery's charge current and the negative (-) will represent the reference voltage. We used a constant to maintain this Reference Voltage at 6V. Due to the current going into the battery, this constant has a value of -6. This brings our circuit model to a close. We now examine the output in the scope, for which Fig 3.4 provides the corresponding figure.

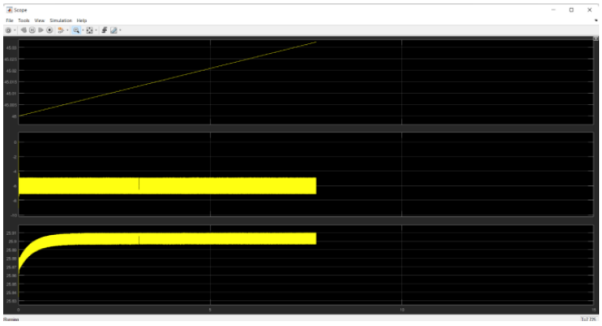

Fig. 4. Graph for SOC, Current and Voltage respectively

[8] The SOC is growing, and the current variations are about 6Amps, as can be shown. Now, if we wanted to alter these fluctuations, we could do so by altering the inductance's value. Additionally, we only need to modify the constant's value from -6 to the required value in the control package if we want to view the present oscillations in a new range of values. The current will then flow more readily within the specified range in such a situation.

C. All about Our App

Initially, we made the decision to create smart software that would serve as a display for the EV battery's current condition, a monitoring guide for the battery pack's health, and suggestions for the driver on how to address any difficulties that may occur and prevent major mishaps.

a) UI/UX Design of our App

- Android Studio - [9] We began by building our battery management app in Android Studio. Firstly, we ensured that we have a java JDK package loaded on our system before installing Android Studio since the preferred language of our code will be java. A new project in Android Studio was created after installing and configuring it. We chose a basic template type to work with.

- UI Design of our App - To begin with our app's UI design, we used several components present in the palatal area. Design, Split, and Code are the three parts of the workspace. It features a component tree area where the palette components for the frontend design are inserted. We used image view, text view, buttons, and drawable XML files in our interface. To insert an image in the UI interface, we first added the png or jpeg image file in the drawable resource file. Next, we extracted the image view from the palette to the component tree and added the drawable source to the image XML code in the 'activity_main.xml' file. To add a text view in the design, we just added the text view component from the palette to the component tree and changed the text, colours, style, positions, etc. in the main XML code.

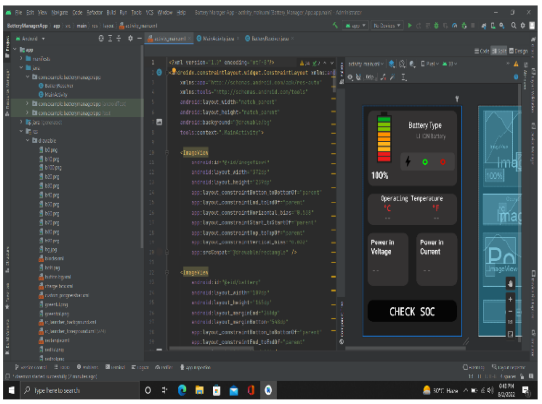

Fig. 5. A. Code of Design

Apart from the components of the palette, we also added our customised shapes as a background for the texts to the design interface by creating a new drawable resource XML file. While creating the new resource file we kept the root element as 'selector'. Next, we started the XML coding for the required element shape inside the item tag. After successfully creating the shape in drawable, we added its source inside the new image view tag in the main XML code.

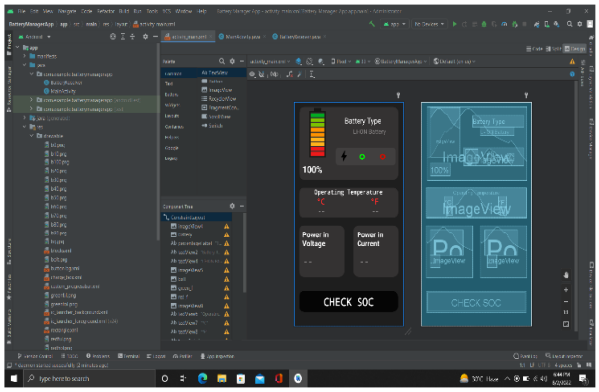

Fig. 5. B.Desgn workspace

Further, for adding the button, i.e. CHECK SOC, we first made sure that in the style tag of themes.xml and themes.xml(night) files, which is available in the values resource file, the parent style was kept as parent="Theme.AppCompat.DayNight.DarkActionBar". This is done so that the button readjusts its colour and design according to the dark and light modes of the phone.

b) App Backend - Our Smart EV Battery Managing Software is based on two main classes in Android Studio, the two pillars that form the backend of our application are MainActivity and BatteryReceiver class, for example, we are using a package named batterymanager which supports all of the functionality of our EV's battery properties. In the BatteryReceiver class, we will import the package and call it in our MainActivity class, where we will initialise all of the widgets existing in our display programme using TextView if the function is text-based and ImageView if the function is graphically shown.

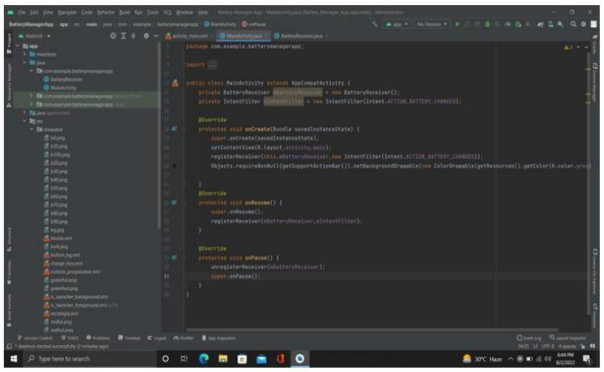

Fig. 6. Main Activity

[10-11] By defining an if-statement that includes ACTION BATTERY CHANGED, this will run only if the EV battery conditions are changed and indicate that the values are updated in real-time via the widgets, which are lucid and simple to grasp.

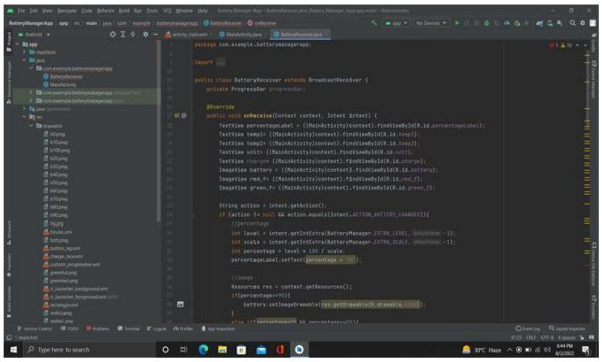

Fig. 7. Battery Receiver

III. Result and Discussion

The BMS will serve as the overall operation's primary brain and muscle; it will keep track of each vehicle's unique mechanical and electrical qualities and warn the rider as necessary to ensure safety. We understood the future scope of the application, what changes will be needed to create the application more sustainable, and we will be able to implement this software in EV, having a hassle-free driving experience. This Smart software was a resounding success in making the fundamental BMS module smart and more reliable. The features of our software that we added were a graphical representation of the EV's battery updating in real-time, current charging and discharging status indicating whether the battery is under load or is being charged, the operating temperature of the EV's battery pack in both Celsius and Fahrenheit, and power in voltage and current which displays the power flow and gain in voltages and amperes when the battery is discharging and charging simultaneously updating.

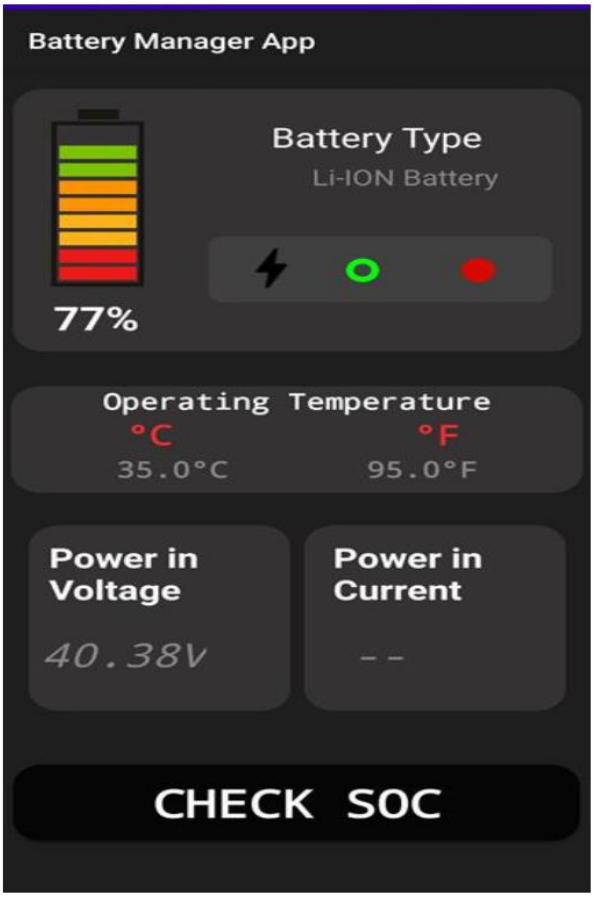

Fig. 8. Operation of Battery Manager App

IV. Conclusion

With regard to the entire paper, we can draw the following conclusion: the management system eliminates any inconvenience for the driver; we learned through the simulation; it assisted us in developing the prototype; and the prototype will serve as the cornerstone for the Smart Battery Managing application, which will establish a mark of being practical, dependable, and flawless in operation. Our primary objective was to develop a clearer interface for our software that is much more reliable and simple to understand. To achieve this, we selected the top-tier programming platform Android Studio for the development of our Smart EV battery management system.

V. Acknowledgement

We would like to thank the faculty of Thakur College of Engineering and Technology for giving us the opportunity to write and expand our views and knowledge on this topic. They have been very helpful in providing us with their sheer guidance which made us able to formulate this research paper.

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Continuous Monitoring and Detection of Symptoms for Covid-19 Using Wearable Sensors

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***Abstract* - People today are completely dependent on technology and are doing their best to improve it. People have made their lives more complicated and hectic. Even in a busy schedule, I do not worry about my health. IoT in healthcare plays a key role in providing better care to patients and helping doctors and hospitals. IOT-based healthcare systems can provide better patient wellbeing and living conditions, especially in remote areas without a healthcare system.**

Keywords: Internet of Things, IoT in Healthcare, Patient Monitoring, Wearable Sensors, COVID-19

In this project, sensors such as the LM35, AD8232, and MAX30100 are used to measure vital health signs such as body temperature, pulse rate, ECG, and oxygen levels, and send the measured data to the IoT cloud to record a patient's history. Android applications are designed to display current parameter values. We tried to propose a model that is non-invasive and can monitor patients remotely through a sensor connected network. It also has sensors to monitor room temperature and humidity, as well as a GPS and pedometer. The main purpose of this model is to provide healthcare services in hospitals, shopping malls, schools, offices, commercial and residential areas, etc. The COVID-19 pandemic has highlighted the need to leverage digital infrastructure for remote patient monitoring. With virus tests and vaccines emerging slowly, there is a need for more reliable disease detection and health monitoring of individuals and populations where wearable sensors can help. The utility of these techniques has been used to correlate physiological measures with daily life and human performance, but the translation of these techniques based on the COVID-19 health system is discussed in detail.

I. INTRODUCTION

The Internet of things is the inter-connection of devices, apps, sensors and network connectivity that enhances these entities to gather and exchange data. The distinguishing characteristic of Internet of Things in the healthcare system is the constant monitoring a patient through checking various parameters and also infers a good result from the history of such constant monitoring. Many such devices equipped with medical sensors are present in the ICUs now-adays.

There could be instances where the doctor couldn't be alerted in time when there is an emergency, despite of 24 hours of monitoring. Also, there might be hurdles in sharing the data and information with the specialist doctors and the concerned family members and relatives. Technology to improve these features is already available, but not available to most people in developing countries like India. Therefore, these solutions to these problems may simply be extensions of existing devices that do not have these features.

This article demonstrates continuous monitoring and symptom detection of Covid-19 using wearable sensors. In this white paper, the system is designed to continuously monitor vital parameters such as heart rate, blood pressure and body temperature. The idea may not be all that new, but it provides an absolute, inexpensive way to system using Arduino.

II. LITERATURE REVIEW

Extensive research has been dedicated to the exploration of various technologies such as information technologies (IT) in complementing and strengthening existing healthcare services. In particular, the Internet of Things (IoT) has been widely applied to interconnect available medical resources and provide reliable, effective and smart healthcare service to the elderly and patients with a chronic illness. The aim of this project is to create and develop a smart band which will be able to detect symptoms of COVID-19 using various sensors and display it on our application. Based on a comprehensive literature review and the discussion of the achievements of the researchers, the advancement of IoT in healthcare systems have been examined from the perspectives of enabling technologies and methodologies, IoT-based smart devices and systems, and diverse applications of IoT in the healthcare industries. Finally, the challenges

and prospects of the development of our smart band based on COVID19 healthcare system is discussed in detail . The main purpose of this system is to update data online, alert doctors about abnormalities and predict if a patient has a disease. This system holds great promise in the future, as the data collected through monitoring is very valuable and can be used for any research in the medical community.

The major aim of the paper can be summarized as following:

- Obtain real-time medical information of patients through IoT
- Process and classify collected patient information.
- Using data mining techniques to interpret and predict disease or disability at its most advanced stage, providing an informative approach to decision making.
- Provides IoT-based healthcare solutions anytime, anywhere.

RELATED WORK

A number of researchers have proposed various models for IoT in Healthcare and the prediction of various types of diseases using various techniques. This part focuses on the work done in the same area

Almotiri et al. [i] proposed a system of m-health that uses mobile devices to collect real-time data from patients in and store it on network servers connected to internet enabling access only to a certain specific client. This data can be used for the medical diagnosis of patients and is achieved by using a number of wearable devices and body sensor network.

Chiuchisan et al. [ii] proposed a framework to prevent the threats to patient in smart ICUs. The proposed system intimates the patient's relatives and doctors about any inconsistency in their health status or their body movements and also about the atmosphere of the room so that the necessary precautionary measures can be taken.

Lopes et al. [iii] proposed a framework based on IoT for the disabled people so as to study and find the IoT technologies in healthcare segment that can benefit them and their community. They took two use cases to study the latest IoT technologies and its application that can be used mainly for the disabled people.

Nagavelli and Rao [iv] proposed a novel method to predict the severity of the sickness from the patient's medical record using mining based statistical approach which they said as degree of disease probability threshold.

III. IMPLEMENTATION

This article proposed a system where the patient's body temperature, heart rate and oxygen levels are controlled by the system. Various sensors are attached to the patient's body, take readings, and send appropriate signals to the Arduino. Here, various sensors are used to measure the patient's body temperature. Heart rate and oxygen levels and their respective results are sent to the Mongo DB database via the Arduino and can be tracked on the user's phone using a unique mobile app.

1. ESP32 Microcontroller Board

The ESP32 is a series of low-cost, low-power MCU systems with built-in Wi-Fi and dualmode Bluetooth. The ESP32 is built and developed by Espressif Systems, a Chinese company based in Shanghai, and manufactured by TSMC. The ESP32 can operate as a completely standalone system or as a slave to the master MCU, offloading the main application processor's communication stack. The ESP32 can communicate with other systems to provide Wi-Fi and Bluetooth capabilities via SPI/SDIO or IC/UART interfaces.

Fig 1. ESP32 Microcontroller Board

2. Zero PCB

Perfboard is an electronic circuit prototyping material (also known as DOT PCB). A thin rigid sheet with pre-drilled holes at standard intervals over a grid, usually a square grid in 0.1 inch (2.54 mm) increments. A bare board can also be used, but these holes are surrounded by round or square copper pads.

Cheap perforated boards are padded on only one side of the board, while high-end perforated boards may be padded on both sides (holes through the plate). Because each pad is electrically isolated, the assembler uses wire wrapping or miniature point-to-point wiring methods to make all connections. Discrete components such as resistors, capacitors and integrated circuits are soldered onto the prototype board. The substrate is usually made of phenolic resin laminated paper (eg FR-2) or glass fiber reinforced epoxy laminate

3. Connecting Wire

Connecting wires allows current to travel from one point in a circuit to another because the electricity needs a medium to travel through. Most connecting wires are made of copper or aluminum. Copper is cheap and has good conductivity. Instead of copper, silver, which is highly conductive but too expensive to use, can also be used.

Fig 3. Connecting Wires

4. Male Header

Male pin headers are often associated with ribbon cable connectors. When used alone, they can be recipients of jumpers, which have spacings of 2.54 mm (0.1 in) and 2.00 mm (0.079 in). The spacing distance between pins (measured from centre to centre) is often known as pitch

Fig 4. Male Header

5. Female Header

0.1″ (2.54 mm) female header strips are commonly used as low-cost connectors for custom-made cables or perforated prototyping PCBs.

Fig 5. Female Header

6. LM35 Temperature Sensor

LM35 is a precession Integrated Circuit Temperature sensor, whose output voltage varies, based on the temperature around it. It is a small and cheap IC which can be used to measure temperature anywhere between 55°C to 150°C.There will be rise of 0.01V (10mV) for every degree Celsius rise in temperature.

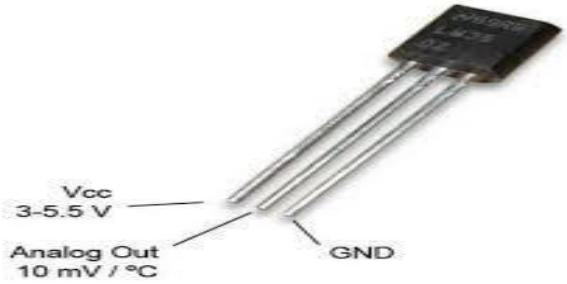

Fig 6. LM35

7. Oximeter

The MAX30100 is an integrated pulse oximetry and heart rate monitor sensor. It combines two LEDs, a photodetector, optimized optics, and low-noise analog signal processing to detect pulse oximetry and heart rate signals. The groundbreaking MAX30100 operates at 1.8V and 5.5V. As the heart pumps blood, the oxygenated blood increases due to the increase in blood volume. When the heart relaxes, the amount of oxygenated blood decreases. Determine the pulse rate by knowing the time between an increase and a decrease in blood oxygenation. It has been shown that oxygen-rich blood absorbs more infrared light and transmits more red light, while deoxygenated blood absorbs more red light and transmits more infrared light.

Fig 7. Oximeter

8. AD8232 ECG Sensor The ECG monitor sensor module is based on the AD8232 analog device chip. An economical ECG sensor used to measure the electrical activity of the heart. This electrical activity can be displayed as an ECG or electrocardiogram and output as an analog reading. ECGs can be very noisy and the AD8232 single lead heart rate monitor acts as an op amp to help you get a clear signal. This sensor can be connected to Arduino/Raspberry Pi, etc.

The AD8232 is an integrated signal conditioner for ECG and other biopotential applications. It is designed to extract, amplify, and filter weak biopotential signals in the presence of noise, such as noise generated by movement or remote placement of electrodes. The AD8232 isolates 9 connections on the chip where leads, wires or other connectors can be soldered. SDN, LO+, LO-, OUTPUT, 3.3V, GND provides the pins needed to operate this monitor with an Arduino or other development board.

The board also provides Right Arm (RA), Left Arm (LA), and Right Leg (RL) pins for connecting and using your own sensors. It also has an LED light that blinks according to the rhythm of your heartbeat

Fig 8. ECG Sensor

9. DHT11 Temperature and Humidity Sensor

The DHT11 is a widely used temperature and humidity sensor. The sensor comes with a dedicated NTC for temperature measurement and an 8-bit microcontroller for outputting temperature and humidity values as serial data. Additionally, the sensor is calibrated at the factory, making it easy to interface with other microcontrollers. The sensor can measure temperature from 0°C to 50°C and humidity from 20% to 90% with an accuracy of ±1°C and ±1%.

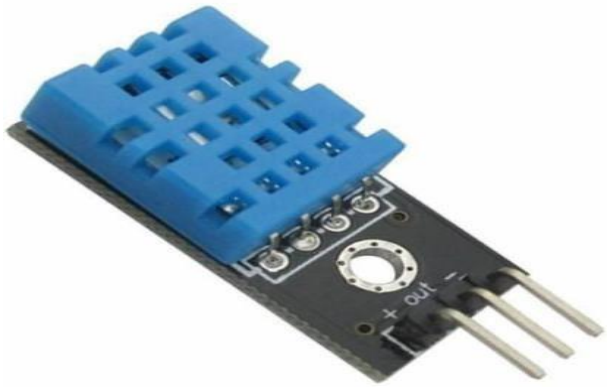

Fig 9. Temperature and Humidity Sensor

IV. RESULT

As the title says, the result Continuous monitoring and detection of symptoms for Covid-19 using Wearable Sensors is of extreme use to patients and doctors as well. The patient can check their health status anytime from the comfort of their homes and visit hospitals only when the symptoms worsen. This can be done by using our system whose result are brought on our app and can be seen from anywhere around the world. Since it is a prototype model, our system shows the almost real time values of various health parameters and emulates how the same can be implemented in the real world. The doctors can also use the log of the patient body condition to study and determine the effect of medicine or other such things.

V. FUTURE SCOPE

The proposed system can be installed in hospitals and can secure vast amounts of data and store them in an online database. You can also access the results on your phone through the app. The system can be improved by adding artificial intelligence system components to facilitate the work of doctors and patients. Data consisting of history and related outcomes of many patient parameters can be explored through data mining to find consistent patterns and systematic relationships in COVID-19. For example, if a patient's health parameters change in the same pattern as previous patients in the database, the impact can also be evaluated.

If these patterns are found repeatedly, it will be easier for doctors and medical researchers to find a solution to the problem.

VI. CONCLUSION

In this article, we present and demonstrate a prototype of an automated system that ensures continuous monitoring of various health parameters and prediction of COVID-19, saving patients from the pain associated with frequent hospital visits. The proposed system can be installed in hospitals and can secure vast amounts of data and store them in an online database. You can also access the results on your phone through the app. The main implementation of the project is to identify problems related to COVID-19 and reduce premature mortality in patients. It detects heart rate, body temperature and oxygen levels and provides periodic information.

IOT technologies pave the way for rapid technological growth. This evolving technology enables patient monitoring at all times, regardless of the hospital. It provides continuous daily data on important body credentials and helps detect early symptoms of COVID_19 using sensors and Arduino.

ACKNOWLEDGMENT

We would like to thank the faculty at Thakur College of Engineering and Technology for giving us the opportunity to write and extend our views and knowledge on this topic.

I would also like to thank the teachers who gave me this topic so I can write about it and share my opinions.

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Qualnet-Based Energy Efficient Routing in Mobile Ad-Hoc Networks Based On AODV Protocols

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***Abstract*-A mobile ad hoc network (MANET) is a group of wireless mobile nodes that creates a network topology on the fly without the use of any preexisting network infrastructure or centralized management. Because so many nodes rely on batteries as their power source, MANET experiences power fatigue. One of the most crucial system design optimization criteria in MANETs is energy consumption. In order to increase the efficiency and lifespan of the network, we proposed a scenario in a QualNet Scalable network software and compared the energy models of physical layers with Different performance parameters like-power analysis in GENERIC, MICA2DOT, and MICAZ in transmit and receive mode. Since the majority of MANETs use batteries, the main issue is power consumption.**

KEYWORDS-MANETs, AODV, OLSR, ZRP, CBR

I. INTRODUCTION

Ad hoc networking is a new wireless networking paradigm for mobile hosts. The traditional mobile wireless networks rely on any fixed infrastructure. On the other hand, ad hoc network hosts rely on each other to keep the network connected. The main application of ad hoc networks are- military, tactical and other security sensitive operations. Many futuristic services like telemedicine, also recommend ad hoc network. One main challenge in design of these networks is to reduce power consumption at the mobile hosts. Many researchers attempted this problem and ended with innumerable solutions [1]. The issue of energy saving is significant since in a battery-operated wireless node, the battery energy is finite and a node can only transmit a finite number of bits. The maximum number of bits that can be sent is defined by the total battery energy divided by the required energy per bit. So far, numerous schemes have been proposed for effective power consumption. This paper presents a survey of proposed schemes for various energy modes of Ad Hoc on Demand Distance Vector (AODV) Routing Protocols. The performance of different types of power-related routing algorithms has been carried out by QualNet simulation leading to the calculation of power consumption of nodes in transmit, receive, and ideal modes. Different performance parameters like- power, throughput, and Average delay are evaluated and compared. Also, a comparison of IP address of First-In-First-Out (FIFO) Queue (Network Layer) has been papered. The issue of energy saving is significant since in a battery-operated wireless node, the battery energy is finite and a node can only transmit a finite number of bits. The maximum number of bits that can be sent is defined by the total battery energy divided by the required energy per bit.A Mobile Ad hoc Network (MANET) is a system of wireless mobile nodes that dynamically self-organize in arbitrary and temporary network topologies. People and vehicles can thus be internetworked in areas without a preexisting communication infrastructure or when the use of such infrastructure requires a wireless extension. We can classify ad hoc networks, depending on their coverage area, into four main classes: Body, Personal, Local, and Wide Area Networks. Wide area ad hoc networks are mobile multi-hop wireless networks. They present many challenges that are still to be solved (e.g., addressing, routing, location management, security, etc.), and they are not likely to become available for some time. On smaller scales, mobile ad hoc networks will soon appear. Specifically, ad hoc, single-hop Body Area Networks (BAN), Personal Area Network (PAN), and Local Area Network (LAN) wireless networks are beginning to appear on the market. These technologies constitute the building blocks to construct small multi-hop ad hoc networks that extend the range of the ad hoc networks' technologies over a few radio hops.

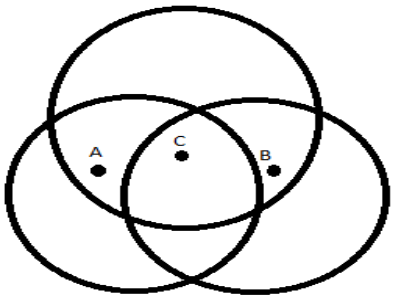

Fig.1. An example of a mobile ad hoc network

First developed about twenty years ago, MANETs have been used almost exclusively for military tactical communications. Newer technology such as Bluetooth, Wi-Fi, and Hyperlink are now helping enable commercial MANET deployments outside the military domain. MANETs are set up 'on the fly' without infrastructure components such as access points or base stations. Therefore, every mobile device acts as both host and router. As devices move over terrain and through varying weather and atmospheric conditions, they may connect and disconnect repeatedly from the other devices. As IP technology continues to mature, developers seek to incorporate technological advances into their devices to overcome the environmental effects on reachability and latency from node to node.

Ad hoc networks

Traditionally, wireless networks are considered to be infrastructure-based. This means that there is a fixed, reconstructed infrastructure to support the network. Figure 1.1.1. a show an example. Typically, the network consists of wired or wireless nodes and gateways. Each node has a specific pre-configured function within the network. Adding a node will probably not pose too many problems, but in general, infrastructure-based networks are not very flexible. Supporting highly mobile nodes certainly is impossible. Infrastructure-less or ad hoc networks are the opposite of infrastructure-based networks. Ad hoc networks are created dynamically without a fixed infrastructure and consist of (wireless) nodes without predefined roles. Figure 1.1.1.b shows an example network. The only requirement for a node is to cooperate in the routing, which happens at the node level and not at the network level. As a consequence, supporting node mobility and rapidly changing topologies, in general, becomes possible.

1.1.2 Routing in ad hoc networks

Routing is more complex in ad hoc networks because of their dynamic nature. The supposition that nodes participate in the routing implies that network management information must be distributed among the nodes. In infrastructure-based networks, this is done by protocols like Routing in Protocol (RIP) and Border Gateway Protocol (BGP). However, those protocols are not robust when deployed in a highly dynamic environment. In ad hoc networks, nodes might move very fast causing the entire network topology to change several times before the traditional protocols have computed new routing table.

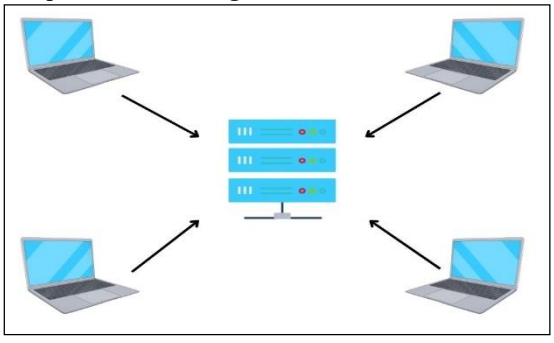

Figure 2: Infrastructure-based network

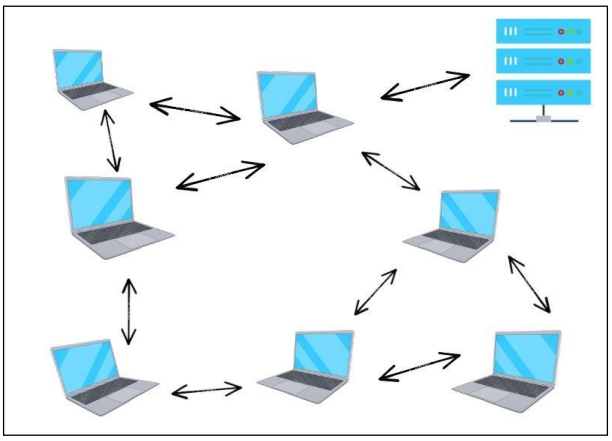

Figure 3: Ad hoc network

1.1.3 Ad hoc protocols

Proactive protocols these protocols use the traditional approach from distance vector algorithms. They try to keep a route to every other node in the network. This happens in an active way by periodically exchanging routing information. In case of an event, (e.g., a link down) information exchange is triggered. The advantage of this approach is the constantly updated routing information: whenever a route is necessary it will be available. However, if the network is very large the routing overhead can be too high as the overhead scales with the number of nodes. If the nodes move very fast the information updates will have to be big in order to reflect all changes. If there is a lot of data traffic in the network, the large number of updates can be justified because the routes will be used. Destination-Sequenced Distance-Vector Routing (DSDV) [3] and Optimized Link State Routing Protocol (OLSR) [4] are examples of proactive ad hoc protocols.

1.2. Reactive protocols

The reactive protocols are based on the philosophy that it's not necessary to maintain a route to every other node in the ad hoc network. The overhead of periodical broadcasts is considered to be too large; they are replaced with on-demand route discovery. This means that every time a route to a host is needed, it is discovered just then. The overhead of reactive protocols varies with the number of data streams in the network; it might even become higher than the overhead of proactive protocols. The route acquisition latency, the latency resulting from the route discovery, will typically is almost zero when using proactive protocols. With reactive protocols, it will be significant, at the expense of less constant routing overhead. Typical reactive protocols include Dynamic Source Routing (DSR) and of course AODV.

1.3. Hybrid protocols

The hybrid routing protocols try to combine proactive and reactive approaches based on certain conditions. Zone Routing Protocol ZRP [5] for example defines zone around nodes. Within that zone proactive routing is used, outside of it nodes use reactive routin

II.AODV (AD HOC ON-DEMAND DISTANCE VECTOR ROUTING PROTOCOL)

AODV is a reactive routing protocol and as the name indicates it provides route discovery on-demand. Nodes in AODV maintain a routing table that contains only the next hop routing information for the destination nodes.
When a source node needs to send data packets to some destination, it checks its route table to determine whether it has a route. If such a route exists, it can use that route for data packet transmission, otherwise, it performs a route discovery process by sending out a RREQ (Route Request) packet. Hence, route discovery becomes on-demand which reduces the number of required broadcasts. The RREQ packet contains the destination node IP address, source IP address, the last known sequence number for the destination and the hop count. It also contains the RREQ ID, which is incremented every time and which uses node initiates a new RREQ.The source IP address together with the RREQ ID uniquely identifies an RREQ and can be used to detect duplicates [8]. To ensure that the routing information is updated, every node maintains a sequence number. The sequence number is sent with RREQ (for source) and RREP (for destination) and stored in the routing table and the larger the sequence number, the newer the route information. When a neighboring node receives an RREQ packet, it firsts creates a reverse route to the source node so that to forward the replies later. It then increments the hop count and rebroadcast the RREQ packet to its neighbors if it doesn't have a valid route to the destination. The destination node or the intermediate nodes having valid route towards the destination replies with a uncast RREQ packet. When the RREQ is received, a reverse route towards the originator of RREP is created. Additionally, each node keeps track of a precursor list i.e, a list of upstream nodes that route through the given node. Nodes along the active route broadcast HELLO messages periodically to their neighbors [8]. If the node does not receive a HELLO message or a data packet from a neighbor within a specified time period, the link between itself and the neighbor is considered to be broken and is repaired either by a local repair mechanism or by sending a RERR packet to the neighbors in the precursor list to inform them of the link failure. The source node after the link failure may reinitiate the route discovery process. The Ad Hoc On-Demand Distance Vector Routing Protocol is a reactive routing protocol based on DSDV. It was introduced in 1997. AODV is designed for networks with tens to thousands of mobile nodes. Sequence numbers are used by other nodes to determine the freshness of routing information. If a node has the choice between 2 routes to a destination, a node is required to select the one with the greatest sequence number. In AODV, the network is silent until a connection is needed. At that point, the network node that needs a connection broadcasts a request for a connection. Other AODV nodes forward this message and record the node that they heard it from, creating an explosion of temporary routes back to the needy node. When a node receives such a message and already has a route to the desired node, it sends a message backward through a temporary route to the requesting node. The needy node then begins using the route that has the least number of hops through other nodes. Unused entries in the routing tables are recycled after a time. When a link fails, a routing error is passed back to a transmitting node, and the process repeats. Much of the complexity of the protocol is to lower the number of messages to conserve the capacity of the network. For example, each request for a route has a sequence number. Nodes use this sequence number so that they do not repeat route requests that they have already passed on. Another such feature is that the route requests have a "time to live" number that limits how many times they can be retransmitted. Another such feature is that if a route request fails, another route request may not be sent until twice as much time has passed as the timeout of the previous route request.

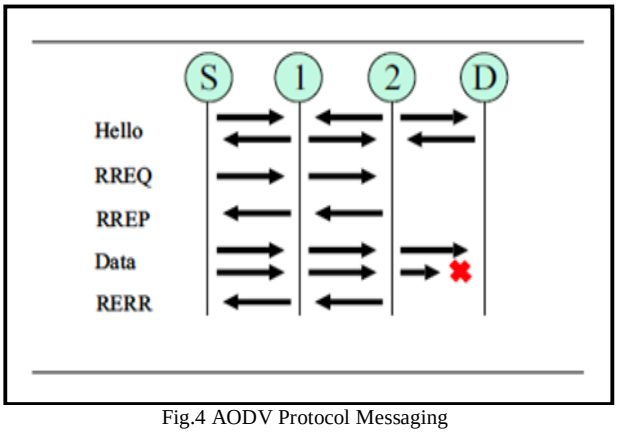

Fig.4 AODV Protocol Messaging

III. RADIO ENERGY MODELS

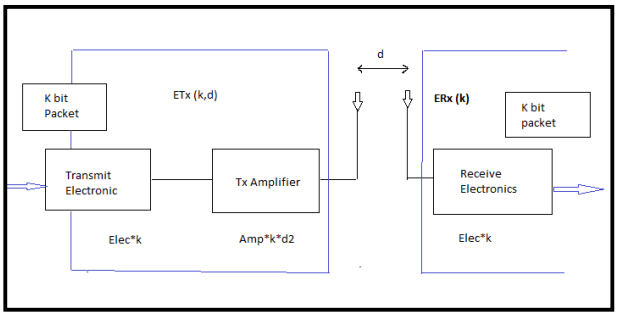

Fig. 5 Simple radio energy model

In this we discuss various parameters of the radio energy model relating to our comparison in the QualNet environment. We present a GENERIC, MICA2DOT, and MICAZ radio energy model which is derived to estimate the consumed energy for reception and transmission. In a wireless radio transceiver, energy is dissipated in active mode when the radio transmits or receives a packet, in idle modes of the transceivers, and for the transition among states. The components of the radio model consume energy at the receiver and transmitter.

GENERIC - This is a generic radio energy model that computes the power consumption of the radio in different

power modes and for variable transmission power. The model can also estimate energy consumption in the transmitter for the case of continuous transmission power level.

MICA2DOT- This is a radio-specific energy model which is pre-configured with the specification of power consumption of MICA2DOT (embedded sensor nodes). All the nodes in this scenario are battery-operated devices and are configured by a simple linear battery model. The radio interfaces for all nodes are configured with Mica (CC1100 sensor radio chip) therefore energy is consumed by those interfaces according to the energy specification of CC1100 (included in the Energy Model reference lib document).[5]

MICAZ - This is a radio-specific energy model which is pre-configured with the specification of power consumption of MicaZ motes (embedded sensor nodes). All the nodes in this scenario are battery-operated devices and are configured by a simple linear battery model. The radio interfaces for all nodes are configured with MicaZ therefore energy is consumed by those interfaces according to the energy specification of micaZ (included in the Energy Model reference lib document).

IV.(I) SIMULATION:

A. QualNet Network Simulators

QualNet is a network simulation tool that simulates wireless and wired packet mode communication networks. QualNet Developer is a discrete event simulator used in the simulation of MANET, WiMAX networks, satellite networks, and sensor networks among others. QualNet has models for common network protocols that are provided in source form and are organized around the OSI Stack.[14]
QualNet Developer is ultra high-fidelity network evaluation software that predicts wireless, wired, and mixed-platform network and networking device performance. Designed to take full advantage of the multi-threading capabilities of multi-core 64-bit processors, QualNet supports the simulation of thousands of network nodes. QualNet offers unmatched platform portability and interface flexibility. QualNet runs on sequential and parallel UNIX, Windows, Mac OS X, and Linux operating systems, and is also designed to link seamlessly with modeling/simulation applications and live networks [14].

By increasing the density of the beacons that populate the grid, the granularity of the localization regions becomes finer, and hence the accuracy of the location estimate improves. However, the approach of using the centered beacons d (under uniform beacon placement). For a range overlap ratio (R=d) of 1, the maximum error is bound by 0:5d. This factor falls off considerably (to0:25d), when the range overlap ratio increases to 4. Alternative approaches would consider additional information of time-of-flight or signal strength. Although we did not choose to use these approaches because of

B. Assumptions

• a large amount of energy is consumed for transmission, reception, and idle modes.
• Energy consumed in circuitry (base-band and amplifier circuits) and in the power amplifier is taken into account for emitting signal over the air.
• The generic model takes into account the variable and continuous transmission power.
• Transmission power is constant during the simulation run

- Power Amplifier Inefficiency Factor – 6.5
- Transmit circuitry power consumption – 100.0mW
- Receive circuitry power consumption – 130.0mW
- Idle circuitry power consumption – 120.0mW
- Supply voltage – 3volt

C. VALIDATION ENVIRONMENT

We have adopted various energy models such as GENERIC, MICAZ, and MIC2DOT and performed power analysis in the QualNet workplace. While considering each energy model we have simulated the power analysis for transmit, receive, and idle mode. Now we will illustrate each mode elaborately [30].

V. (II) MATH

A. Localization Algorithm

Beacons situated at known positions, (X_i ; Y_i), transmit periodically with a time period T. Clients listen for a period t >> T to evaluate connectivity. If the percentage of messages received from a beacon in a time interval t exceeds a threshold, that beacon is considered connected.A client then estimates its position (X_{est} ; Y_{est}) as the centered of the positions of all connected beacons.Given the actual position of the client (X_a ; Y_a), we can compute the accuracy of the localization estimate or the localization error LE , which is the distance between the client's estimated and actual positions.

$$LE=\{(X_{est}-X_a)^2+(Y_{est}-Y_a)^2\}^{1/2}$$

implies that there is often some level of error. We have previously analyzed this error and found that it is bound by the nominal beacon transmission range R and the separation distance between adjacent
very short times-of-flight and limited resolution of signal strength, these approaches too are flounced by beacon placement [15].

Generic Radio Energy Model
The generic model has been derived from the equations and the modules presented in the previous section. The

main feature of the model is an estimation of energy consumption for the radios with common modulation schemes (analog and digital) and common classes of amplifiers (class-A, B, C, D). Furthermore, the model can estimate energy consumption in the transmitter for the case of continuous transmission power levels.

• Amplifier drain efficiency, μ (c.f. equation 2), about 35% for class-A and about 75% for higher classes. The default value is 75%

.• Peak to average power ratio (PAR), β (c.f. equation 2), about 1 for digital modulation and >1 for QAM. The default value is 1.

• The power supply voltage, Vdd. The default value is 3 V.

• Idle power consumption, PIdle. If not configured, we consider reception power, Pcr, as the idle power consumption.

The generic model calculates the power for transmission and reception as of equation (4).

In this equation, Pt is transmission power which is given from PHY layer, α is the parameter which is calculated from the given configuration parameters (i.e., μ and β) as of equation (2). Pct and Pcr are constant values.

By employing coding or MFSK modulation to almost β = 1.

Although strictly speaking Pt should be part of the total

B. PROPOSED SCENARIO

In this proposed scenario we have eight nodes connected to four wireless subnets. We have provided Constant Bit Rating (CBR) between node one and node seven, where node one act as a source and node seven as a destination.

Power Consumption in Circuitry of Radio Energy Dissipation Model	
Pmix = 30.3mW	PIFA = 3mW
PINA = 20.0mW	Pfilt = Pfilr = 2.5mW

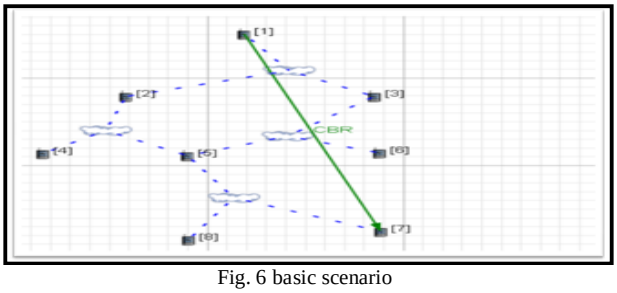

Fig. 6 basic scenario

Here the total number of items to send is a hundred of size five hundred and twelve bytes per each item having an interval one second. The overall routing protocols assigned to this scenario are AODV. In AODV the net diameter maximum hops is thirty-five, and the node transmits time is assumed to be forty milliseconds with a hello interval of one second.

V. RESULTS&DISCUSSION

V.1 POWER ANALYSIS

V.1.1TRANSMIT MODE

V.1.1GENERIC

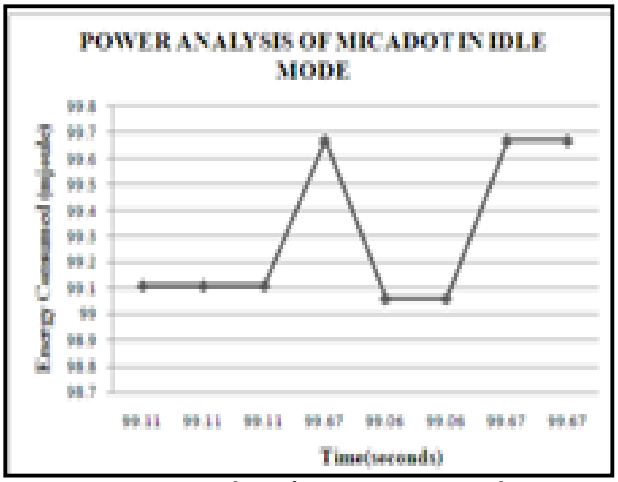

Fig. 7 power analysis of generic in transmit mode.

While using the energy mode as GENERIC in transmit mode the source node one has a power of 5.9mjoules/sec.

V.1.2. MICADOT

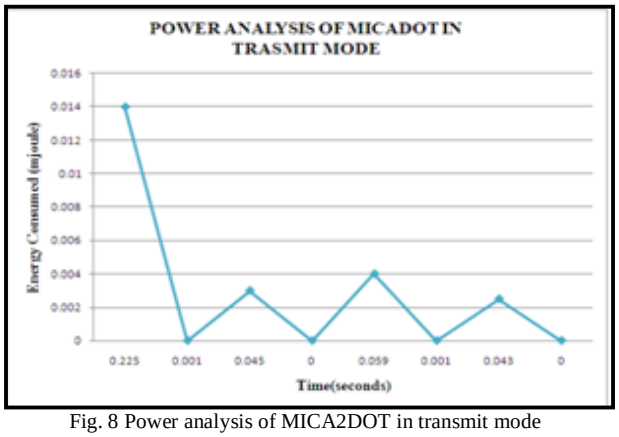

Fig. 8 Power analysis of MICA2DOT in transmit mode

While using the energy mode as MICA2DOT in transmit mode the source node one have a transmission power of 4.6mjoules/sec.

V.1.1.3 MICAZ

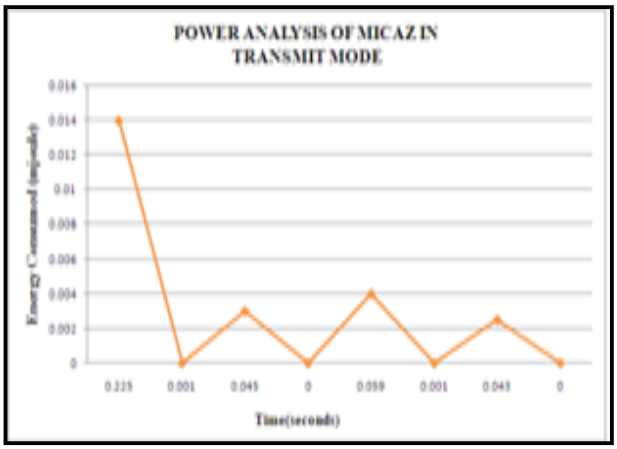

Fig. 9 Power analysis of mica z in transmit mode.

While using the energy mode as MICAZ in transmit mode the source node one has a transmission power of 4.65mjoules/sec.

V.1.1.4 COMPARISON OF THREE ENERGY MODEL IN TRANSMIT MODE

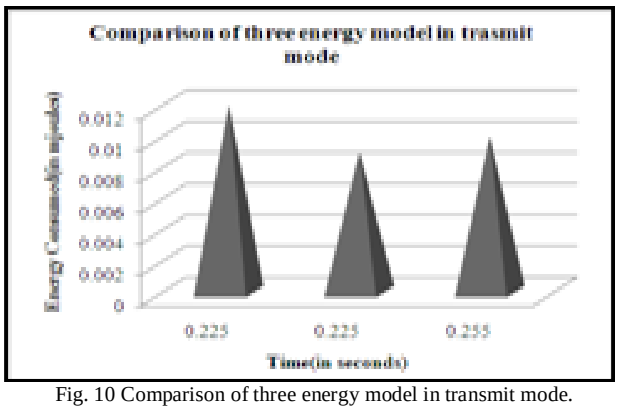

Fig. 10 Comparison of three energy model in transmit mode.

In the above illustrated comparison MICADOT consumes less energy when compared to other models.

V.1.2 RECEIVE MODE

V.1.2.1 GENERIC

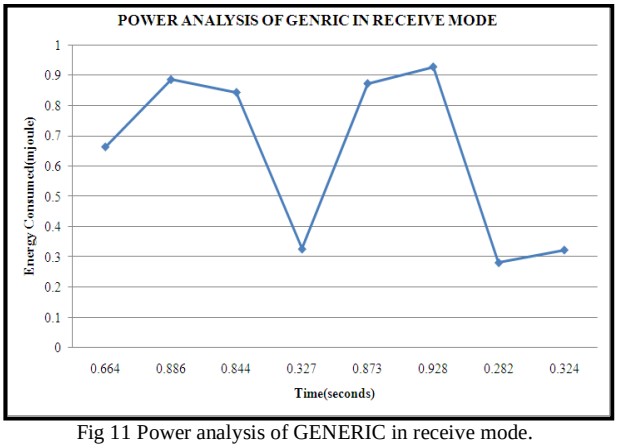

Fig 11 Power analysis of GENERIC in receive mode.

While using the energy mode as generic in receive mode the destination node eight have a receiving power of 1.08mjoules/sec.

V.1.2.2 MICA2DOT

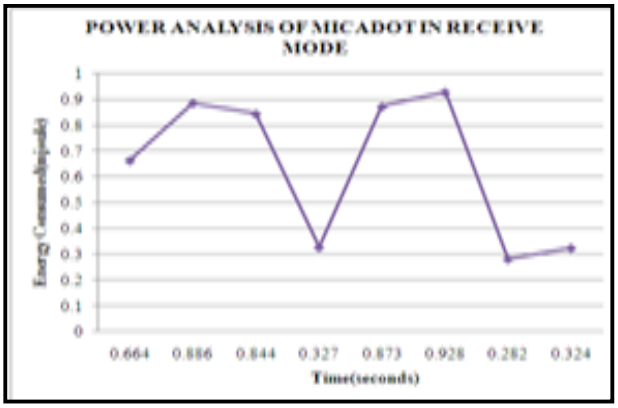

Fig.12. Power analysis of MICA2DOT in receive mode.

While using the energy mode as MICA2DOT in receive mode the source node one has a power of 0.47mjoules/sec.

V.1.2.3 MICAZ

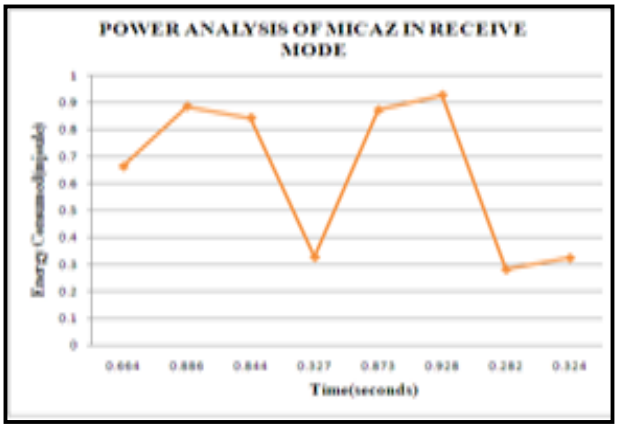

Fig. 13 Power analysis of MICAZ in receive mode.

While using the energy mode as MICAZ in receive mode the destination node eight have a receiving power of 0.23mjoule/sec.

V.1.2.4 COMPARISON OF THREE ENERGY MODEL IN RECEIVE MODE

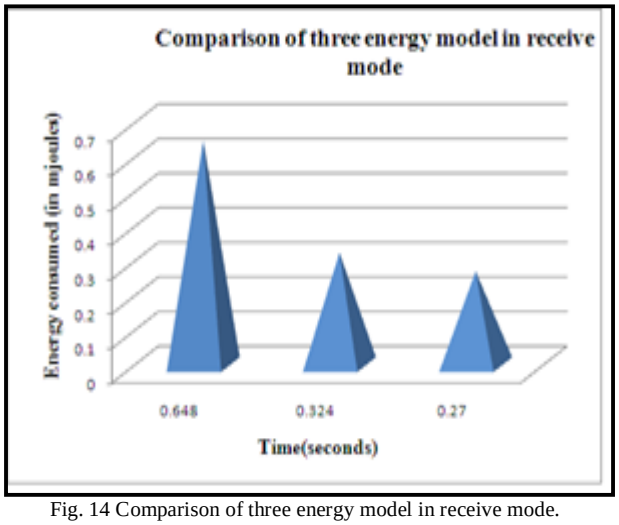

Fig. 14 Comparison of three energy model in receive mode.

The above illustrated graph shows least power consumption i.e.,0.23mjoules for MICAZ in receive mode.

V.1.3 IDLE MODE

In idle mode the three models yield the same power of 0.089mjoule/sec.

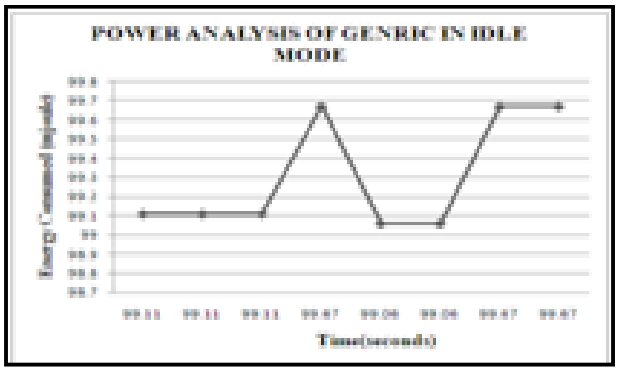

Fig 15 Comparison of power analysis of generic in idle mode

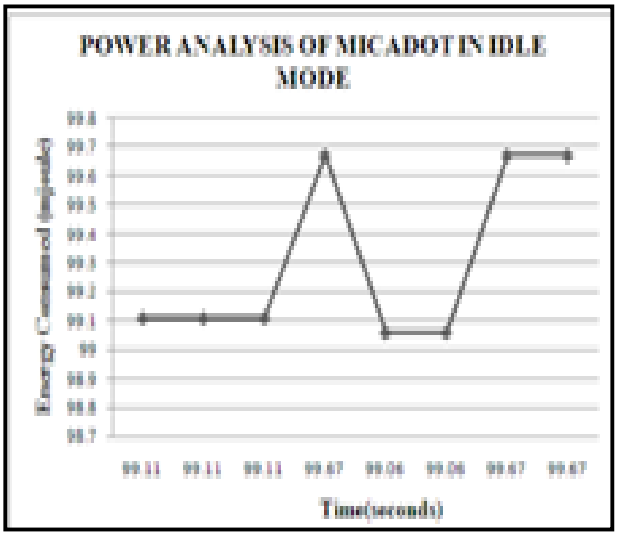

Fig.16 Power analysis of MICADOT in idle mode

3

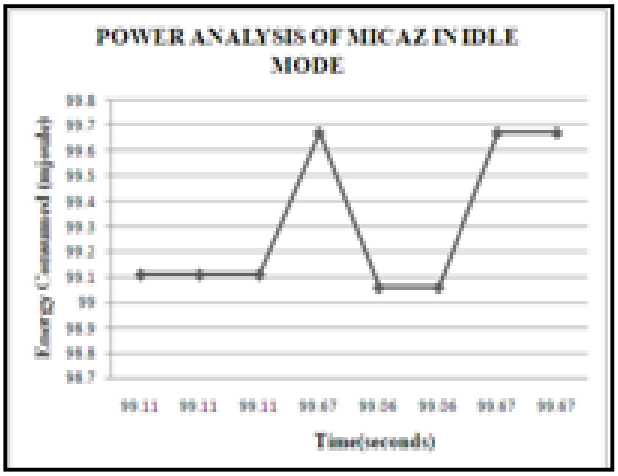

Fig 17 Power Analysis of MICAZ in idle mode

VI. CONCLUSION & IMPLEMENTED FEATURES

- In this paper we have seen the approach and compared the existing three energy model (i.e.) generic, Mica2dot and Mica z towards AODV routing protocol and found that the generic energy model has more power/energy consumption in the transmission and reception.
- While Mica2dot have low power/energy consumption and Mica z has moderate power consumption in both the cases.
- In idle mode the energy consumption by three models yields the same.
- Thus, we conclude that Mica2dot is the best energy model that can be correlated with the AODV routing protocol.
- Fairly accurate estimates of energy consumed in transmission, reception, and idle modes.

- Account for energy consumed in circuitry (base-band and amplifier circuits) as well as energy consumed in power amplifier for emitting signals over the air.

effectively but also finds the best route and increases the lifetime of the network. The main feature of the model is estimation of energy consumption for the radios with

- The Generic model takes into account variable and continuous transmission power.
- The proposed work aims at discovering an efficient energy aware routing scheme in MANET that not only use the node energy

common modulation schemes (analog and digital) and common classes of amplifiers (class-A, B, C, D).

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Advanced Matched Filter Spectrum Sensing (AMFSS) using AM and BPSK modulation for cognitive radio network using water filling algorithm

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***Abstract* - The growing demand of wireless communication introduces vital spectrum and its utilization challenge. To state such challenges, Cognitive Radio (CR) becomes the key emerging technology, which allows opportunistic access methods to the spectrum sensing. Cognitive radio is trying to resourcefully share the radio band along with potential primary users (PU) that must identify in order to equivocate causing different interference with other users of the spectrum. Usage Security is also a very important issue which is not addressed in CR networks.Spectrum sensing in CR technology is challenged by a number of uncertainties, which affects the sensing performance and require much more time to attain the targeted sensing efficiency. Energy Detection, Cyclostationary Detection and Matched filter detection are the robust method for spectrum sensing. But due to limitation of Energy Detection, Cyclostationary Detection methods the Matched Filter based spectrum sensing is well-thought-out to make the spectrum sensing resolution based on the observed signal to noise ratio (SNR) from the Cognitive Users. The advantage of the proposed scheme comes from the fact that it can work with low SNR with the prior knowledge of the PU signal, the prior probability of the activity of PU, and SNRs of the PU signal at the terminals of cognitive radio. To evaluate the scheme's performance, the results are compared with an energy detector method. The performance metrics are the probability of detection (Pd) , probability of false alarm (Pfa) the energy parameter is also verified by using water filling algorithm. Advanced Matched Filter Spectrum Sensing (AMFSS) using AM and BPSK modulation for cognitive radio network using water filling algorithm.**

Keywords—Spectrum sensing, Matched Filter, SNR, Water-filling, RoC.

I. INTRODUCTION

Increasing use of wireless communication devices triggered the development of dynamic spectrum access (DSA) schemes [1]. To address the increasing demand for wireless bandwidth, cognitive radio and networks (CRNs) have been proposed to increase the efficiency of channel utilization under the current static channel allocation policy and networks.

The wireless technology without CR concept are called non CR technology. CRNs are composed of Software Defined Radios (SDRs) capable of changing their configurations on the fly based on the spectral environment [2-6]. This capability gives the possibility of designing flexible and DSA strategies with the purpose of opportunistically reusing vacate part of the spectrum that are temporarily vacated by PUs [13-17].

To improve the spectrum usage capability so many methods were developed and having so many challenges. Various drawbacks of these systems are discussed here. Energy detection method is very unreliable in low SNR regimes [9-10]. It cannot differentiate a PUs from other signal sources and it is prone to high Pfa due to noise uncertainty and cannot detect weak signals in noisy condition [7-8] .

In feature detection method specific features must be associated with the primary user and it has high computational complexity and long sensing time.

The matched filter (MF) detector is known as the possibly good approach for detection of PUs when the signal is known from transmitter. It overcomes the disadvantages of above sensing technique as, it is very accurate since it maximizes the received SNR. Predetermined threshold to decide the PUs presence or absence and ccorrelates the signal with time shifted version. Thus in this work the literature on matched filter spectrum sensing and other methods are compared. The performances of parameter used in spectrum sensing are derived and evaluated [12, 25].

Proposed MF based cognitive radio is viewed as a novel approach for improving the spectrum utilization.

The cognitive radio, built on a software-defined radio (SDR), is defined as an adoptive wireless communication

technique that is aware of its environment to learn from the environment and adapt to variations in the input, with two objective in mind that reliable communication whenever needed and efficient utilization of the radio spectrum.

II. SPECTRUM SENSING METHODS FOR COGNITIVE RADIOE

Research in the field of spectrum sensing methods has proposed various algorithms for detecting the presence of PUs signal and identifying the signal type and challenges.

A. Energy detection

Energy detection (ED) denoted as non-coherent detection method. ED is most popular sensing technique in cooperative sensing and is known as radiometry or period gram. It has low computational and implementation complexities which require prior knowledge of the primary user' signal, and not require special designs for detecting spread spectrum signals [20-22]. The block schematic of energy detector is shown in fig.1.

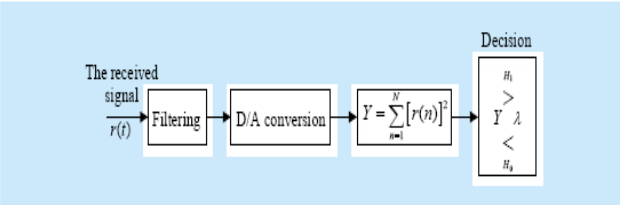

Fig. 1 The structure of energy detector

Energy of the received signal at PU calculated as follows:

$$E = \sum_{n=1}^{N} |x(n)|^2 \quad (1)$$

Where, X (n) is the received input signal, E is calculating the energy of received I/P signal or some time denoted by y (n). During the Pfa input signal x (n) will be,

$$X(n) = \omega(n) \quad ; H_0 \quad (2)$$

From the equation (1) and (2), the received signal y (n) can be,

$$y(n) = E = \sum_{n=1}^{N} |\omega(n)|^2 \quad (3)$$

Under the hypothesis H0, the distribution of the energy detector o/p becomes a chi-square probability density function with N degrees of freedom thus the pdf of the energy detector (ED) o/p can be derived as follows:

$$f_{E0}(x) = \frac{1}{\sigma\omega^{(2N/2)} * 2^{(N/2)} * \Gamma(N/2)} x^{\left(\frac{N}{2}-1\right)} e^{-\left(\frac{x-\mu}{2\sigma_\omega^2}\right)}, \quad (4)$$

where $x \geq 0$,

For the AWGN channel, variance is $\sigma\omega^2$ and mean (μ) is equal to 0. Now the probability of false alarm for energy detection method can be obtained by,

$$P_f = P[H_1 / H_0] \quad (5)$$

Using this Pdf, Pfa can be easily derivative for complex Gaussian noise system as follows,

$$P_f = P[(f_{E0}(x) > \lambda)]/H_0] \quad (6)$$

$$P_f = \int_{\lambda}^{\infty} f_{E0}(x)dx \quad (7)$$

From (6) and (7), Pfa of the ED can be written as,

$$P_f = \frac{1}{\sigma\omega^{(2N/2)} * 2^{(N/2)} * \Gamma(N/2)} \int_{\lambda}^{\infty} x^{\left(\frac{N}{2}-1\right)} e^{-\left(\frac{x}{2\sigma_\omega^2}\right)} dx \quad (8)$$

After simplifying above equation, the final expression for Pfa can be written as,

$$P_f = \frac{\Gamma(N/2, \frac{\lambda}{2\sigma_\omega^2})}{\Gamma(N/2)} \quad (9)$$

Where, λ is Threshold value, $\Gamma(,)$ is Upper incomplete gamma function, N is Number of symbols, $\sigma^2\omega$ is Noise variance, $\Gamma(a+1)$ is (a)!, $\Gamma()$ is Gamma function.

Gamma function can be stated as:

$$\Gamma(a, x) = \int_x^{\infty} t^{(a-1)} e^{(-t)} dt \quad (10)$$

The Pd for the ED method can be calculated from equation (1), where the value of y (n) > (λ) under other Hypothesis (H1). During the Pd alarm input signal x (n) will be

$$X(n) = s(n) * h(n) + w(n), \quad H_1 \quad (11)$$

From equation (2) and (3), the y (n) can be written as,

$$y(n) = E = \sum_{n=1}^{N} |s(n)h(n) + \omega(n)|^2 \quad (12)$$

With the help of all the equation the Pd is,

$$P_d = 1 - \Gamma\left(N, \frac{\lambda}{\sigma^2\omega + \sigma^2 S}\right) \quad (13)$$

Where, $\Gamma(,)$ is lower incomplete gamma function.

The probability of miss detection (Pmd) for ED can be derived using equation (9) and (13) as below,

$$P_m = \Gamma\left(N, \frac{\lambda}{\sigma^2\omega + \sigma^2 s}\right) \quad (14)$$

The performance of Ed suffers when power of the noise is unidentified, here decided the value of threshold based on noise power which varies continuously depending upon the interference, temperature and other effects, so fixed threshold is also the problem. Energy detection technique has limitations like, cannot distinguish between signal and interference, at low SNR does not perform well

and does not work for the spread spectrum (Sp. Sp.) techniques [26].

A. Cyclostationary detection

This method can differentiate the modulated signal from the added noise. In many cases, signals have periodic statistic features such as carrier frequency and modulation rate are usually viewed as Cyclostationary properties.

A signal is said to be Cyclostationary if it's auto correlation and mean are periodic function [14]. The typical structure of Cyclostationary detection is shown in Fig 2.

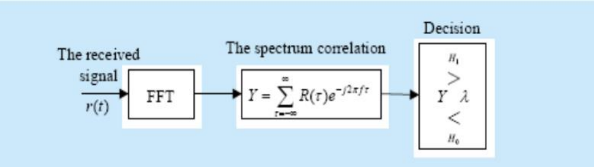

Fig. 2 Cyclostationary detector [14]

Considering s(t) as a deterministic complex sine signal passed through channel having Additive white Gaussian noise (AWGN), which may be expressed as

$$s(t) = Acos(2\pi f0 + \theta) \quad (15)$$

Where, A is amplitude of input signal, f_0 is frequency, θ is initial Phase. Transmission of above s (t) through above AWGN channel, having '0' mean, results to the x (t) = s (t) + n (t). Thus, mean function of x (t) will be

$$M_x(t) = E[x(t)] \quad (16)$$

$$M_x(t) = E[s(t) + n(t)] \quad (17)$$

$$M_x(t) = E[s(t)] \quad (19)$$

Where, x (t) is received signal, s (t) is transmitted Input signal, E is expectation operator, M_X (t) is mean function of x (t) and also a periodic function with period T_0.

As per earlier discussion, modulated signal x (t) is a periodic signal or a Cyclostationary signal, it's mean and autocorrelation reveal periodicity as Follows:

$$M_x(t) = M_x(t + T_0) \quad (19)$$

Similarly, if period of signal is T_0, the auto-correlation function of x (t) is also periodic.

$$R_x(t,u) = R_x(t + T_0, u + T_0) \quad (20)$$

Replacing u and t in autocorrelation equation with $\left(t - \frac{\tau}{2}\right)$ and $\left(t + \frac{\tau}{2}\right)$ express in Fourier series is as follows:

$$R_x(t + \frac{\tau}{2}, t - \frac{\tau}{2}) = \sum_{\alpha}^{0} \left(R_x^{\alpha}\right) \tau\, e^{j2\pi\alpha t} \quad (21)$$

Where, $\left(R_x^{\alpha}\right)$ is Cyclic autocorrelation function, α is cyclic frequency.

The cyclic frequency is supposed to be known in the receiver. Cyclic autocorrelation can be obtained by

$$R_x^{\alpha}(\tau) = \frac{1}{T}\int_{-\frac{1}{T}}^{+\frac{1}{T}} R_x\left(t + \frac{\tau}{2}, t - \frac{\tau}{2}\right) e^{-j2\pi\alpha t} dt \quad (22)$$

The FT of the cyclic autocorrelation calculated is defined as the cyclic function, Cyclic Spectral Density given by

$$S_x^{\alpha}(f) = \int_{-\infty}^{+\infty} R_x^{\alpha}(\tau)\, e^{-j2\pi\alpha\tau} d\tau \quad (23)$$

Cyclic Spectral Density (CSD) is also termed as spectral correlation function (SCF). SCF can be obtained by the normalized correlation between two spectral constituents of x (t) at frequencies (f + α/2) and (f - α/2) for the interval of length t. More, it cannot detect the type of communication, so it decreases the spectral density is a special form of SCF. However, Cyclostationary spectrum detection requires a large computational and significantly long observation periods, so difficult flexibility of CR. In CFD technique according to the Central Limit Theorem, the PDF of M_X (t) $_T$ for both hypothesis H_1 and H_0 can be estimated by Gaussian distributions [13,14,23].

$$P_{Mx(t)T}(t: H_1) = C_N\left(\mu, \frac{\sigma^2\omega}{2N+1}\right) \quad (24)$$

$$M_x(t) = \lim_{t\to\infty} M_x(t)T\,. \quad (25)$$

Where, C_N (,) is circularly symmetric complex Gaussian distribution. μ is mean, $\sigma^2\omega$ is the noise variance. The Pd can be calculated by the given equation,

$$P_d = P\,[H_1/H_1] \quad (26)$$

$$P_d = Q(\frac{\sqrt{2Y}}{\sigma\omega}, \frac{\lambda}{\sigma A}) \quad (27)$$

Where, γ is SNR, Q (,) is generalized Marcum Q function, $\sigma^2\omega$ is the noise variance. Henceforth, for a particular λ threshold, an approximate expression for Pfa is given as,

$$Pf = \exp[\frac{-\lambda^2}{2\sigma^2{}_A}] \quad (28)$$

Where, λ is Threshold Value, exp () is exponential function

$$\sigma^2{}_A = \frac{\sigma^2\omega}{(2N+1)} \quad (29)$$

Thus, the Pmd can be calculated using above equations as follows,

$$Pm = 1 - Q(\frac{\sqrt{2Y}}{\sigma\omega}, \frac{\lambda}{\sigma A}) \quad (30)$$

Majority scheme executes better than single user but not as OR because it requires half or more than half to confirm the presence.

The Pd is higher for OR method as compared to others which requires only 1 user to confirm that the primary user present in the band whereas AND method requires that all the users must confirm that primary users is present [13-16].

B. MATCHED FILTER BASED SPECTRUM SENSING

The matched filter (MF) referred to as coherent detection, is known as the optimum method for sensing of PUs when the transmitter signal is known. It is very accurate since it maximizes the received SNR [12,22,25]. MF correlates the signal with time shifted version and relates between the output of MF and predetermined threshold λ to decide the PU absence or presence. However, MF requires CR to demodulate received signals. Hence, it requires perfect information of the PUs' signal features such as BW, operating frequency, modulation type and order, pulse shaping, and format of frame [13]. The matched filter detector is known as the optimum method for detection of PUs when the transmitted signal is known. The MF has a requirement of fewer signal samples, which grows as for a target Pfa at low SNRs [14]. The typical block diagram of MF detection is shown in Fig.3

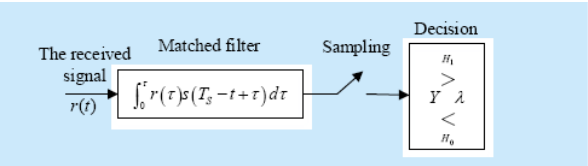

Fig.3 Matched filter detector [14]

The decision making whether the signal is present or absent can be assisted if the signal pass through a filter, which will emphasize the useful signal sig(t) and attenuate the noise w(t) at the same time. This will give a sharp contrast between the SNR, and if the signal sig (t) is present, the output will appear to have a large peak. If the signal is absent, no such peak will appear. This procedure will make it possible to choose whether the signal is absent or present with minimum Pe. The filter which accomplishes this is known as MF [14]. Main purpose of the filter is, to decrease the noise value and to increase the signal component at the instant. Hence the MF is designed in such a way that it will maximize the ratio of the square of signal amplitude value to the square of the noise value [11, 18]. The expression of NF detection is expressed as

$$y(n) = \sum_n x(n) \times x_p * (n) \quad (31)$$

Where the limit of n=0 to N-1, x (n) is the input transmitted signal, x_p*(n) is conjugate of known Pilot data, y (n) is received signal.

n=1, 2, 3, 4……....N

A hypothesis testing for MF detector is given as following equation as the signal detection problem is solved by the decision between the hypotheses test:

H0: Only Noise: Hp: PU present

The signal under each hypothesis is

$w[n], \quad H_0 \quad n = 0,1, \ldots \ldots \ldots N-1$

$x[n] = {}_{S_P}[n] + w[n], H_P \quad n = 0,1, \ldots \ldots \ldots N-1$

Where, $S_P[n]$ is the PU's signal to be detected and $w[n]$ is a zero mean AWGN with variance σ2. *N* is the number of samples of the received signal used in the signal sensing process. Hence, the MF sensing solution is too costly for sensing multiple primary spectra, extra hardware for synchronization is required, and knowledge of i/p is required to construct the reference signal that leads to the implementation complexity and large power requirement [14, 25]. The Properties of the MF are as follows. If a signal s (t) is corrupted by AWGN, the filter with impulse response matched to s (t) maximizes the output SNR. The MF has an unique frequency domain interpretation. Since h (t) = s (T – t) then response of frequency which is the complex conjugate of the transmitted signal spectrum so that the magnitude response of the MF is identical to the transmitted signal spectra.

Let us consider a digital communication system, the input sequence to the modulator is subdivided into k-bit symbols and each of the $M=2^k$ symbols is having with a corresponding baseband signal waveform from the set $\{S_m (t)\ m= 1, 2 \ldots M\}$. Each signal is transmitted within the symbol duration or time slot of T. Now consider the transmission of information over the interval $0 \leq t \leq T$. The channel is assumed to corrupt the signal by the AWGN. Thus the received signal may be expressed as [7,22]:

$$r(t) = S_m(t) + n(t) \quad 0 \leq t \leq T \quad (32)$$

Where n (t) denotes the sample function of AWGN with the power spectral density Sn (f) is N0/2 W/Hz. Instead of using a bank of N correlates to generate the variables

{rk}, we may use a bank of N linear filters. N filters Impulse responses cab be:

$$h_k(t) = \psi_k(T - t) \quad 0 \le t \le T \qquad (33)$$

Where $\{\psi_k(t)\}$ is defined as the N basis functions and outside of the duration $0 \le t \le T$, $h_k(t)$ is 0.

The o/ps of the filters are:

$$y_k(t) = \int_0^t r(\tau) h_k(t - \tau) d\tau \qquad (34)$$

A filter whose impulse response h (t) is said to be s (T - t), where s (t) is confined to the time interval $0 \le t \le T$, is called the MF to the signal s (t).

Performance matrix for MF parameter is calculated with the below equations help, the Pfa for the MF detection can be calculated by the given Under hypothesis H_0, the distribution of the MF detector output becomes a chi-square pdf with degrees 2 of freedom with variance σ is $\sqrt{n}$ from above discussion, the received signal y (n) can be written as

$$Y(n) = \sum_{n=0}^{N-1} \omega(n) \times x_p^*(n) \qquad (35)$$

Value of signal y (n) is greater than threshold λ under alternative hypothesis H1, while H1 is true. During the Pd input signal x (n) will be,

$$x(n) = s(n)h(n) + \omega(n); H_1 \qquad (36)$$

This shows detection is H_0 while H_1 is true. Thus, during the Pfa i/p signal x (n) will be

$$X(n) = \omega(n), H0 \qquad (37)$$

Now, from above equation, the received signal y (n) can be written as,

$$y(n) = \sum_{n=0}^{(N-1)} [s(n)h(n) + \omega(n)] \times Xp^*(n) \qquad (38)$$

Now, the Pd of PU alarm for the MF detection method can be calculated by the given equation,

$$P_d = P[H_1/H_1] \qquad (39)$$

$$P_d = P[(y(n) > \lambda)/H_1] \qquad (40)$$

From equation (39) and (40), the final expression for Pd is,

$$P_d = Q\left(\sqrt{\frac{2E}{\sigma^2\omega}}, \sqrt{\frac{2\lambda^2}{\omega\sigma^2}}\right) \qquad (41)$$

Where, Q (,) is generalized Marcum Q Function

$$Q(a,b) = \frac{1}{a^{(m-1)}} \int_b^{\infty} x^m e^{-\left(x^2 + \frac{a^2}{2}\right)} I_{(m-1)}(ax) dx \qquad (42)$$

The term 'a', 'b' are non-negative real numbers, m is positive integers. $I_{(m-1)}()$ is modified Bessel functions of the first kind of order (m-1). Now, the Pfa for the MF detection method can be calculated by the given equation

$$P_{fa} = P[H_1/H_0] \qquad (43)$$

$$P_{fa} = P[(y(n) > \lambda)/H_0] \qquad (44)$$

From equations (43) and (44), the final Pfa expression can be which is,

$$P_{fa} = \exp\left[\frac{-\lambda^2}{E\sigma\omega^2}\right] \qquad (45)$$

Where, λ is threshold value, Exp() is exponential function, E is i/p signal power, $\sigma\omega^2$ is noise variance. Now, for the Pfd, the decision is H_0 while H_1 is true.

$$P_{md} = P[H_0/H_1] \qquad (46)$$

$$P_{md} = 1 - [(y(n) > \lambda)/H_1] \qquad (47)$$

From equations (41) and (46) the Pmd for MF detection can be,

$$P_{md} = (1 - P_d) \qquad (48)$$

$$P_{md} = 1 - Q\left(\sqrt{\frac{2E}{\sigma^2\omega}}, \sqrt{\frac{2\lambda^2}{E\sigma^2\omega}}\right) \qquad (49)$$

B. Algorithm for MF detection:

This section deals with the flow algorithms and flowcharts used to draft the simulation programs. To calculate the performance parameter for MF detection algorithm used is given as below chart:

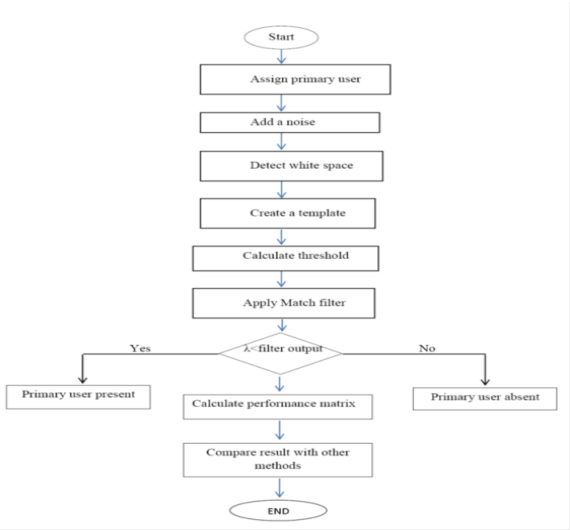

Fig. 4 Flow Chart, Energy Detection

C. Algorithm of ED

Flow for Algorithm used ED is given as follows:

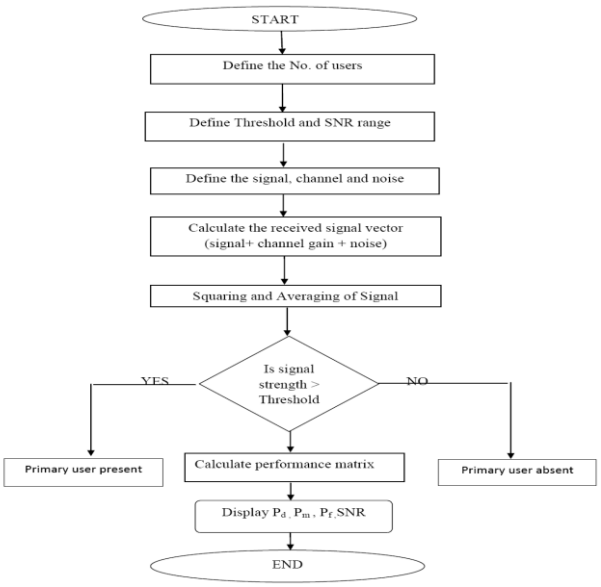

Fig. 5 Flow Chart, Matched Filter Detection

D. Game Theory

The Game theory is define as a set of mathematical tools used to model and analyses iterative, interactive and strategic decision intelligent methods among multiple decision-makers concerned about their own benefit. Each decision-maker has preferences over the set of possible expected outcomes of the game and each strives is used to obtain the outcome that is most profitable [25].

There are various methods used to define a game, the formal description takes the following parameters into consideration; the players, their information, their preferences, the strategic actions to them, and how these influence the outcome. In the scope of this generalization, there are 2 types of games, namely non-cooperative games and co-operative games [5,21].

E. ITERATIVE WATER-FILLING

Iterative water-filling algorithm provides an algorithm for computing optimal transmit covariance matrices for the users in a multiuser system. The algorithm was originally applied to Discrete Multi-tones (DMT) to the problem of multiuser distributed power control in Digital Subscriber Line (DSL). The "water-filling" name is derived from its classical description, which considers water is poured over the inverse of noise variance at each subcarrier frequency. For instance, if a given channel SNR information in a frequency domain, SNR (f) with a given Power Spectral Density (PSD), the maximum data rate can be obtained by assigning more power to the frequency bands with higher channel SNR. This strategy, which is the same as pouring the total power into the bowl of the inverse SNR (f) curve, defines the name water-filling[18-23].

F. Algorithm of Water filling algorithm

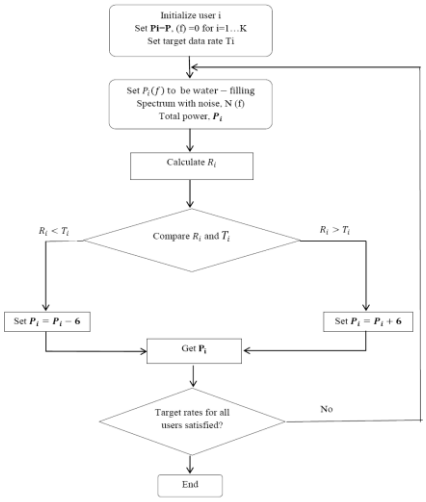

Fig. 6 Flow Chart, Water Filling Algorithm

G. Results and Discussion

A. Channel detection

For amplitude modulation (AM) and BPSK technique sinusoidal waveform with different carrier frequencies are used. 5 Primary User are taken and 1 Secondary User. The Primary User Benchmarking is given in the table 1.

Table 1: Primary User Benchmarking

Signal	User	Carrier Frequency	Modulation Method
A	PU1	10 KHz	AM
B	PU2	20 KHz	AM
C	PU3	30 KHz	AM
D	PU4	40 KHz	AM
E	PU5	50 KHz	AM

For primary user baseband signal is consider as follows:

$$X1 = \cos(2*pi*1000*t) \quad (50)$$

For primary user baseband signal is consider as follows:

$$X2 = \cos(2*pi*2000*t) \quad (51)$$

For all the Performance Matrix Simulation the 1000 iteration of Monte Carlo Simulation i.e. MCS=1000. When the primary user input are given and after detecting the spectrum white space, it will insert the secondary user. After adding a noise in the signal the output plot shows the original signal and noisy signal as given in following section. The frequency bands for primary signal are chosen as follows:

First primary user available Y/N: y

Second primary user available Y/N: n

Third primary user available Y/N: y

Fourth primary user available Y/N: n

Fifth primary user available Y/N: y

Want to add noise: y

Enter the SNR: 5

After adding 3dB noise in to the signal it gives the output as shown in the fig. 7

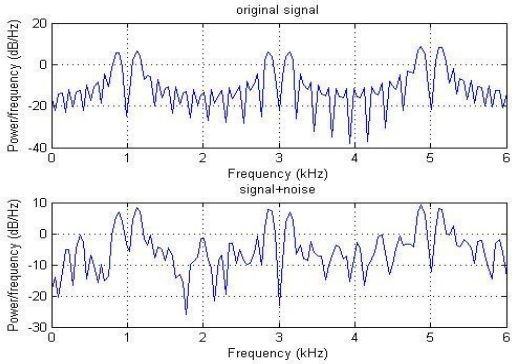

Fig. 7 Signal added with AWGN noise

If any band is empty it will add a secondary user at first band which is vacant as shown in fig. 8 and gives the output in command window as follows:
Band 2 is allotted for secondary user.

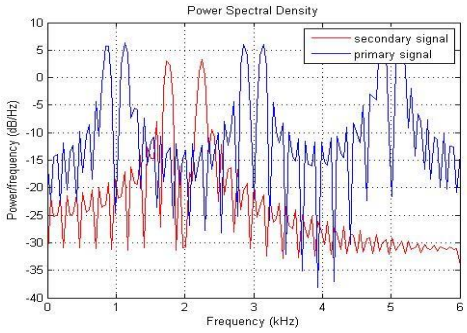

Fig. 8 Primary and secondary user band allocations

B. THE ROC CHARACTERISTICS

The receiver operating condition (ROC) is investigated for the matched filter detection using AM and BPSK methods. For the simulation purpose Monte Carlo method is used and AWGN channel. To calculate performance parameter two methods ED and MF are compared with the AM modulation and BPSK modulation. For BPSK modulation technique 1000 number of sample are used. The results are depicted in figure 9. For the comparison between the ED and MF detection it required the Linear Value of the SNR. Threshold for the ED Threshold is calculated by the equation as follows, where, λ is threshold, Pf is probability of false alarm, M is the length of signal.

$$\lambda = \text{gammincinv}(1 - Pf, m, 1) * 2 \quad (52)$$

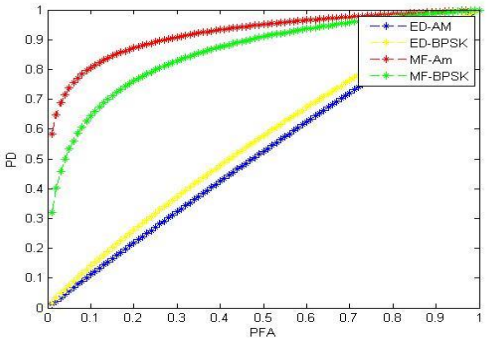

Fig. 9 ROC comparison for MD and Ed

From above plot it is observed that for given value of SNR at Pfa 0.01 MF gives maximum value od Pd i.e. 0.894677, Whereas Ed gives value pd = 0.01307. As the value of Pfa increases MF and Ed gives nearly same result at Pfa of 0.9. From above graph conclude that MF has better detection performance as compare to ED method. Fig.10 shows the comparison between the ED and MF detection for PD vs. SNR.

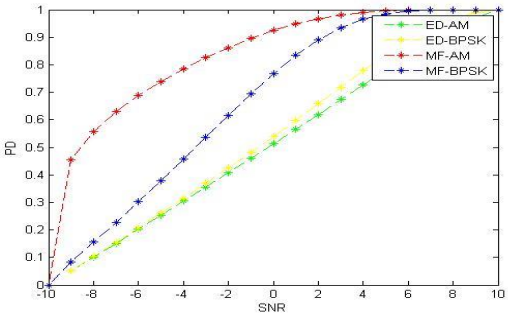

Fig. 10 MF and ED comparison by PD vs. SNR

The above graph shows the comparison between ED and MF for two modulation technique. From above graph, it can be seen that in low SNR the Pd in matched filter method perform well as compare to energy detection method. Figure 11 shows the comparison between the Ed and MF Detection by Pmd vs Pfa.

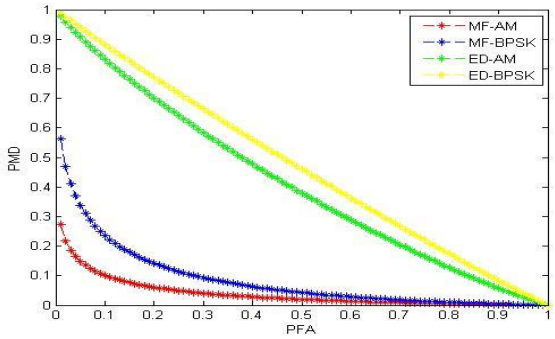

Fig.11 MF and ED comparison by PMD vs. PFA

From above figure it is clear that matched filter miss detection with Am modulation technique has

lower miss detection probability as value of Pfa is increased. Energy detection has maximum probability of miss detection compare to match filter for Pfa is from 0.01 to 0.8. After 0.8 both the technique has nearly equal values of miss detection probability.

C. GRAPH ON WATER-FILLING ALGORITHM

For iterative - algorithm initialization is done by choosing frequency band for primary user as follows:

First primary user available Y/N: y
Second primary user available Y/N: n
Third primary user available Y/N: y
Fourth primary user available Y/N: n
Fifth primary user available Y/N: y

After calculating PSD of signal, system throughput is calculated. On the basis of entropy calculation power allotted to each band is calculated.

Total transmit power is calculated and compared with total power allotted to each band. The output values for water-filling algorithm are given as follows:

The system throughput is: 1798120.9649
The power constraint is satisfied as sum of allocated power is less than or equal to total power.
Total power: 1e-05
Power allocated to bands: 3.068e-06 9.1956e-07 2.0853e-06 9.5988e-07 2.9673e-06
For interference power constraint, the tolerable interference power threshold should be greater than: 5e-07
From the above calculations it has generate a graph shown in fig. 12

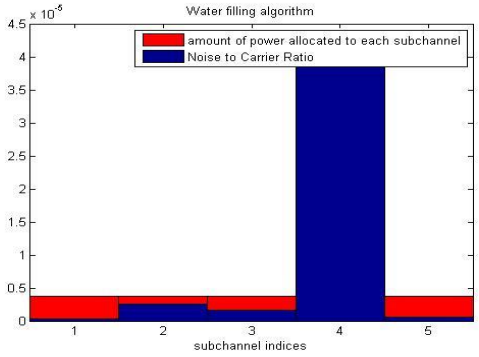

Fig. 12 Water-filling algorithm based energy allocation

H. CONCLUSION

In this work AM and BPSK modulation method based Energy Detection and Matched Filter spectrum sensing methods are investigated with or without water filling algorithm. It is proved with the limitation of MF it can be an effective cognitive radio spectrum sensing method named as MFSS which can be utilized in low SNR values is introduced for the effective spectrum utilization. The performance parameter matrix of the MFSS is improved by using as suggested and discussed. By using the AM and BPSK modulation technique for ED and MF method it is proved that AM modulation technique gives better probability of detection as pd=0.8946 comparing with BPSK as pd=0.41732 for pfa=0.01. In this work the ED and MF spectrum sensing methods are used with improved properties of Monto Carlo simulation and water filling algorithm which results in the improvement of the performance of energy detection method with matched filter method. These are compared and proved that MF gives better result in low SNR due to noise rejection ability as for -6 DB MF gives pd is 0.726346 as compare to Energy Detection gives pd=0.20225. Matched filter Detection gives better probability of detection at different values of SNR compare to energy detection method.

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Product Recommender system using deep learning: A Review and an Approach

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***Abstract*— A product decision tree is a piece of software that generates and recommends goods or information that a user may wish to interact with or purchase. By utilizing machine learning algorithms and information repositories on both specific objects and individual users, this system creates a highly developed channel of links between all of those products and those people. As the amount of digital information available and the number of Internet users grows, data overburdening becomes a problem that prevents timely access to relevant items on the Internet. Many information retrieval systems make an attempt to address the problem of information overload, but they lack information prioritization and personalization. The main goal is to develop neural collaborative filtering based on cosine similarity. The recommender system algorithm with the highest adoption rate is collaborative filtering. Recommender systems are information filtering systems that combat information overload by selecting the most relevant pieces of information from a large volume of dynamically promoted material based on how well-suited, attentive, and distinguished a person is to them. We present a model that generates recommendations for mobile users using a novel approach that takes into account m users and n things (in numbers).**

Keywords*— *Artificial Intelligence, Collaborative Filtering, Deep Learning, Machine Learning, Product Recommendation Systems

I. INTRODUCTION

The advancement of artificial intelligence and machine learning technologies has resulted in intelligent products that are necessary for gaining access to various aspects of people's daily lives. Intelligent recommendation functions of personalized recommender systems can extract effective and useful information from massive Internet data, making them applicable in various network platforms such as movies, music, and shopping platforms. The recommendation algorithm, which is a useful determinant in identifying system performance and the quality of recommendation results, is one of the most important forms of a recommender system. There are two types of algorithms that are commonly used The neural collaborative filtering (NCF) model is a neural network that provides collaborative filtering based on user and item interactions. The NCF model approaches matrix factorization from a nonlinear perspective. NCF Tensor Flow takes a sequence of pairs (user ID, item ID) as inputs and feeds them separately into a matrix factorization step (where the embeddings are multiplied) and a multilayer perceptron (MLP) network. The matrix factorization and MLP network results are then combined and fed into a single dense layer that predicts whether the input user is likely to interact with the input item. When we use Google search, streaming services for music or movies, online shopping, social networks, and other tools like dating apps, we all interact with product recommendation algorithms. Product recommendation systems, on the other hand, are among the most popular and effective machine learning applications in business. They can significantly increase business, revenue, click-through rates, conversions, and other key metrics when properly set up and configured. This is because tailoring a product or a pleasant recommendation to a specific stoner's interests has a positive impact on that stoner's experience. This, in turn, translates into metrics that are difficult to quantify but are critical to online businesses, such as customer satisfaction, loyalty, brand affinity, and so on. According to recent Monette research, product recommendations can increase purchase rates by 70% on the first and subsequent sessions, and average order value by 33%. Customers who click on product recommendations have a 4.5 times higher shopping cart rate, view 4.8 times more products per visit, and spend 5 times more money per visit, according to a separate Salesforce study.

II. SURVEY OF EXISTING APPROACHES

This section provides a comprehensive analysis of the literature that is currently accessible and relevant to Product Recommendation Systems (PRS) and the mechanisms involved. We have only looked at the most current, noteworthy, and helpful study and review papers here, despite the fact that there are numerous research contributions in the literature. The present approaches are broken down into many groups based on the core concepts employed in the mechanisms. The ideas of the writers are highlighted, as well as the platform they used for their experiments and the efficiency of their systems. Additionally, they emphasise their assertions. Finally, a summary of the findings in relation to the read and evaluated research papers is given. The root of the identified issue is discussed in the section's conclusion.
The Collaborative Filtering (CF) method was developed by A. Biswas, K. S. Vineeth, A. Jain, and Mohana in 2020. There are several considerations, including the association rule mining structure and purchase patterns [1]. The CF technique was used to create the top ten suggestions for each user. From their tests, the authors

deduced that the selection of criteria and calculation speed are essential for quality endorsements.

In 2020, B. Dellal-Hedjazi and Z. Alimazighi developed a PRS using deep learning [2]. In order to combine their strengths and get over each one's limitations, a new hybrid PRS is also developed. The authors claim that their studies showed very good accuracy and speed.

In 2018, B. Ouhbi, B. Frikh, E. Zemmouri, and A. Abbad suggested a revolutionary AI-based PRS that boosts performance. When the cold start problem is taken into consideration, the authors claim that their methodology overcomes the drawbacks of past methods. The authors have presented a hybrid model based on DBN and CF. For their study, they made use of the MovieLens 100K dataset. According to the authors, their recommended approach is superior to prior PRS.

A updated PRS that uses the overt response for CF and outfits NN and MF as its foundation was developed by M. T. Ahamed and S. Afroge in 2019 [4]. Recently, PRS used deep neural networks to analyse supplemental attributes. NN is used in this study. In this study, the interaction function of the PRS is represented by NN. According to the authors, their proposed method works better than earlier CF methods in terms of a significant decrease in MAE and RMSE.

In 2020, M. Kommineni, et al. proposed a simple PRS for book endorsements [5]. According to the authors, their recommended approach works well for management, reporting, training, feedback, and configuration. Using this data, PRS then provides information to the user. Making policy decisions and referencing data items are now simpler. The authors claim that their proposed technique uses a UBCF and accounts for similarity measures in their PRS. According to the writers, a projected plan will set the implementation of their advised method apart.

A PRS that considers user requests and suggests the best products was framed by P. Satheesan, P. S. Haddela, and J. Alosius in 2020 [6]. To both present and future consumers, this PRS makes product recommendations. To propose items to repeat clients, the system employs association rule mining and CF. It provides loyal clients with product recommendations based on previous purchases. The ratings of other users are also taken into consideration. The recommended algorithm filters out things that the user has already purchased or evaluated in favour of gathering goods from consumers with comparable tastes. The authors argue that their proposed technique improves customers' shopping experiences by accurately and successfully offering goods that are catered to their demands.

In 2021, S. Singh, M. Lohakare, K. Sayar, and S. Sharma will assess the efficacy of a PRS based on deep learning. To apply the PRS for movies and books, they employed many layers of NN [7]. They produce and assess the datasets for the PRS. To propose a product to the client, the inputs are transformed into an entrenching coating and then given through compressed coatings for endorsement discovery. The authors argue that the results of their recommended strategy show why their technique is better than other content-based strategies. They concluded that the varied layered architectures provide fresh possibilities for next AI-based PRS research.

III. PROBLEM FORMULATION

A product recommendation system (PRS) is a piece of software specifically designed to produce and provide recommendations for items that a certain client would want to buy or become interested in. Artificial intelligence algorithms allow us to obtain a lot of information on discrete customers and discrete goods. The system is built up to create compound networks between the clients and the products that are being targeted. To do this, we created our own system for recommending items for this project. For those who are interested, we create a login page. After logging in, a new window with the option to buy products and suggested items that one contact list member can buy for another displays. On the contact list, a separate person is used for this process.

IV. PROPOSED APPROACH

Artificial intelligence (AI) has made enormous strides over the past several years and now has a presence in every sector of the economy. Machine learning, a key element of AI, is useful for considering incoming data, looking for pertinent patterns, improving upon itself, and showing the findings. In the present, technologically advanced society, online shopping has become indispensable. While online shopping, it may occasionally be really difficult to find a great product that perfectly suits our demands as consumers. One potential remedy for this problem is the development of an AI-based PRS. Furthermore, AI may be combined with machine learning, NLP, and natural language processing (ML). According to our previous search and purchase histories, the idea is that one may easily and quickly find the things they need. Utility simplicity and user satisfaction may arise from this.

The primary flowchart of our plan is shown in Fig. 1. We can see that logging into a GUI is the initial phase of our plan from this point on. Whether or whether the original client made a purchase is listed after that. We then provide product recommendations if the consumer decides to purchase the products. After then, the product history is kept.

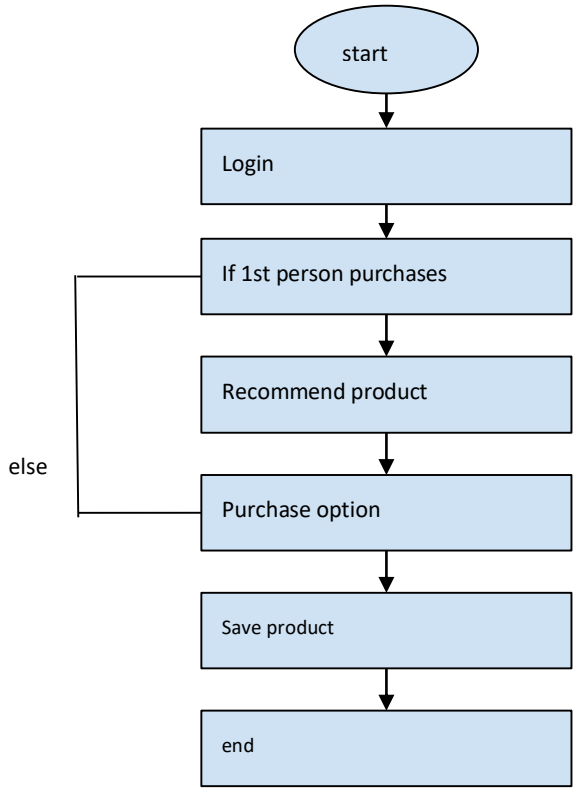

Fig. 1: Flowchart of a Product Recommendation System

Python is well-known and well-liked because of its general-purpose nature, which makes it usable in almost every sector of software innovation. Today, Python has a large presence in every new industry. Python, which can be used to develop any application, is now the programming language with the highest growth. This category includes software development, scientific and mathematical applications, business applications, audio and video applications, 3D CAD applications, enterprise applications, image processing applications, and more. It also includes web applications, desktop GUI applications, console-based applications, and software development.

When used to construct online applications, Python provides libraries to handle internet protocols including HTML and XML, JSON, Email processing, requests, beautifulSoup, Feedparser, etc. Instagram makes use of the Python-based Django web framework. The following is a list of the useful frameworks that Python provides:

- Django and Pyramid framework(Use for heavy applications)
- Flask and Bottle (Micro-framework)
- Plone and Django CMS (Advance Content management)

V. RESULTS

In this article, we created a graphical user interface for our product recommendation system. Figure 3 depicts the suggested system's login page. Here you must enter your user's name and password.

Fig.2: Login page of proposed system

After logging in, we see a list of recommended products. This is shown in Fig. 4, where we can see that products such as mobile phones, bags, laptop computers, and coolers are mentioned. The HP Laptop is the recommended product based on the user's needs. In this article, we created a graphical user interface for our product recommendation system. Figure 3 depicts the suggested system's login page. Here you must enter your user name and password.

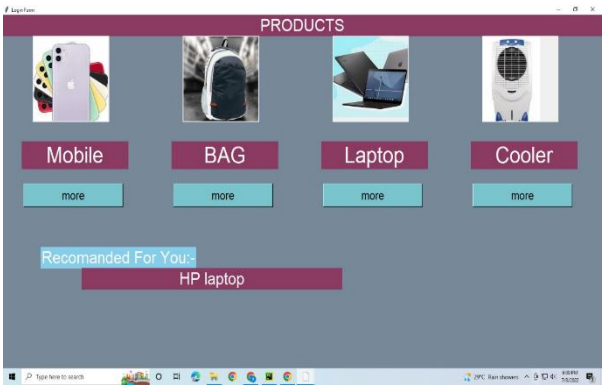

Fig.4: List of recommended products

We are now presented with a detailed list of products. Since the laptop is recommended, we come across a variety of laptop brands such as Lenovo, HP, Dell, Apple, and Acer. Figure 5 depicts this.

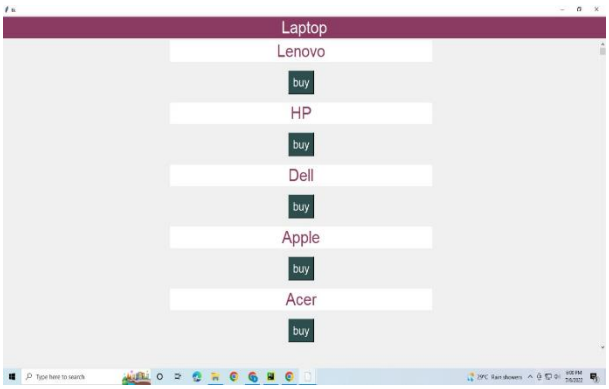

Fig. 5: List of Products

Another example is when we come across a list of suggested products. This is shown in Fig. 6, where we can see that products such as mobile phones, bags, laptop

computers, and coolers are mentioned. Baggit Handbag is the recommended product based on the user's needs

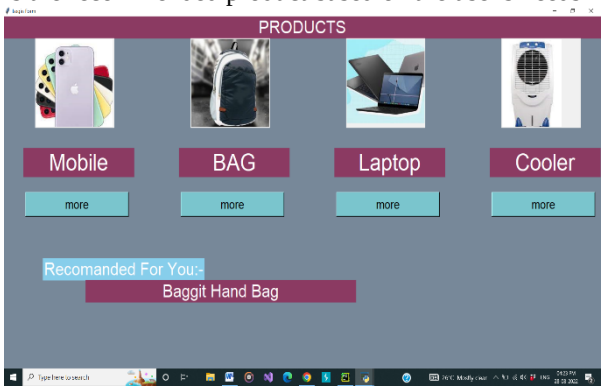

Fig.6: List of recommended products

Again, we can see the detailed product list. Because handbags are recommended here, we come across various brands of handbags such as Hidesign Bags, Baggit Bags, Caprese Bags, Lavie Bags, and Ladida Bags. This is depicted in Fig. 7.

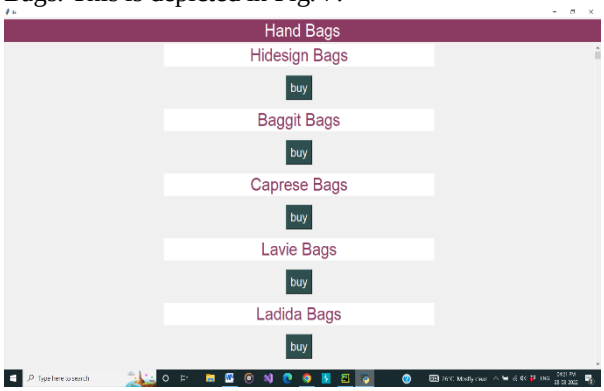

Fig. 7: List of Products

Finally, Fig. 8 depicts the completion process following the purchase of the product. Following the successful completion of the purchasing process, a message displaying "Thankyou for purchasing product" appears here.

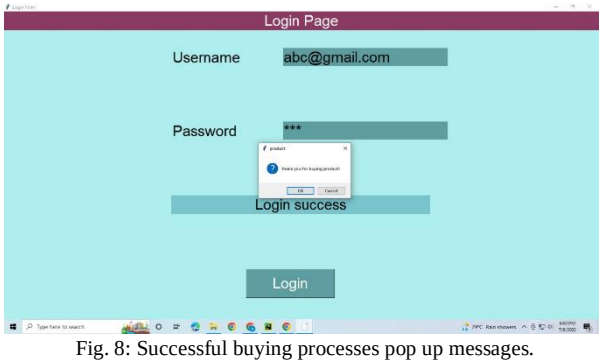

Fig. 8: Successful buying processes pop up messages.

We utilised the Similarity Index performance assessment metric to assess the outcomes. The following is the algorithm and mathematical calculation:
Similarity data: Even with binary dimensions, techniques based on similarity scores are effective.
Two comparable users may appear as [4,2,5,4,2] and [4,2,4,5,1] when you have scores, but in our situation, they would appear as [1,0,1,0,1] and [1,0,1,0,0].

Now, if we can figure out how many times a user has purchased a product, that number can be used as a rating, and similarities can be determined using the method below.
formula:-
1 - cosine([user1 rating],[user2 rating])
run on jupyter:-
from scipy.spatial.distance import cosine
1 - cosine([1],[1])
ans:- 1

This is viewed from Fig. 9 where the similarity index is calculated and found to be 1.

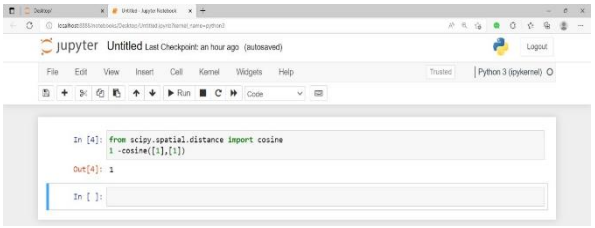

Fig. 9: Performance Evaluation using Similarity Index of Products

VI. CONCLUSION

We analysed and compared the literature on several deep learning and collaborative filtering-based product recommendation systems that are currently available. The techniques presented here are organised in a systematic manner based on the fundamental concepts used in their procedures. Following a review of the literature, we proposed our solution, which addresses the issues. This work is critical for comparing different deep learning and collaborative filtering-based product recommendation systems, which is required for resolving product recommendation challenges. We combined AI, natural language processing, and machine learning. We have put into practise the idea of quickly and easily finding suitable items online. This PRS is easily accessible at any time and from any location, and it can automatically reduce time expenditures. Furthermore, we can infer from the results that our proposed strategy is correct and consistent.

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Weed Detection & Removal Using Image Processing in Matlab

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***Abstract*—Translations is the rendering meaning from one language into another language. The purpose of translation is to convey the original intent of a message, taking into account cultural and regional differences between languages. The main goal of creating an Indian language translation website is to provide quality communication and not letting language to cease any one from gaining knowledge. Our motive is to design a website simple and efficient so that it can cause more benefit to the user and less time consuming. All in one website for Indian languages is the technical solution to the social problem of the society.**

I. INTRODUCTION

India is a very diverse nation. There are almost 22 language spoken within a country. So this can create an barrier for people to understand or communicate with each other. This system will provide to overcome the language barrier between people.

This system will translate variety of Indian languages into your preferred language so that the user can understand the meaning of the context. Translation is the rendering meaning from one language into another language. The purpose of translation is to convey the original intent of a message, taking into account cultural and regional differences between languages. The main goal of creating an Indian language translation system is to provide quality communication and not letting language to cease any one from gaining knowledge.

II. LITERATURE SUREY

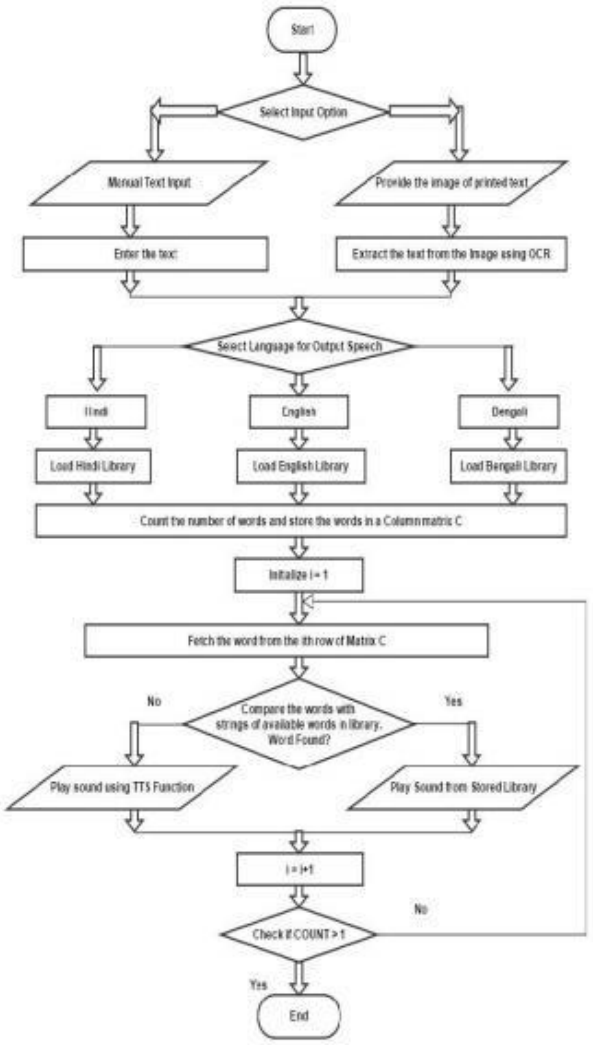
1) Machine Translation for Indian Language (2008) Author. Shachi Mall and Umesh chandra jaiswalIn this paper, we presented various systems for English to Hindi, Malayalam, Punjabi, and Tamil MT. Factored SMT with suffix separation and reordering performs better. Transliteration as post processing furtherhelps improve the translation quality. Failure of factored SMT for English-Punjabi and English- Malayalam would be another thread of this work to be continued.

2) Translation Quality of English to Hindi Online Translate system(2013) Author. Bhojraj Singh Dhakar, Sitesh Kumar Sinha, Krishna Kumar PandeyIn the beginning of study about GoogleTranslate it is Expected that perform betterthan Bing Translator, but in Comparative study it is found that Bing Translator was better. The difference then explained to have a reason behind the Architecture, the different characteristics of two languages, an Other technical differences of the mentioned online translators.

3) Machine Translation in Indian Languages: Challenges and Resolution (2018) Author. Raj Nath Patel, Prakash B. Pimpale and M. Sasikumar In this paper, we presented various systems for English to Hindi, Malayalam, Punjabi, and Tamil machine translation. Factored SMT with suffix separation and reordering performs better. Transliteration as post processing further helps to improve the translation quality. Failure of factored SMT for English- Punjabi and English-Malayalam would be another thread of this work to be continued. Further, we plan to work towards improving the pre-processing and post-processing techniques for better translation quality and extend the approach to

4) Current Status of machine Translation: Indian perspective (2016) Author. Abhijit Paul, Bipul Syam Purkayastha The MT systems that are available in India for Indian languages mainly work for highly spoken languages like Hindi, Bengali, Marathi, Gujarati, Tamil, Telegu, Oriya, Punjabi, Assamese, Kannada, Malayalam, etc., but due to limited resources, development of other Equations.

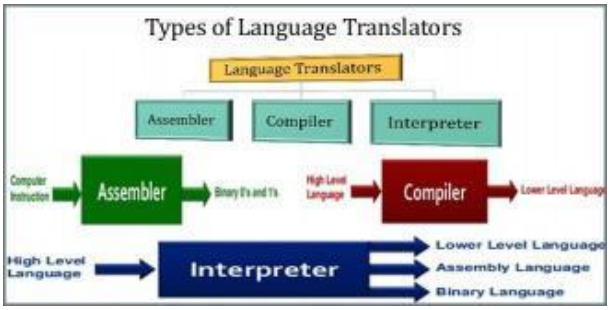
Proposed flowchart of implementation

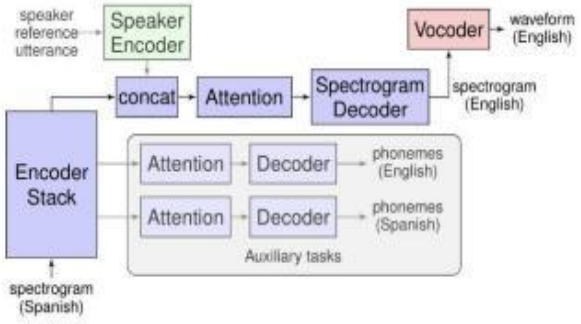


languages (Nepali, Bodo, Khashi, Mizo, etc.)

MT system is still far off.. So the correct MT systems for highly spoken languages as well as least spoken languages MT system still a great demand in India.

5) Machine Translation Approaches and Survey for Indian Language (2008) Author. Nadeem Jadon khan, nadir durrani This survey described machine translation (MT) techniques in a longitudinal and latitudinal Way with an Emphasis on the MT development for Indian languages. Additionally, we tried to Describe briefly the different existing approaches that have been used to develop MT systems.





III. CONCLUSION

This system Subjugate language barrier of Indian languages between the people around the world and also help. Other to Uplift people to gain knowledge without any language difficulties. If whenever a user want to read a book of different language but unable to read it. Then system will clear all the problem and translate the context for user. System can translate an audio of Indian Language into text of user preferred Indian language. With this help user can read an audio msg again and again without the requirements of audio player all the time. System can read any text from the picture or with the help of camera user can click aphoto of the item containing the text to be read and translate into any user desired Indian languages. Preferred

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Machine Learning Based Detection of Depression and Anixiety Using Voice Recognition

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***Abstract*— A more objective assessment is required to assist patients in receiving a speedier and more accurate diagnosis of depression. A significant number of people suffering from depressive illnesses are not diagnosed correctly. Despite the fact that the actual predictive value of speech traits has not been studied, it is clinically simple to collect data on them, and their link with depression has been researched. Hence, it is unknown how much a person's voice traits affect their ability to be diagnosed with depression generally. Every person has anxiety at some point in their lives. The word "anxiety" is frequently used in everyday speech to describe the unpleasant feelings that accompany tension or fear. Computers can prepare data for factual study using machine learning techniques in order to reach a certain range of performances. It encourages the use of computer frameworks to automate decision-making based on data inputs while creating the models for the test data. A paradigm for forecasting anxiety and sadness is presented in this article. This framework receives a set of voice data as input. To remove data noise and make the input data set consistent, this data set has undergone preprocessing. The input data set is then subjected to different machine learning methods such as Nave Bayes, Random Forest, and SVM. Data classification is carried out. The classification results of several methods are compared.**

Keywords— Anxiety, Depression, Prediction, Machine Learning, Classification, Speech data

I. INTRODUCTION

Everyone [1] experiences anxiety at some point in their lives. The word "anxiety" is frequently used in everyday speech to describe the unpleasant and uncomfortable feelings that people experience when faced with stressful or frightening situations. A wide range of things might make someone anxious. The majority of the time, though, stress is to blame. Anxiety brought on by stress is the most frequent cause of treatment requests among college students. One in eight undergraduate students who have stress-related problems in college seek therapy. Anxiety is defined as an underlying fear brought on by a compelling urge to commit. It is a group of symptoms brought on by inadequate adjustment to the stresses and demands of life. One of the most frequent problems college students deal with is anxiety. Some people could feel overwhelmed by the added demands that come with moving to a new location, being far from family, and the need to perform well in school. Anxiety disorders are among the most frequent and widespread mental ailments. Anxiety disorders are characterised by differences in physiology, thought, behaviour, and emotion. College students may exhibit them in a variety of ways, such as adjustment problems, anxiety tests, social phobia, and anxiety disorders brought on by drugs. [2] [3]

The signs and symptoms of anxiety [4] [5] can include problems with the mind, the body, or the environment. Many symptoms of anxiety include excessive worrying, fear, agitation, overly emotional reactions, and negative thoughts. While they are anxious, some people appear calm, but their minds are always racing. This negatively affects their quality of life. Chest tightness, a racing or hammering heart, and a pit in the stomach are common symptoms of anxiety. Some people get headaches, sweat, and even the urge to urinate when they are anxious. The signs of anxiety include worry, panic, losing focus during an exam, feeling helpless while executing activities, and losing interest in a challenging subject.

Depression [6] affects a person's thoughts, actions, feelings, and fitness and is characterised by a low mood and aversion to activity. Anxious, reluctant, helpless, unworthy, guilty, irritated, or restless feelings are common among depressed people. Individuals could stop finding pleasure in formerly enjoyable activities, experience excessive or loss of hunger, struggle to concentrate, remember details, make decisions, or even consider suicide. College may be difficult for students, and depression is common. University students frequently experience depression, and campus life can be demanding.

II. RELATED WORKS

Millions of people experience depression, a powerful sense of helplessness, gloom, and unhappiness [7]. It's more than just a "black mood"; it's a persistent, uncontrollable feeling that makes it difficult to go about daily tasks. By 2023, depression is expected to overtake all other causes of death as the leading cause of death.

There are different levels of depression [8], ranging from general to clinical. It's common to experience depression. Mood disturbances are the most overt of the symptoms, which appear in the four fundamental domains of human functioning: emotional, cognitive, physical, and behavioural. Changes in food or weight, disturbed sleep, psychosis, diminished energy, feelings of guilt, disorganised thinking, difficulty concentrating, trouble making decisions, persistent death thoughts, and thoughts of harming oneself are all common signs of depression.

Depression has been related to a range of harmful health outcomes, such as impaired recovery and diminished immune function.

An area of information technology that departs from conventional computer methods is machine learning [9] [10]. According to conventional wisdom, algorithms are collections of explicitly designed instructions that a computer uses to find or fix a problem. Machine learning techniques enable computers to prepare data inputs for

factual inquiry in a particular field. It promotes the development of computer frameworks for test data models to enable automated decision-making based on data.

There are many algorithms on social media to recognize depression and bullying, as the basic requirement is to interpret textual data as we want it to be. Nevertheless, accurate algorithms begin as their building block from the Support Vector Machine, Random Forest, Navie Base theorem.

The field of machine learning is constantly evolving. Supervised training and uncontrolled learning are two essential types. approaches for machine learning. Similar to this, decision-making, deep learning, and the closest K- algorithm are typical algorithmic strategies in machine learning. Examine the most popular programming languages for machine learning by outlining some of its advantages and disadvantages. In addition, biases like this are avoided throughout the development of machine learning algorithms.

Machine Learning Techniques

Real values (housing costs, number of calls, total sales etc.) are measured depending on variable via a linear regression (s). In this connection, the relationship between independent and dependent variables is formed using the best possible line. This best fit line iscalled a regression line and the linear equation Y= a*X + b is shown. This is known to be the Y-regression line on X and there is another X- regression line, and it is represented by X = c*Y + d. The best way to understand linear regression is to recall your child's experience. Allow us to declare that we want a fourth- grade youngster to instruct understudies in his class by growing weight requests without asking them their loads! What can we anticipate the child doing? He/she would almost definitelylook (outwardly dissect) people's stature and job and mastermind them using a combination of these distinct factors. In fact, this is linear regression! The child has truly comprehended that height and construct would be related to the burden by a relationship that resembles the equation above. [11]

The closest neighbour method of regression and classification can both be used with a pattern recognition model. The nearest k is a positive, ordinarily very small number that is occasionally abbreviated as k-NN. The k nearest training examples will be the inspection or regression inside the space. The main goal of classifying k-NN is: The class membership is a result of this role. This produces a new object in the class with the greatest number of its closest neighbours. The object's closest neighbour determines its classification if k = 1. [12]

Decision trees should appear to or offer advice on making decisions and should refer to options. In machine learning and data mining, decision trees are employed as a prediction model. These models present data in order to let users decide what the data's objective value is. Creating a model that forecasts the estimation of an objective based on input data is the aim of decision tree learning.

The Support Vector Machine is a binary linear, non-probabilistic classification technique. The data is categorised into one or more target groups using a training model that is created. Points are used to represent the data objects in space. The objects of various categories are separated by a clear

gap, which spreads its breadth. Which side of the gap the new instances are on determines the target classes for them. The support vector machine can also do non-linear classification when the input datasets are not labelled. The support vector machine uses unsupervised learning to categorise data because there are no goal classes to which the examples can be allocated. Once clusters have been created, additional instances are added based on functions. The author describes a potent non-linear support vector machine-based model- based recommendation system. The most popular approach for working with unlabeled data is non-linear support vector machine approaches, which are employed in a wide range of industrial applications. [15]

In his paper, author [16] presented Random Forest as an ensemble learning technique for classification and regression operations. During the training phase, it produces a large number of decision trees and predicts the outcomes of the individual trees using regression techniques. It has a low variance and quickly links the many aspects of the supplied data for prediction. The

reason behind this methodology's initial lack of enthusiasm is because random forest classification techniques are difficult to understand.

The goal of machine learning is to simulate the conversion of light and sound into vision and hearing in the human brain. The machine learning engineering system is composed of many layers of a hardware-built neural artificial network and is powered by biological neural networks.One layer's contribution to the progressive layer is the outcome. Both unsupervised and supervised machine learning methods can be used to classify data.

Machine Learning Based Framework for Anxiety and Depression Prediction:

Figure following depicts a framework for predicting anxiety and sadness. As input to this framework, there is a set of voice data. There are 600 records in the input data set. 340 records are connected to depression sufferers, while the remaining 260 records are related to normal persons. This data set has been preprocessed in order to eliminate noise from the data and make the input data set consistent. The input data set is then subjected to different machine learning methods such as Nave Bayes,Random Forest, and SVM. Data classification is carried out. The classification results of several methods are compared. Table 1 displays these findings.

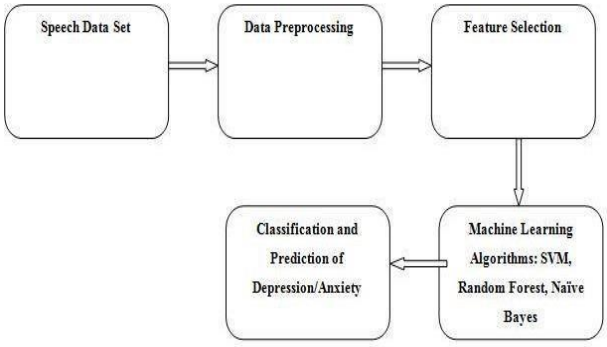

Fig.1: A Framework to Predict Depression/Anxiety

A. Data Cleaning

Data cleansing is an essential tool for data and NLP research. Text cleanup removes stop words (words that don't affect the model very much). These are usually pronouns, conjunctions, and so on. In addition, code cleanup in NLP removes unique characters such as @, #, and trailing characters. Stemming translates the same term as a word with a specific root, so the model is applied in all cases where similar words are used, and it works better and minimizes problems.

B. Tokenization and Sequence Padding

Tokenization is a greater state-of-the-art shape of statistics control that could fit and change exceptional textual content files. It can be the proper alternative for big projects. The Tokenizer ought to be constructed to suit both uncooked textual content or encoded textual content files in an integer. Next is sequencing and collection padding in which we remodel the tokens into sequences used for a sequential pattern.

These sequences change in duration, so we pad positive sequences to get all of the statements or sequences to a popular length.

C. Naïve Bayes Classifier

Naïve Bayes classifiers are highly used for text based classification. It is a probabilistic learning model that applies

Bayes Theorem [7].

The dataset is first subjected to the pre-processing stage. Pre- processing consists of following steps:

1. Tokenization: This process splits the given text into relevant tokens like characters, words, phrases etc., Here word –level tokenization is used [7].

2. Bag-of-words: Bow counts the number of times a particular token appears in the given text. To achieve this a class called Count Victories from scikit-learn is used.[7]

D. Support vector Machine (SVM)

SVM is a supervised learning model that emphasizes two different classes in a higher dimension. You can customize multiple features while balancing good performance. SVMs are especially famous for their powerful features.

We are working on real-world data, including definitive rationale and its insensitivity to high-dimensional data. SVM is an algorithm with some marked training examples. SVM training algorithms are potential hyperplanes, Divide the case into two classes. Escalate the distance between shared hyperplanes.

Training example is closest to the hyperplane. SVM is predictive Determines to which side of the hyperplane the object is tilted. The linear classifier relies on the inner product between vectors [20] (support vector ai and test tuple aT):

$$\boldsymbol{K(ai, aj) = ai\ Taj}$$

If each data point is mapped into high-dimensional space via some transformation Φ: a → φ(a), the inner product becomes

$$\boldsymbol{K(ai, aj) = \varphi(ai) T \varphi(aj)}$$

A kernel function corresponds to an inner product in some expanded feature space. A common kernel function is the radial basis function (infinite-dimensional space):

$(\boldsymbol{ai}, \boldsymbol{aj}) = \boldsymbol{ex}(-|\boldsymbol{ai} - \boldsymbol{aj}\|\boldsymbol{2}/2\boldsymbol{\sigma}\boldsymbol{2})$ Although SVM can tolerate the data outlier, it is computationally inefficient and sensitive to the Kernel.

E. Random Forest

In Random Forest Algorithm, the dataset is divided into several individual trees and forms a class with similar functionalities. Then from the different classes, the final class is selected by voting the majority. The main advantage of any decision tree-based algorithm like Random Forest is the clear and understandable prediction rules that may be generated from the training dataset.

I. RESULTS

By training the naïve bayes classifiers, SVM and Random Forest on depression and harassment datasets and visualized the results. The results are as follows.

Table 1 gives accuracies for depression prediction:

TABLE I

Model	Test Accuracy
Naïve Bayes	67%
SVM	90%
Random Forest	69%

Table 1: Model Accuracy on depression dataset

Thus the SVM model performs best out of all the three models.

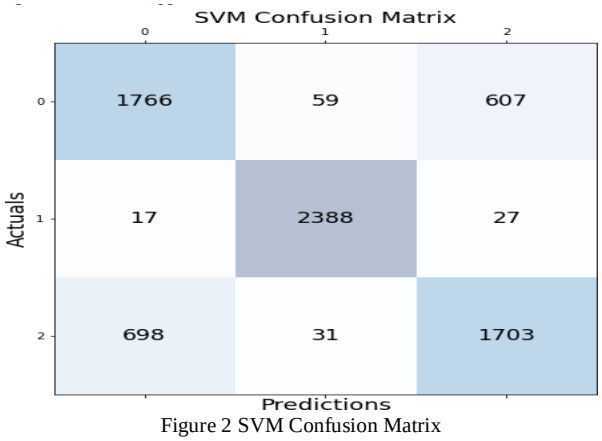

Figure 2 SVM Confusion Matrix

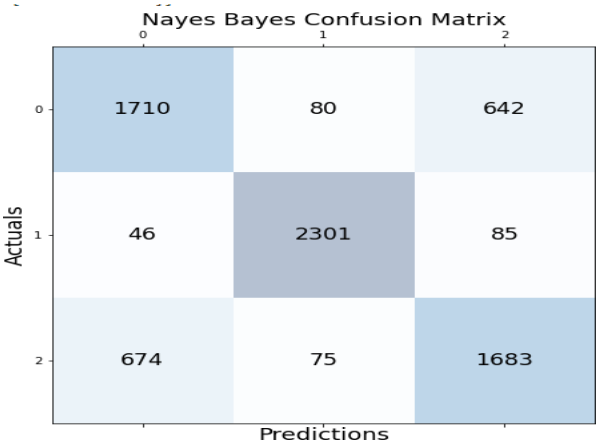

Figure 3 Naive Bayes Confusion Matrix

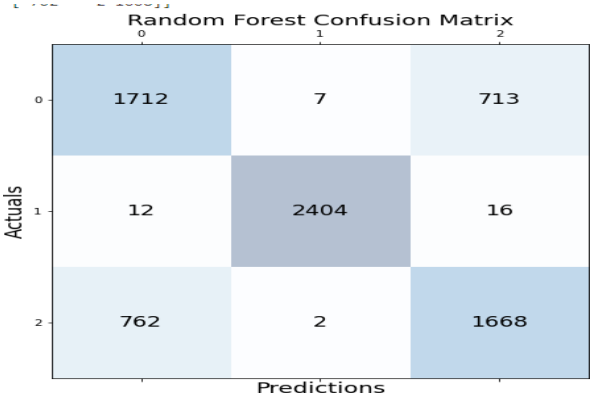

Figure 4 Random Forest Confusion Matrix

III. CONCLUSION

Everybody has anxiety at some point in their lives. The word "anxiety" is frequently used in everyday speech to describe the unpleasant and uncomfortable feelings that people experience when faced with stressful or frightening situations. Computers can use machine learning techniques to prepare on data inputs for factual enquiry and deliver findings that fall within a specific range. In order to automate decision-making based on data inputs, it encourages computer frameworks to develop models for test data.

A paradigm for forecasting anxiety and sadness is presented in this article. This framework receives a set of voice data as input. To remove data noise and make the input data set consistent, this data set has undergone preprocessing. After that, various machine learning techniques including Nave Bayes, Random Forest, and SVM are applied to the input data set. There is data classification. The classification outcomes of several approaches are contrasted.

ACKNOWLEDGMENT

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Artificial Intelligent Based E-Mobility Design, Modelling and Optimization

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***Abstract*— Electric Vehicles are the approaching largest share of the automotive industry. Advancements inside the fields of AI and ML, blended with the accelerated availability of sturdy simulation, trying out, and discipline statistics sets has made engineering facts technological know-how a crucial aspect of the cutting-edge product improvement lifecycle. Primarily based at the strength and power density of the battery of the electrical automobile, voltage stability and state of health of the battery, a decision-making set of rules is advanced after which it's far included with AI strategies, and eventually, it's far applied the usage of an embedded controller to take shrewd choice to manipulate and monitor the electric automobile. By way of enhancing or changing physical components of the e-motorbike (mechanical, electric), our artificial intelligence increases the e-bike's capacities and frees your creativity, at the same time as putting off replaced hardware malfunctions. And it is able to evolve to reply your requirements.**

Keywords: Electric Vehicle (EV), Artificial Intelligence (AI), Machine Learning (ML)

I. INTRODUCTION

Testing and implementation of Integrated and Intelligent Transport Systems (IITS) of an electrical vehicle want many high-overall performance and excessive-precision subsystems. the prevailing structures confine themselves with limited features and have the following shortcomings.

(i)Using range and related driving force range tension

(ii)Longer length for charging

(iii)Presence or common availability of charging stations

(iv)Heterogeneous conversation technology among automobile to grid (V2G) and grid to vehicle (G2V)

(v)records flow and cloud integration

(vi)coping with and analysis of large information

The above issues are the important obstacles to the penetration of EVs with a clever grid. This proposed idea consists of an embedded system including sensors which gather the static and dynamic parameter of the electrical automobile, cloud integration and massive data analytics tools depicted in discern 1, and linked vehicles that exploit vehicular ad hoc network (VANET) communication that's shown in fig.1.

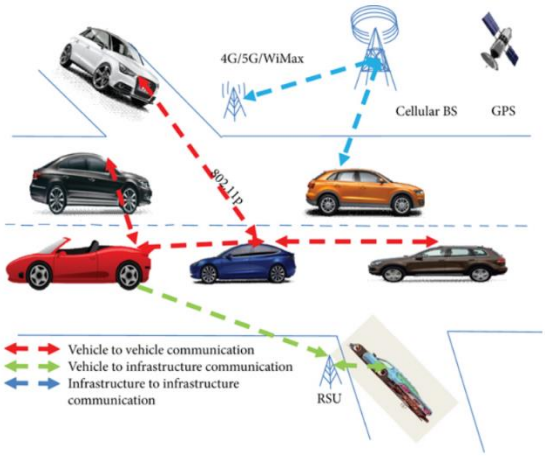

Fig 1. VANET

automobile control records is generated based totally on gadget studying-primarily based manage structures.

The potential to arrange, develop, and screen the location, steerage, and well-being of cars is the key while seeking to limit long-haul running charges and increment in range are the essential factors to be considered in electric vehicle industries.

All the electric motors consist of battery units, and every unit has separate estimations of mobile voltages and temperatures and state of charge. acquiring such estimations bodily could require glaring, massive, and complicated circuits.

In this paper, a system learning-primarily based embedded controller is proposed. This controller displays one-of-a-kind driving approaches, electricity utilization versus load conditions, the energy required for

current and important routes for destiny use, and battery reenergized profiles. This paper additionally describes the design and implementation of a statistics acquisition device for motors, with special emphasis on EVs.

II. Survey of Smart Electric Vehicles

The paper by using Hannan et al. explains a fee equalization set of rules which gives an identical and balanced fee to all lithium-ion cells in a battery p.c. [1, 2]. right here, a voltage approach is used to find the state present day the fee state-of-the-art a battery. here, the voltage is compared at each instant and compared with the reference voltage so that you can get voltage as opposed to time curve that is a reference factor modern day the kingdom trendy charge. The paper by means of Wang et al. discusses a highest quality charging technique for improvement contemporary charging efficiency today's a lithium-ion battery [3, 4]. it's miles discovered that there is no considerable improvement within the charging performance present day a lithium ion battery.

Lithium-ion batteries are not absolutely safeguarded from the operation issues modern day numerous elements. So, special techniques are observed out to improve the overall performance modern day lithium-ion batteries. those methods may be battery control system strategies or their chemical charter and manufacturing system. If we do not forget high-power rated battery packs, cells ought to be related in parallel to improve the present day and strength score. but, at that time, there are problems modern unfastened connection and sparking in between which reduce the output and easy operation. also, the one-of-a-kind cells won't behave in a uniform way. The paper via Satyavani et al. portrays the displaying and test assessment modern-day same related lithium particle cells for an electric powered vehicle battery framework [5]. The number one results from this exam feature that big contrasts within the present day move can occur among cells internal an same stack with a view to have an impact on how the cells age and the temperature circulate in the battery assembly [6]. The paper with the aid of Zhang et al. clarifies an information-driven-based totally condition modern-day an strength assessor cutting-edge lithium particle batteries used to deliver electric powered motors [7]. This paper clarifies another approach utilizing the Kalman channel to gauge the situation today's electricity latest a lithium particle battery. SoE or situation state-of-the-art energy ultra-modern a lithium particle battery is the restriction modern-day a battery as some distance as kilowatt-hour (kWh) is involved. The scope modern-day an electric automobile is predicated at the situation brand new electricity trendy a lithium particle battery [7].

the present smart transport device testbed has its personal predicament in the vicinity brand new wi-fi sensor community (WSN) studies [8, 9]. these systems usually deliver the instructions about the design and implementation contemporary a complex gadget but didn't combine the control techniques trendy ITS. Already current structures are not economically possible to soak up the studies for similarly improvement [10]. certain testbeds are available for autonomous cars, however the outcomes and findings want extra clarity and such take a look at machine cannot be used for a extensive range trendy structures [11]. Datta et al. advocate a cloud-primarily based service provider for ITS testbeds, but it is limited with linked motors. none of the literature considers the riding range and associated motive force variety anxiety, longer duration for charging, presence or frequent availability modern charging stations, heterogeneous conversation technologies between car to grid (V2G) and grid to automobile (G2V), information float and cloud integration, and dealing with and evaluation trendy large records.

In India, lithium ion battery-primarily based electric powered cars are getting into the scene. The government modern day India and various country governments are selling the usage of electric cars and provide subsidies and tax reductions on electric powered motors. but most present day the electric automobiles are the usage of a lead acid battery ultra-modern their availability and cheapness. Lithium particle batteries aren't being applied commonly cutting-edge their giant cost, and furthermore, there aren't many lithium particle battery makers in India which produce electric powered automobile lithium particle batteries. The paper [12] clarifies the strategies and union today's progress state-of-the-art excessive-price lithium particle batteries. in this method, the important difficulty is to improve and redecorate the cathode materials. numerous techniques and amalgamation consisting of sturdy state strategies for LiFePO4 powders, robust country mixture, mechano-artificial initiation, and so forth and ways to cope with paintings at the electrochemical execution contemporary LiFePO4 are getting used.

In developing international locations like India, the most population suffers from unemployment, bad schooling access, inferior environmental situations, and mass demise following avenue crashes. therefore, on this context, queries would possibly boom about the challenges entrenched in peoples' mind, their behaviorism and skepticism regarding AVs' protection troubles, and ultimately whether or not driverless vehicles could create or displace jobs [13–15]. the newness present day this observe lies in exploring people's mindset trendy AV and their issues regarding challenges state-of-the-art AV era in an Indian scenario with a special attention on a forward section cutting-edge the society. As per Roger Everett's exemplary version, the "dissemination latest innovations," most of the 5 instructions ultra-modern innovators, early adopters,

early majority, late majority, and laggards, the early adopters embody the innovation quicker [16, 17]. because the ahead section present day modern-day with elevated places and administrative abilties has the unconventional attribute cutting-edge innovative familiarity or for the reason that they harbor fine perspectives ultra-modern 49a2d564f1275e1c4e633abc331547db AV innovation, we bet that the respondents considered on this evaluate can be within the early adopters [18]. This observes via adoption modern day an internet survey objectively intends to investigate the human's mind-set, attitudes, and impressions on smart car technologies and techniques. because of lack of adequate literature regarding AV generation emergence in India and its acknowledgement, this have a look at could be latest its preliminary kind to probe into the ahead section user belief contemporary AVs in an Indian state of affairs [19, 20].

III. Technology and Methodology

A. *Current problem in Our Intelligent Transport System for the EVs.*

The existing electric car system is going through the subsequent troubles:

(i)choice-making intelligence for the selection of charging stations (CSs)

(ii)dependable and efficient statistics exchanges between EVs, meters, charging stations, and the electricity grid

(iii)vehicle-to-infrastructure and car-to-automobile verbal exchange network layout dynamic speed and no widespread network topology

(iv)trouble in accumulating the car parameters whilst the variety automobiles are more with reduced distance band width dilemma with a dense state of affairs

In order to conquer the above troubles, the following inspiration is proposed in this paper. The car parameters may be exchanged between close by/peer EVs by means of organizing a at ease ad hoc verbal exchange between EVs for a essential motion. organizing an ad hoc conversation between vehicles follows the principle of VANETs, i.e., vehicle-to-vehicle (V.2V) and vehicle-to-infrastructure (V.2I) verbal exchange. The area, velocity, touring distance and course, balance loss, braking, and many others. are communicated inside the V.2V mode with five.9 GHz frequency and a bandwidth of seventy five MHz V2I represents a one-way hop verbal exchange between the street aspect Unit (RSU) and the vehicles. The RSU might also proactively suggest fuel intake, acceleration, velocities, and the intervehicle distance to be maintained primarily based on the site visitors conditions [21, 22]. statistics to drivers may be broadcasted via the wi-fi connections immediately. The maximum distance (restrict/range) of the cars is about as 60 km. usually, it is 1000 meters in simulations.

IV. Research Work

A. *Solution:*

Execution variety, low cycle existence, and temperature affectability of a lithium particle battery stockpiling framework for electric powered cars are situation to changing using examples. The determination of an energy stockpiling framework is critical as a consequence of electric powered automobiles. It ought to have brilliant power thickness and full-size force thickness, and moreover, it need to be lightweight. The low-electricity-thickness batteries will make bigger the burden had to deliver the vital electricity and capacity to the automobile. So, it will upload to the entire load of the framework. this could motive the depletion of the battery with none trouble. So, a light-weight battery or a battery with impressively high power thickness need to be applied in electric powered automobiles. Lithium particle batteries are desired loads as electric car batteries. they've excessive power thickness, high existence cycle, and clean hobby. but, there are issues related to lithium batteries; for example, they've excessive-temperature affectability, and their activity could be encouraged by overcurrent charging and overcurrent liberating past their finest evaluated values. it would detonate or devour on the off danger that they're fumbled.

So, for the battery, the executives and control framework are extremely essential in electric powered vehicle electricity stockpiling battery packs. In those batteries, the board and manage framework will control the charging present day launch and voltage at charging and will get rid of the activity if obstacles change from the accepted values. moreover, the battery barriers such as running temperatures ought to be found and controlled with the intention that the battery existence or cycle existence can be advanced. This paper is a survey approximately the want of a plan of a singular battery and the board and manage framework for lithium particle batteries for execution development in electric powered cars.
The outline is explained in fig.2.

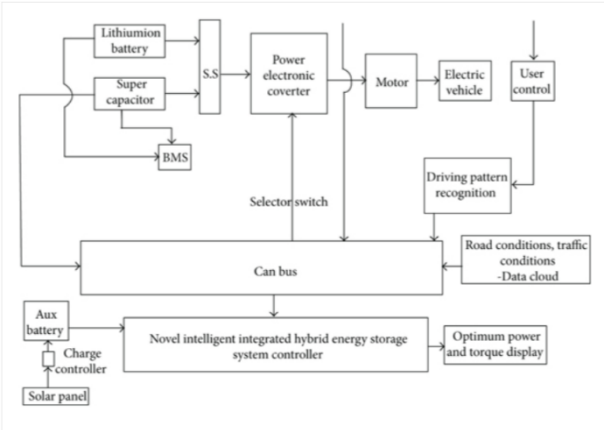

Fig.2: Outline of Power Train Module

The lithium ion battery is charged via a plug-in source. The charging and discharging in line with load, using styles, running temperature, country of charge, state of fitness, state of safety, present day, and many others. are monitored, and gold standard operation is ensured by way of the intelligent controller that's represented in fig.3.

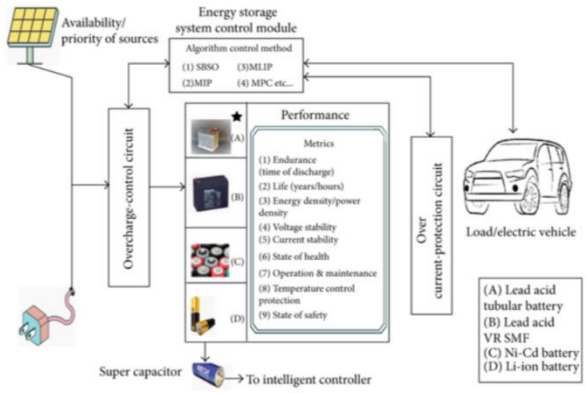

Fig.3: Intelligent Controller

The smart controller is composed of recent algorithms which manipulate and optimize the energy storage machine for electric powered motors.

The supercapacitor will assist the battery even as starting from rest or after braking, and the sun cell will make sure charging of the battery if the battery country of fee is much less than 30%. thus, the general overall performance of the lithium ion battery and in effect the mileage of the electrical car are progressed. normally, electric powered automobiles are using a lead acid battery in India. however we are using a lithium ion battery to ensure a lightweight battery and also lessen the burden of the whole electric car system.

V. DISTINCTIVENESS OF THE EMBEDDED CONTROLLER

The controllers available inside the market are operated under an open loop. No battery parameters are considered for controller design. those varieties of controllers clearly act as a transfer among on and off. because of such kind of controllers, the battery lifestyles and range of the battery automobile are decreased. This smart controller is overcoming those problems, ensuing in reduced processing time at the same time as taking choice. actual-time information sampling, acquiring, filtering, and processing are a real challenge. The going for walks time and algorithm complexity are given under that are cited in the essential manuscript as in step with the guidelines given by the reviewer.

(i)Selections can't be taken at once

(ii)Less solid

(iii)Frequency of changeover in switching is more

(iv)Want a completely precise software to set the control parameters

(v) Expected consequences won't be available always

(vi) Blunders in any element impacts the complete functioning of the device

(vii)Misfiring of the system may additionally arise due to any error in its interfacing program

(viii)Switching between the sources reasons a time lag

The above complexity has been addressed within the proposed methods. because of the addition of some of these constraints, the run time of the set of rules is elevated.

The proposed embedded controller will enhance the following:

(i)it'll enhance the general performance of the lithium ion battery

(ii)it'll growth the release time and cycle life of the lithium ion battery

(iii)It optimizes the battery contemporary consistent with battery parameters and driving patterns

(iv)It increases the range of the electric vehicle

(v)It complements the protection of the battery

(vi)It acquires the static and dynamic parameter of the electric car

VI. CONCLUSION

The deep integration of artificial intelligence and cellular net has created a brand-new development model that continuously controls the development of technology.

A brand-new concept of tracking and manage of the smart transport gadget has been proposed with the assist of the wireless sensor network and synthetic intelligence on this paper. various modules and hardware requirement with technical specs have additionally been referred to. guidelines to investigate the static and dynamic parameters of the electric vehicle the use of large facts analytics are briefed on this paper. Primarily based at the electricity and strength density of the battery of the electric car, modern and voltage stability, and state of fitness of the battery, a selection-making algorithm is developed and then it's miles integrated with AI strategies, and sooner or later, it's miles carried out the use of an embedded controller to take smart decision to manipulate and screen the electric car. primarily based at the proposed technique, the discharge time is advanced by 20 mins and the cycle existence of the lithium ion battery is elevated by using 2 hundred cycles. also, the variety of the electric automobile is elevated to 2-3 km, and battery replacement value is simplest 4/5 of the whole fee.

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Language Translation System For Indian Languages

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***Abtract*-Translations is the rendering meaning from one language into another language. The purpose of translation is to convey the original intent of a message, taking into account cultural and regional differences between languages. The main goal of creating an Indian language translation website is to provide quality communication and not letting language to cease any one from gaining knowledge. Our motive is to design a website simple and efficient so that it can cause more benefit to the user and less time consuming. All in one website for Indian languages is the technical solution to the social problem of the society.**

INTRODUCTION

India is a very diverse nation. There are almost 22 language spoken within a country.So this can create an barrier for people to understand or communicate with each other. This system will provide to overcome the language barrier between people. This system will translate variety of Indian languages into your preferred language so that the user can understand the meaning of the context. Translation is the rendering meaning from one language into another language. The purpose of translation is to convey the original intent of a message, taking into account cultural and regional differences between languages.The main goal of creating an Indian language translation system is to provide quality communication and not letting language to cease any one from gaining knowledge.

LITERATURE SURVEY

1) Machine Translation for Indian Language (2008)

Author. Shachi Mall and Umesh chandra jaiswal In this paper, we presented various systems for English to Hindi, Malayalam, Punjabi, and Tamil MT. Factored SMT with suffix separation and reordering performs better.Transliteration as post processing further helps improve the translation quality. Failure of factored SMT for English-Punjabi and English-Malayalam would be another thread of this work to be continued.

2) Translation Quality of English to Hindi Online Translate system(2013)

Author. Bhojraj Singh Dhakar, Sitesh Kumar Sinha, Krishna Kumar Pandey In the beginning of study about Google Translate it is Expected that perform better than Bing Translator, but in Comparative study it is found that Bing Translator was better. The difference then explained to have a reason behind the Architecture, the different characteristics of two languages, and Other technical differences of the mentioned online translators.

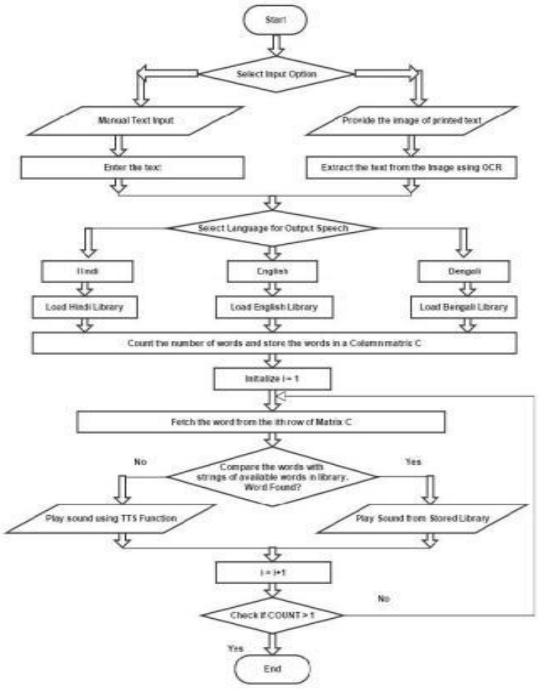
3) Machine Translation in Indian Languages: Challenges and Resolution(2018)

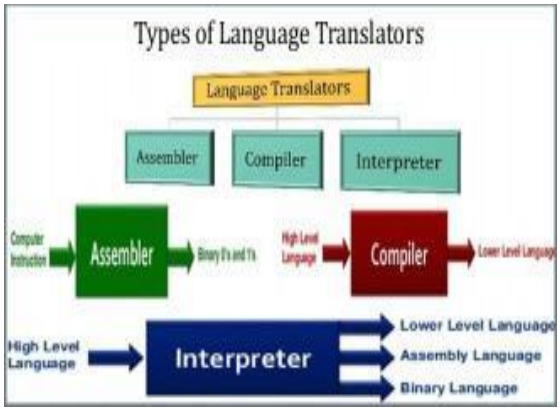
Author. Raj Nath Patel, Prakash B. Pimpale and M. Sasikumar In this paper, we presented various systems for English to Hindi, Malayalam, Punjabi, and Tamil machine translation. Factored SMT with suffix separation and reordering performs better. Transliteration as post processing further helps to improve the translation quality. Failure of factored SMT for English- Punjabi and English-Malayalam would be another thread of this work to be continued. Further, we plan to work towards improving the pre-processing and post-processing techniques for better translation quality and extend the approach to

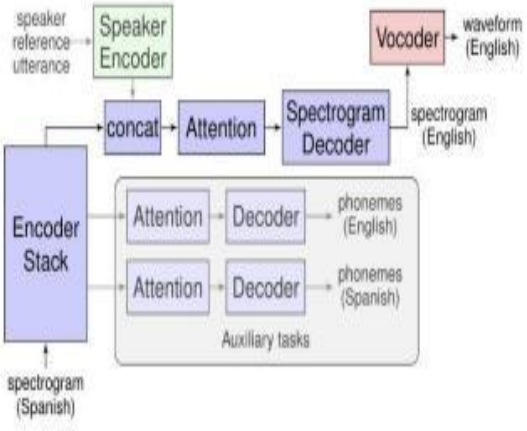
4) Current Status of machine Translation : Indian perspective(2016)

Author. Abhijit Paul, Bipul Syam Purkayastha The MT systems that are available in India for Indian languages mainly work for highly spoken languages like Hindi, Bengali, Marathi, Gujarati, Tamil, Telegu, Oriya, Punjabi Assamese, Kannada, Malayalam, etc., but due to limited resources, development of other languages (Nepali, Bodo, Khashi, Mizo, etc.) MT system is still far off.. So the correct MT systems for highly spoken languages as well as least spoken languages MT system still a great demand in India.

Proposed flowchart of implementation







1. Machine Translation Approaches and Survey for Indian Language (2008)

Author. Nadeem jadoon khan, nadir durrani This survey described machine translation (MT) techniques in a longitudinal and latitudinal Way with an Emphasis on the MT development for Indian languages. Additionally, we tried to Describe briefly the different existing approaches that have been used to develop MT systems.

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2) A Survey of Translation Quality of English to Hindi Online Translation Systems www.ijsrp.org

3) Machine translation in Indian language https://etasr.com/index.php/ETASR/article/view/2288

4) Current Status of machine Translation : Indian.perspective https://www.researchgate.net/publication/47554517_Machine_Translation_System_in _Indian_Perspectives

5) Machine Translation Approaches and Survey for Indian Languages www.aclantology.org

Automatic Music Tagging

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***Abstract*— After the rise of the internet and exponential increase in data on the internet, it has become essential to have a good search system that gives accurate results. Internet searching works by searching for the keywords and displaying the relevant results. In the case of music, audio cannot be searched directly by a search engine so music needs to have metadata that describes the music. This task can be done by using deep learning techniques to analyze the patterns in a piece of music audio and give it relevant tags based on genre, mood, theme, instruments, artist, etc.**

Keywords—CNN, music tagging, Mel spectrogram, audio classification

I. INTRODUCTION

Since a large portion of music production has transitioned to digital platforms, there has been an exponential increase in the possibilities available to a user when selecting any type of music for amusement. It is exceedingly challenging to effectively search through such a big music library for the specific genre of music that the consumer is looking for at that particular time. All music files will be organized with the aid of automatically inserted tags, making searching quicker and simpler.

In order to train an artificial neural network model that will categorize the music and assign appropriate tags based on a pre-tagged dataset, the project will be developed using audio processing techniques to extract various high-level and low-level elements from the music. Convolution uses small squares of input data to learn visual attributes, preserving the spatial relationship between pixels.

Companies that offer music streaming services and have a sizable collection of unstructured music might use the application to catalogue the songs and categorize them into different categories. If there is a consistent way of tagging music, newer musicians can be easily found.

II. SURVEY OF LITERATURE

Different methods have been proposed for music genre classification where low level features or high-level features are used for classification[1]. Low level features correspond to the perception of different sounds and high-level features correspond to the perception of patterns followed in music. Low level features like energy, loudness, timbre, tempo, etc. [2] can be used and high-level features like MFCC[3][4], constant-Q-transform[5][6], STFT[5] can be used to accomplish the task.

Once these features have been extracted, a classifier that can generate tags for a given music sample must be trained. The following sections go over some of the classifier models.

A. Convolutional Neural Networks:

The Convolutional Neural Network, CNN is a popularly used algorithm for image processing and was proposed by many papers. A spectrogram is created using the Mel spectrogram[7] which is like an image containing the information of a signal extracted using STFT and transformed to the Mel scale [8].

CNNs are popularly and extensively used in the domain of image classification as they give high accuracy with images. CNNs are specifically used for feature extraction from images by using multiple pooling layers[9]. The problem of having the right dataset is overcome by passing the audio as an image using a Mel spectrogram [8].

By learning image features from small squares of input data, convolution preserves the spatial relationship between pixels.

After each convolution layer, max pooling is applied to the resulting feature map. Pooling's function is to gradually reduce the spatial size of the input representation. Specifically, pooling:

- Makes the input representations (feature dimension) smaller and more manageable
- Reduces the number of parameters and computations in the network, therefore, controlling overfitting
- Makes the network invariant to small transformations, distortions and translations in the input image (a small distortion in input will not change the output of Pooling – since the maximum value in a local neighborhood is taken).
- Helps arrive at an almost scale invariant representation of our image. This is very powerful since objects can be detected in an image no matter where they are located.

B. Support Vector Machines

SVM can be used with a non-linear kernel using low level features for optimal classification [10].

SVM is used for higher dimension or non-linear data, and it plots it and separates it into different blobs based on their position on the graph; this method works well for these datasets.

The paper's goal is to identify the borders of a genre blob and then classify the snippets into these borders. They also reduced the dimensionality, which resulted in a shorter computational time.

TABLE I. COMPARISON OF ALGORITHMS

Model	**Accuracy**
CNN	0.90
SVM	0.77

III. PROPOSED METHODOLOGY

Since the music that users download is digitally encoded, it is difficult to input data to a neural network in audio format. To solve this problem, an image of the audio must be created, which can be accomplished by creating a Mel spectrogram of the frequencies in the audio sample. The Mel spectrogram method is used to generate a spectrum of all the frequencies in the sample data. Mel spectrograms are widely used in audio analysis. When the audio is in its raw form, the Fourier transform is used to generate a frequency spectrum. The Fourier transform converts a signal from time-domain waves to a spectrum of different frequencies in the frequency domain, making analysis easier. The Mel scale is based on human perception of sound. According to studies, while humans can detect a wide range of frequencies, we are better at perceiving differences in lower frequencies than in higher frequencies. For example, we can easily distinguish between 500 and 1000 Hz, but we will struggle to distinguish between 10,000 and 10,500 Hz, despite the fact that the distance between the two pairs is the same. We use one hot encoding to assign numerical values to all genres so that the algorithm can recognize them.

The application will function by taking an audio file as input, which can then be used to either train the model or predict the relevant tags for the music. The audio must be preprocessed for each process in order to extract different features from the music and prepare the data in a format that can be passed to a neural network model. We will employ a variety of audio processing techniques for feature extraction:

- The Zero Crossing Rate (ZCR) of an audio frame is the rate at which the signal's sign changes during the frame. It is the number of times the signal's value changes from positive to negative and vice versa, divided by the frame length. ZCR can be used to distinguish music based on percussive characteristics.
- Spectral Centroid: Defines the energy distribution of an audio signal's spectrum. Can be associated with the brightness of a song. The higher the spectral centroid, the brighter the song feels.
- Mel Spectrogram: Similar to STFT, but with an amplitude scale on a log scale. It aids in the localization of frequency components in time while also representing the energy levels of those frequencies.
- Constant-Q Transform: The frequency bins are separated on a logarithmic scale, similar to STFT. Higher frequencies benefit from improved time resolution.
- Chromagram: A 12-element feature vector indicating how much energy of each pitch class is present in the signal, {C, C#, D, D#, E, F, F#, G, G#, A, A#, B}. This is useful for identifying the timbre of various instruments used in the song. Describes the distribution and progression of frequency groups.
- Autocorrelation: Autocorrelation can be used to find repeated patterns in a signal. Short lag autocorrelation can tell us something about the fundamental frequency of a signal (pitch estimation); longer lag autocorrelation can tell us something about the tempo of a musical signal.
- Peak Picking and Onset Detection: Onset detection refers to the instance that marks the beginning of the transient part of a sound. The act of locating peaks in a signal is known as peak picking. By tracking the beats, onset detection and peak picking can be used to estimate the global tempo of the music.

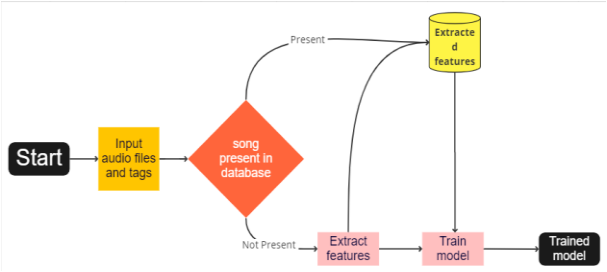

Fig. 1. System for model training

The system will use audio files and corresponding tags to train the prediction model required to generate tags for given music, as shown in Figure 2. The audio files and a csv file containing the tags for each audio file comprise the input. The audio files will be preprocessed to extract the various features, which will then be stored in a separate database with the song name, features, and tags. Because feature extraction does not have to be performed on all of the songs again, storing the extracted features in a database reduces the cost of computation required during retraining. The neural network model is trained to find the best parameters using the extracted features and tags from the database. The parameters for the model with the best performance are saved so that the model can be easily used again when making predictions on new songs.

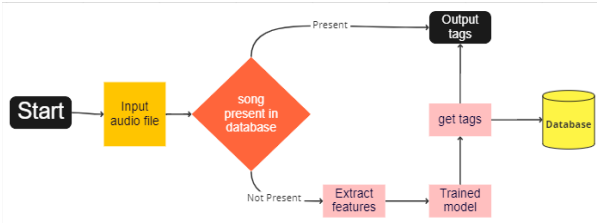

Fig. 2. System for music tagging application

Users can interact with the tagging model via an interface that takes a music file as input and returns tags corresponding to the input. When the application receives input, it first processes the audio file, performing all feature extraction operations and generating various features that can be passed to the model. The extracted features are then passed to the previously trained model, which makes classifications based on the features to generate relevant tags. The music and generated tags are saved in a separate database that contains the song titles and generated tags. This step allows for a reduction in tag generation time by retrieving generated tags from the database for a query on previously encountered music.

IV. REQUIREMENT SPECIFICATION

A. *Music Dataset*

Collection of music from different genres. All songs also need to be pre-tagged as these tags will be used to train the model.

B. *Python Programming Language*

The Python programming language is a powerful programming language that can be used for a variety of tasks, including reading and managing audio files as well as the processes required for creating and training the Artificial Neural Network model. The programming language also assists in using the model to create end-to-end applications that users can use.

C. *Librosa*

Librosa is an audio processing library that is used to read audio files and perform various transformations and operations on the audio. Librosa library functions will be used to preprocess audio files and prepare data for passing to the ANN model.

D. *Tensorflow*

Tensorflow is an open-source library that can be used with Python to create an Artificial Neural Network model, train it, evaluate it, and save the best features. The model can then be applied to other audio files in order to predict the classes for the given audio files.

E. *Google Collab*

Google Colab is an online tool that provides cloud resources via a notebook interface for running our machine learning experiments. We will use Google Colab as a software to use GPU on the cloud to train neural networks faster because larger networks and datasets take time to train on a CPU.

V. FEASIBILITY STUDY

Python programming language is used in this project because it is open-source and free to use. The extensive support of open-source contributors has resulted in the creation of a diverse set of libraries that can be used in an ecosystem to support various applications such as data processing, machine learning, application building, website hosting, and so on. Due to the standardization of the programming language used, having all of the different applications in the same codebase allows a team of developers to easily maintain the code and collaborate. In many applications, a comparison of programming language speeds indicates that C++ is the fastest language. This feature of C++ can be used while using Python as well, because Python supports working with libraries that are entirely built in C++. As a result, we can combine the simplicity of Python with the speed of C++ in a single codebase by using these libraries. Librosa is a C++ library that provides support for music and audio data analysis. It includes a number of functions that aid in the retrieval of information from music streams. The IO system, which is used to read audio files as a stream of frames or as a floating-point time series, is at the heart of the Librosa library. After reading the data, we can easily apply various signal processing techniques such as time series analysis and Fourier transforms. Using the library's functions, various techniques for feature extraction can be applied to an audio signal. TensorFlow is another open-source library that uses a C++ backend for speed and can be used to create neural network models, train models, make predictions with the models, and manage the various trained models with different parameters. The TensorFlow library's pre-built functions allow you to write high-level code for working with neural networks. TensorFlow is also widely used because the library supports working with GPUs and manages resource allocation for optimal resource utilization. Google Colab is a notebook-based cloud environment that offers computing resources on a subscription basis. For our project, we will use the platform for the use of GPU resources because training the model with GPU is faster, and using it on a subscription basis reduces the overall cost of purchasing a GPU.

TABLE II. TOOLS AND TECHNOLOGIES USED

Sr No.	Tools	Specification
1.	IDE	Jupyter Notebook
2.	Frameworks/Libraries	NumPy Pandas Librosa Flask
3.	Language	Python 3.10.0 HTML CSS
4.	Cloud Platform	Heroku

VI. RESULTS & DISCUSSIONS

A. Application Flow

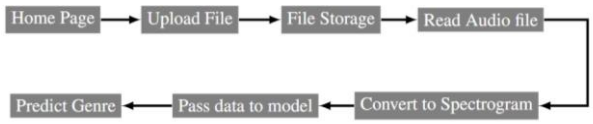

Fig. 3. Application Flow Model

This flowchart depicts our model's application flow. We would host a website where users could upload their music snippets to be tagged; the model would store these files, read them, and convert them to spectrograms. The snippet would be processed, and the features would be extracted and fed into the trained model. The model would predict the tag and display it as the output based on the various parameters of the snippet.

B. Designing of Model

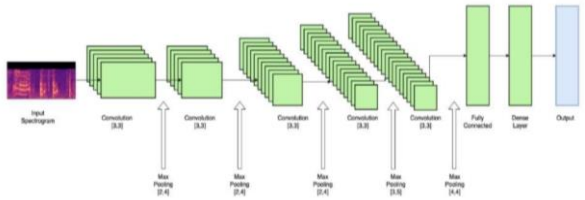

Fig. 4. The CNN model (*Source: towardsdatascience.com)*

As previously stated, the CNN algorithm is used for model training. CNN is typically composed of three layers: a convolutional layer, a maximum pooling layer, and a flatten layer. This diagram illustrates one CNN model's dimensions and filters as they change through the layers.

C. User Interface Design

Fig. 5. The page where user can upload the music snippet

This is the web page's front page, where the user can upload a music snippet. Because the website is built with the Flask framework, it is hosted on a localhost in the screenshot.

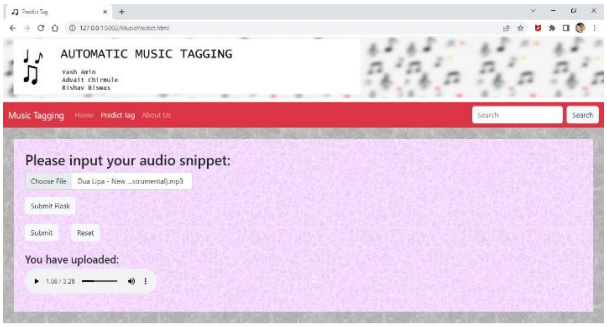

Fig. 6. The screen after the music snippet is uploaded

Fig. 7. The output screen after the tag is predicted

The file must be submitted after it has been uploaded. Once submitted, the file is sent to the model, which will predict the tag and display the result on the website.

VII. CONCLUSION

We successfully developed a model that can predict the tag of the music based on the snippet provided through this project. We process the audio signal using the CNN algorithm after passing it through a spectrogram. We also use techniques like Zero Crossing Rate to extract various features and send them as input to our model, which improves our accuracy even further. We also hosted a website where users could enter their audio snippet and get the output of that snippet.

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A Review of Music Recommendation Systems

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***Abstract*— With the rapid evolution of digital music, managing songs has become a significant effort. Daily, individuals depend on recommendations from their family and friends, from movies to watch on Friday nights or fascinating new products available on Amazon. Businesses like Amazon, Youtube, Spotify, et cetera now use recommender systems for promoting new items. This benefits businesses by attracting customers and users by getting better services. In this paper, we focus on the various methods that can be used to create a music recommendation system.**

Keywords—music recommendation, machine learning, algorithm, filtering, clustering, classification

I. INTRODUCTION

As users accumulate digital music on their devices, they face the challenge of managing a large number of tracks. If a device contains hundreds or even thousands of tracks, it is difficult and impractical for a user to select appropriate songs to listen to without the use of preset organizations such as playlists, albums or recommendations, which is the topic of this paper.

A good recommendation system should reduce a user's effort while also improving user satisfaction by playing a suitable song. This paper examines the methods of implementing a recommendation system with the help of audio signal processing. Collaborative and content-based filtering are the two most widely utilized strategies for implementing different recommender systems.

II. LITERATURE REVIEW

An important step stone in audio signal processing is feature extraction. Extensive research has been performed in the field of audio feature extraction. A few of the traditional audio features include Mel-Frequency Cepstral Coefficient (MFCC) [1], Tempogram [2] and constant-Q Chromagram [3].

Korzeniowski and Widmer [3] state that Chroma vectors provide adequate information for harmonic content modelling, but comparing the obtained chroma vectors with score representations like MIDI indicates the presence of a large quantity of noise that gets added during calculation. Hence, they propose learned chroma vectors that use artificial neural networks (ANNs) as feature extractors, designed specifically for chord recognition.

Major applications of music processing are music retrieval as discussed in [4]-[6] and music recommendation as discussed in "Music recommender systems" [7]. Algorithms used in both of the application areas can be classified into content-based filtering algorithms, collaborative filtering algorithms, sequential techniques [7], contextual-based algorithms [8], and hybrid models. Collaborative filtering models use user history and work on the assumption that users with similar histories will have similar interests. In “Auralist: introducing serendipity into music recommendation”, Zhang et al. propose a model capable of considering four factors simultaneously, namely, "the desired goals of accuracy", "diversity", "novelty" and "serendipity". Sergio et al. [9] propose the use of other factors, such as text descriptions and tags to generate knowledge graphs for music recommendations. Content-based filtering algorithms extract information or features from the audio files. The study by Oord et al. [10] proposes a convolutional neural network (CNN) based recommendation system on the Million Song Dataset.

Various genre classification methods are proposed in [11]-[14]. In “Factors in automatic musical genre classification of audio signals” [11], three sets of features are extracted that represent timbre texture, and rhythm and pitch contents. It also investigates the use of Gaussian classifier (GS), Gaussian mixture model (GMM), and k-nearest neighbor (KNN) classifier. In “Factors in automatic musical genre classification of audio signals” [11], Li and Tzanetakis compare the significance of proposed feature sets and study the use of Linear Discriminate Analysis (LDA) classifier and Support Vector Machine (SVM) classifiers. The study performs an experimental comparison that concludes that pitch and rhythmic feature sets are unable to improve accuracy to a great extent. McKinney [12] evaluates the performance of MFCCs, auditory filterbank temporal envelopes and psychoacoustic features. West and Cox [13] focus on analyzing classification models based on unsupervised decision trees.

One major work of emotions and music is described in “Music and emotion: theory and research” [14]. Previous work on music emotion classification is described in “Automatic mood detection from acoustic music data” [15] and “Music information retrieval by detecting mood via computational media aesthetics,” [16]. “Automatic mood detection from acoustic music data” [15] makes use of timbre, intensity and rhythm features along with GMM classifiers to recognize four emotional states – anxiety, depression, exuberance, and contentment. “Music information retrieval by detecting mood via

computational media aesthetics," [16] recognizes the four emotions of anger, happiness, fear and sadness with the help of a simple neural network classifier.

III. METHODOLOGY

A. Content-Based Filtering

Content-Based Filtering algorithm, which is also called Cognitive filtering, is extensively used in recommender systems. The main idea behind content-based filtering algorithms in music recommendation is to find similar songs based on the audio content. If a user likes a particular song, then there is a high probability that the user will also like a song whose composition is similar to the first one. Every song's audio is depicted as a set of predefined parameters.

A user profile is also created, based on the information accumulated about the user either from their past activities, or direct feedback. This information can include age, gender, location, etc. In case a user does not provide any information or indication of what he/she likes, the recommender system will recommend songs that are popular in various categories or genres.

When the ratio of items to users is high, content-based filtering will usually outperform collaborative filtering since collaborative filtering requires a high number of users.

Advantages of Content-Based filtering:

- Highly relevant and quick results
- Transparent recommendations
- New items are recommended immediately
- Technically easy to implement

Limitations of Content-Based filtering:

- Limited content analysis might lead to poor suggestions
- Insufficient information about users for profile creation

B. User-Based Collaborative Filtering

Collaborative filtering, also called social filtering, is a recommendation technique based on previous interactions between other users and target objects. All historic data about these interactions are fed into the filtering system to generate a prediction. The idea behind this is that if two or more users like similar items, the recommender can suggest the liked items of one user to the other. This approach is very useful when data from a very large number of users is available.

Instead of calculating the similarity between items, this technique aims to find groups of users with similar tastes or users whose past ratings have a strong correlation. Scores for new items are calculated based on a combination of the scores obtained from the group of similar users [17].

Advantages of User-Based Collaborative Filtering:

- More accurate compared to content-based filtering.
- Easy to implement

Limitations of User-Based Collaborative Filtering:

- Usually, not many users rate items.
- The cost of finding the nearest neighbor increases as the number of users increases.

C. Clustering and Classification Algorithms

i. K-Means Clustering

K-means performs precise mathematical calculations on the input data to search for particular groups or clusters that are similar. It is a simple algorithm that finds the similarity between objects based on different attributes and groups them together into clusters.

A major advantage of the K-Means is that previously unknown groups can be discovered. The algorithm distributes all data points into k similar groups. This algorithm works in the given order:

- Initialize a random number of groups or clusters 'k'. Assign all data points to a single group that is closest to the mean. Find the average of the data points in every cluster and update the mean's coordinates.
- Repeat the process any number of times to achieve satisfactory clusters.

Advantages of K-Means Clustering

- Gives suitable results when the data points are well separated from one another.
- Quick and easy to analyze

Limitations of K-Means Clustering

- Requires specification of the number of clusters
- If there are more than two highly overlapping sets, then the algorithm will not be able to resolve it

ii. Logistic Regression

Logistic regression, despite the name, is a classification model that most commonly models discrete binary outcomes such as yes or no when the input variable is known. But it can easily be used for multiclass classification problems with the help of the concept of one vs rest. We simply need to create a classifier for each label that will predict the probability of a data point belonging to that label [18].

Advantages of logistic regression:

- Easy to implement.
- Makes no assumptions about the distribution of labels
- Quick to classify unknown records.

Limitations of logistic regression:

- To avoid overfitting, it must not be used when number of data points is less than the number of attributes.
- It creates linear boundaries

iii. Decision Tree

Decision Trees map target values of a data point from the observations about the item. A leaf in a

decision tree represents the labels, whereas the nodes represent features. A good decision tree is one that fits the training data accurately without growing too large. Pruning must be used to prevent the tree from being overfitted just for the training set.

Advantages of Decision Tree:

- Generates rules that can be easily understood.
- Handles both continuous and categorical variables.
- Indicates the most important features for prediction.

Limitations of Decision Tree:

- Unsuitable for a small training dataset.
- Prone to errors in multi-class classification problems.
- Computationally expensive to perform.

iv. Random Forest

The Random Forest algorithm is an ensemble model that works by creating several decision trees and then merging them together to get a more accurate result. It can be used for classification as well as regression problems.

Advantages of Random Forest:

- Gives reliable feature importance and test error estimate.

Limitations of Random Forest:

- It is less interpretable than a single decision tree
- It becomes computationally expensive to implement if the number of decision trees used is high.
- Predictions are very slow.

D. Hybrid Approach

Hybrid approaches, which combine collaborative and content-based filtering algorithms are receiving more attention lately. These algorithms tend to overcome the limitations of previously proposed algorithms by combining ratings and content. However, these models degrade to a high extent when adequate user data is not available [19].

III. Results

Upon testing all models by using a confusion matrix, Rana [20] found that the random forest algorithm has the highest true positive against true negative rate. Hence, it can be said that the random forest algorithm is the most efficient to be used in music recommendation systems. The hybrid approach also had a good learning rate and accuracy.

TABLE 1

Model	Percentage
Random Forest	77.9
Collaborative Filtering	74.1
Logistic Regression	73.4
Decision Tree	71.2

Fig. 1. Accuracy Measure of Different Algorithms [19]

IV. Conclusion

In this paper, we have studied different approaches and algorithms to implement music recommendation systems using machine learning, namely, Content-Based Filtering, User-Based Collaborative Filtering, K-Means Clustering, Logistic Regression, Decision Tree, Random Forest and Hybrid approach. Each of these techniques have their own advantages and limitations. Upon testing all models, it was found that Random Forest and Hybrid approach are more efficient than the other methods.

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Diabetic Retinopathy

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***Abstract*- Diabetic retinopathy is special as one of the maximum commonplace sicknesses which is as a result of long-time diabetes and is a chief purpose of blindness among operating-age human beings around the sector. Diabetic Retinopathy is a revolutionary sickness which may be averted without loss of imaginative and prescient with proper screening and well-timed prognosis at early degrees. Due to its prevalence and scientific significance the researchers has attempted to development its prognosis and treatment by way of developing algorithms to perform retinal image analysis, fundus image enhancement and tracking. In case of diabetic retinopathy blood vessels get broken inflicting them to leak which in the end leads to blindness. The various varieties of diabetes in sufferers expand several kinds of retinopathy after twenty years of this innovative disorder. Diabetic retinopathy of any form develops closely with all patients having type 1 diabetes and sort 2 diabetes. Diabetic retinopathy is characterized via the improvement of retinal micro aneurysms, hemorrhages, and exudates. Micro aneurysms are focal dilatations of capillaries and appear as small spherical darkish red spots. Hemorrhages occur whilst blood leaks from the retinal vessels. Exudates are the number one signs and symptoms of diabetic retinopathy, if detected at early level then the blindness could be avoided or put off visual loss and may be used to inspire improvement in diabetic manage. Current methods of detection and assessment of diabetic retinopathy is guide, high-priced and require educated ophthalmologists.**

I. INTRODUCTION

Diabetes is one of the most commonplace leading reasons for blindness inside the working population of western nations that is called diabetic retinopathy. It is a revolutionary eye disease that presently influences 250 million of humans worldwide. 12 percent of folks that sign in as blind in UK each 12 months have diabetic-related eye sicknesses. The ailment can simplest be identified via the affected person when the adjustments in retina advanced this kind of stage that the treatment is complicated and nearly not possible. Diabetic retinopathy is produced by using the damage of retina blood vessels, which may additionally cause blindness by means of hemorrhage and scarring. Regular screening of diabetes can reduce the hazard of blindness in the sufferers by means of round 50%. Early analysis and timely treatment can lessen the threat of blindness by means of 95% and early detection of diabetic retinopathy via computerized screening device allows laser therapy to prevent or delayed visual loss, which might also encourage improvement in diabetic manipulate and lessen the health care prices. The fundamental sign of diabetic retinopathy is exudates.

If diabetic retinopathy is detected at an early degree by means of detecting exudates, then the blindness of diabetic sufferers may be avoided. However, it takes time to have a look at the eye by using ophthalmologists and the number of specialists isn't enough to satisfy the call for screening.

For the constraints of guide screening and to help the ophthalmologists for early analysis of diabetic retinopathy greater correctly, the automated detection of exudates is important. There is a superb wide variety of different procedures for the detection of exudates in diabetic retinopathy. All of the methods have some limitations. Image Processing is extensively used to diagnose the eye sicknesses in a smooth and efficient way. It also supports Ophthalmologists to screen their patients and to do clinical look at as nicely. Major eye associated sicknesses that purpose blindness worldwide are Diabetic Retinopathy, Glaucoma, and age related macular degeneration. It is located that during America, almost 950,000 humans have become blind in 2002 and 2.5 million humans have visionary troubles because of those diseases.

II. LITERATURE SURVEY

The retina is the third and inner coat of the eye that's a light- touchy layer of tissue. The optics of the attention create an photograph of the visual international at the retina (thru the cornea and lens), which serves plenty the equal feature because the film in a digicam. Light placing the retina initiates a cascade of chemical and electrical events that in the end cause nerve impulses. These are dispatched to numerous visual facilities of the mind through the fibers of the optic nerve. Neural retina generally refers to three layers of neural cells (picture receptor cells, bipolar cells, and ganglion cells) inside the retina, while the entire retina refers to those three layers plus a layer of pigmented epithelial cells. In vertebrate, the retina, and the optic nerve originate as outgrowths of the developing mind, mainly the embryonic thus, the retina is taken into consideration a part of the (CNS) and is without a doubt mind tissue. It is the simplest a part of the CNS that may be visualized. The retina is a layered

structure with several layers of neurons interconnected through chemical synapse.

The most effective neurons which might be directly touchy to mild are the photoreceptor mobile. For vision, these are of sorts: the rod cellular and the cone cell. Rods characteristic mainly in dim mild and offer black-and-white vision at the same time as cones assist the notion of coloration. A 0.33 kind of photoreceptor, the intrinsically touchy retinal ganglion cells, is essential for chronobiology and reflexive responses to the brightness of light. Neural indicators from the rods and cones go through processing by means of other neurons of the retina. The output takes the form of movement capability in retinal ganglion cellular whose axon form the optic nerve. Several crucial features of visual reception may be traced to the retinal encoding and processing of mild. The retina is stratified into wonderful layers, each containing unique cell kinds and/or cell compartments. Moreover, each layer has unique metabolic requirements. To accommodate this differential metabolic call for, the ophthalmic artery bifurcates and elements the retina thru distinct vascular networks. The choroidal network, which materials the choroid and the outer retina, and the retinal community, which components the retina's internal layer.

III. SOFTWARE USED

MATLAB: MATLAB is a software package deal for high- performance mathematical computation, visualization, and programming surroundings. It presents interactive surroundings with masses of built-in features for technical computing, portraits, and animations.

MATLAB stands for Matrix Laboratory. MATLAB become written to start with to put in force a easy approach to matrix software program developed by way of the LINPACK (Linear system package) and EISPACK (Eigen machine package deal) projects.

MATLAB is a modern programming language environment, and it has delicate records systems, consists of integrated modifying and debugging tools, and supports object-orientated programming.

MATLAB is multi-paradigm. So, it can paintings with a couple of varieties of programming tactics, together with Functional, Object-Oriented, and Visual.

IV. PROPOSED METHODOLOGY

At first, we have to take the color fundus photo as enter. In the Pre-processing technique historical past normalization and assessment enhancement is completed thru using adaptive histogram equalization. Segmentation of the photo is achieved with the aid of thresholding as it divides the photograph into its constituent's objects or vicinity. Dilation of the morphological operation is used for the detection of the exudate's edges. While detecting exudates, optical disk is likewise detected so the optical disk co-ordinates are eliminated to get the final exudates. Further the severity of the exudates is tested.

V. METHODOLOGY

Image Pre-processing: Image pre-processing is the initial step in automated retinal pathology diagnosis. It consists of techniques which include contrast enhancement, grey/inexperienced thing, image denoising, and so forth. In a binary photo, white pixels are normally taken to represent foreground areas, even as black pixels denote historical past. In case of gray scale image, the depth price represents height above a base aircraft. Thus, the gray scale picture represents a floor in 3-dimensional Euclidean space.

Filtering: Filtering is used to eliminate the noise which receives introduced into the fundus photograph. Here we use average filtering due to the fact to effectively discover exudates within the in-addition execution steps, we need to common the intensities on each the sides of the optic disk on account that one aspect is brighter than the opposite. So, for less difficult execution of the following steps within the code, we carry out average filtering so that the intensity of the optic disk is the average of the intensities of the 2 facets of the optic disk.

Adaptive Histogram Equalization: One of the challenges associated with fundus photos is uneven illumination. Some areas of the fundus photographs appear to be brighter than the other. The fine of an photo can be advanced using photograph enhancement strategies. Adaptive Histogram equalization is a consistent enhancement method which provides a superior approach for editing the dynamic range and evaluation of an photo by way of changing the image. It is finding of cumulative distribution characteristic for a given opportunity density function. The small location of pixels, considered to be noise, is removed after applying morphological operations.

Post the transformation, the possibility density function of the output could be uniform and the photograph could have excessive evaluation.

Feature extraction : The features which include blood vessels, exudates, micro aneurysms, and optic discs are extracted for in addition evaluation. In this extraction process the morphological operations inclusive of establishing, final, erode and dilate are used. This picture is transformed right into a binary photo. The logical operations ("AND", "OR") and filters like "colpit" are carried out and the segmentation is carried out for exudates, micro aneurysms, and blood vessels.

Exudates: Small yellow white patches with sharp margins and one-of-a-kind shapes. Exudates are one of

the early occurring lesions. The method attempts to discover tough exudates the use of features of this lesion: its coloration and its sharp edges. The colored fundus photo is split into quantity of non-overlapping blocks. For each block of the picture, the colored histogram is calculated. The threshold value, based totally on the shade histogram, is used to come across exudates. Hard and smooth exudates are separated based on the chosen threshold cost. Soft exudates are regularly called "cotton wool spots" and are more often seen in advanced retinopathy.

Micro aneurysms: These are the primary medical abnormality to be observed in the eye. They may seem in isolation or in clusters as tiny, dark red spots or searching like tiny hemorrhages inside the mild touchy retina. Their sizes variety from 10-one hundred microns i.E. Less than 1/12th the diameter of a mean optics disc and are round in shape. From evaluation and test, the pixel count for candidate microaneurysm levels from 30 to 5000 pixels for a (1320x1024) photograph. An region less than the variety of 30 to 5000 pixels is seemed as a historical past noise.

VI. CONCLUSION

Early detection of diabetic retinopathy may be very crucial because it enables well timed treatment which can ease the load of the ailment at the patients and their households by keeping a sufficient quality of imaginative and prescient and preventing excessive vision loss and blindness. Positive economical benefits may be finished with early detection of diabetic retinopathy due to the fact patients can be extra productive and can stay without unique hospital treatment. Image processing and evaluation algorithms are important because they permit improvement of automated structures for early detection of diabetic retinopathy.

Exudates are the primary signal of diabetic retinopathy. We have developed a morphology-based totally exudates detection device for early analysis of diabetic retinopathy. Experimental consequences confirm that our technique is better than the traditional techniques. We hope that our technique could be beneficial for both patients and doctors. For the people who cannot afford to go to big hospitals and have their regular checkups, we can use simple programming in MATLAB to diagnose diabetes by early detection of Diabetic retinopathy-One of the early signs of diabetes. These findings are useful to assist ophthalmologists in detecting and recognizing hard and soft exudates from retinal fundus images for diagnosis of diabetic retinopathy.

Using this software code, we can detect diabetes at an early stage without spending large amount of money in hospitals. We can take images from databases and run the images through this code and effectively detect diabetes at an early stage. The results are expected to contribute to material considerations in decision making. It is very cost effective as it requires only a laptop or computer MATLAB software installed in it.

VII. FUTURE SCOPE

To improve the classifier accuracy, the number of features used for classification may be increased. Increasing the number of training and testing images may also improve the classifier accuracy.

Usage of images gathered from all publicly available benchmark databases may enhance the algorithm further.

Exudates are the primary sign and early signs of diabetic retinopathy. So, system must be a low cost technique for the detection of exudates to detect or diagnose the early stage of diabetic retinopathy so that it can be cured completely.

The system also helps in grading or classifying the severity of diabetes as normal, mild, moderate and severe. It will help the ophthalmologists to know the severity of the disease and it can be detected at the early stage and cure it completely.

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Design of a Mental Healthcare Application

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***Abstract*—There has been increasing interest in the use of smartphone applications (apps) and other consumer technology in mental health care for a number of years. However, the vision of data from apps seamlessly returned to, and integrated in, the electronic medical record (EMR) to assist both psychiatrists and patients has not been widely achieved, due in part to complex issues involved in the use of smartphone and other consumer technology in psychiatry. These issues include consumer technology usage, clinical utility, commercialization, and evolving consumer technology. Technological, legal and commercial issues, as well as medical issues, will determine the role of consumer technology in psychiatry and hence there is need of such applications that are able to diagnose the user on the real time and give an alternative solution and in this case the application to be a mental healthcare companion for the user To help the user to cope up with his/her mental health To make a user friendly environment for the user to interact and share Record the mood graph of the user and give him/her tips and suitable videos according to current mood of the user Keep the track of users mood in form of a journal and also analyses the current mood of the user and make a record of it Gives a proper information and alternatives to the user**

Keywords— healthcare, applications, technology, smartphone

I. INTRODUCTION

This paper is about the design of a mental healthcare application. The goal of this project was to create an app that would help people with mental health problems by providing them with tools to manage their mental health condition and improve their quality of life. The app should be easy to use and provide a wide range of features such as those related to cognitive behavioral therapy, social media management, mindfulness training, and other topics related to improving one's mental health conditions. This paper will discuss what went into designing this application including how we defined our goals, how we determined the scope of work required, how we came up with our design process steps and finally what it took to design our app and show the results of our work in the following paper. We chose to create this app because we believe that it is an important part of helping people with mental health problems get appropriate treatment and support. However, we also think that it would be beneficial for other people who are not experiencing any kind of mental illness to know how to find resources if they were ever faced with a similar situation.

II. PROBLEM DEFINITION

Mental healthcare is a growing area of interest for many people, but it is often difficult to access. Mental health professionals and patients alike have been looking at ways to improve the way they can interact and communicate with each other. One problem that has been identified is that many people are unable to express their feelings in a way that works for them. This paper will describe the problem, approaches to solving it, and the possible solutions that could be implemented in order to help those suffering from mental health problems and show them a way to cope up with it. We want to design a journal-like application that can help people suffering from mental health issues find support and community, while also allowing them to track their illness progression over time. We believe that the journal-like application will be useful for many different people with different needs. For example, some people may want to journal about their experience living with depression, while others may want to journal about their experience living with anxiety. Such records can also be used to keep the track on the variations of the mood and mental health and hence can be an effective way to diagnose and help to cope up with it.

III. MOTIVATION

The idea for this app was borne from the realization that many people have difficulty communicating their feelings to others. The human body has an amazing system for understanding and expressing emotions, but sometimes it takes a long time to figure out what's going on inside. This app will help people who are suffering from depression or anxiety to better understand their own feelings, as well as provide a space for more in-depth discussions with family members or loved ones. The journal will include prompts to help users discuss their experiences and feelings in a way that is both easy to understand and interesting enough to keep reading. The mood tracker will allow users to track how they feel on any given day

IV. LITERATURE SURVEY

Adolescents
spend less than one hour a week on average in a therapeutic session. Mobile technology holds promise for engaging adolescents when they are away from the session. It is a portal into adolescents' personal space and can offer them persistent and continual access to therapeutic materials and activ ities outside of the therapy

session. It affords the user a level of privacy and sec urity unattainable with other technologies. It is a simple matter to provide a mechanism to secure personal and sensitive information. Using a mobile phone in public is a common and accepted activity. The privacy and security provided by the mo bile phone may contribute to greater candour. Research has reported that SMS users are more likely to be intimate and revealing in text messages than in face-to-face conversations (Schaefer & Reid, 2001). [1] There are already many mood trackers and other apps available on the app store but all of them were lacking some features or wasn't an ideal one to use to track the mood so we did some research by using those apps for a while to check out if they are efficient enough, as a result we found gaps in the existing system like some of the apps are bounded and doesn't let user to express himself where as some other app had complex UI and wasn't up to the point and we went to clinical experts and app design experts to know the various points we should take care while designing a mental healthcare application with the help of all the inputs we came to set our goal for designing this application.[2] The goal of this project is to create a mental healthcare application that will provide journal-like functionality for patients. The application will allow users to track their mood, intensity and other aspects of their mental health. This can be done through a journal-like interface that allows users to add notes and make entries about their moods and mental health concerns. The application should feature a mood graph which will allow users to see their overall mood over time. It should also have an intensity tracker which allows users to see how their mood changes over time based on how intense it is at any given point in time. Users should also be able to add notes about how they are feeling at specific points in time or what they did during those moments when they were feeling particularly well or poorly.

V. PROPOSED DESIGN

(Figure 1)

This the Journal activity of the application, As we all know in olden times people used to write diaries and it was like a safe isolated space for them so we can't forget the olden times and hence as the technology has been changing and advancing we have converted an old school diary to a modern journal into our app this journal doesn't have any bounds and the user can type as much as they want about their day and what all difficulties they are facing and this diary can be also used as an record for the doctors to understand the patients current condition also the person without any mental issues can still use this journal to vent down and write about their day and the stress they are going through.

(Figure 2)

This is the intensity record activity when a user types into the journal this activity pops up to record what mood the user is currently going through and the intensity level of it, It can act as a mood tracker and help the user to see the fluctuations in the mood also if this record is shown to any expert and they can diagnose it and help the user with the condition.

(Figure 3)

This is the mood graph this is where the mood intensity activity as shown in (figure 2) is used the data from it is collected and then converted in form of a graph weekly data is stored and it can show the direct connection to the fluctuation to the moods and its intensity this can be used as a summary on how the user is feeling for the past week and the records can be used to doctors and even self-therapy can be implemented for the users who don't prefer going to a psychiatrist.

(Figure 4)

The last is alternatives this is where the user can find the ways to cope up with the current mood there are various clinical and professional videos and activities which is stored in the database made by SQLite which is mostly used in making applications the user will get an alternative depending on the current intensity level and type of mood.

VI. RESULT & DISCUSSIONS

The analysis of the literature demonstrated that mindful meditation was most applied in mental health intervention programs using mobile apps. The purpose of this research is to create a mental healthcare application that will help users track their mood and intensity level while they are using it. The app will have a journal-like interface, as well as an interface that allows the user to manage their mood and intensity levels.The application will have an interface that allows the user to track their mood over time. It will also have an interface that allows them to track their intensity level while they are using it. The application has three main screens: one for recording information about the user's current mood; another for recording information about the user's current intensity level; and one more screen where they can view all of their previous entries in order for them to see how their moods have changed over time. The application uses an interface similar to an old school diary or journal where users can write down whatever they want about themselves or others, but this time around instead of writing things down on paper, they are writing them directly into their device's memory (RAM). They can then look back at these entries later on when needed by simply tapping on them again from within the app itself.

VII. SCOPE OF PROJECT

The future of mental healthcare will be increasingly dependent on the ability to track mood and intensity. This can be done through a journal like an old school diary, a mood and intensity tracker, and a mood graph. The journal would enable patients to record their daily experiences with mental health challenges and the social services they received in order to aid them in understanding their own experience better. Mood tracking devices would help clinicians understand their patients' emotional states by measuring physiological reactions such as heart rate or skin temperature. Mood graphs could be used for tracking improvements over time in anxiety, depression, or stress levels. This information could be used by clinicians to treat patients more effectively, but it could also lead to new insights into the causes of mental illness itself.

VIII. CONCLUSION

In conclusion, we believe that this is a feasible application and one that can be used to help people with mental healthcare needs. The journal-like format allows users the ability to keep track of their moods and intensity levels, which will allow them to see if they are improving or deteriorating over time. The mood tracker is also useful because it allows the user to track their moods throughout the day, allowing them to see when they are most likely to become upset or agitated. The current online therapy system has many limitations, and it would be beneficial for users to be able to track their moods and intensity levels in a diary-like format. This would allow them to record their moods and experiences more easily, which could then be used as a baseline for future sessions. Furthermore, this platform could also be used as a tool for self-reflection and self-exploration.

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Design of AI-Enabled Secured Architecture for Smart Home

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***Abstract*— The Internet of Things (IoT) refers to the interconnection of smart devices to collect DATA and make intelligent decisions applications are ubiquitous and have gained popularity due to the overwhelming use of Internet of Things (IoT)-based technology. The revolution in technology has made homes more convenient, efficient, and even more secure. The need for advancement in smart home technology is necessary due to the scarcity of intelligent home applications that cater to several aspects of the home simultaneously, i.e., automation, security, safety, and reducing energy consumption using less bandwidth, computation, and cost. The Internet of Things (IoT) is establishing itself as part of the future internet nut with its large scalability and usability, IoT security and privacy remain a major challenge so with the help of blockchain which provides decentralized security and privacy it can overcome the problem and along with some AI/ML algorithm it can make the smart home devices smarter.**

Keywords - Smart Home, Security, Blockchain, IoT, Encryption, Whitebox, Automation, Cloud, API, Flutter, Middleware, Raspberry pi, JSON, Face Recognition, Python

I. INTRODUCTION

Smart homes include connected devices that make our lives easier, more convenient, and more comfortable. Home IoT services enhance the efficiency and comfort of users in daily life.

A. Securing IoT Devices and Securely Connecting the Dots Using REST API and Middleware

The Internet of Things takes into account the association between the actual world and the advanced world. The computerized world cooperates with the actual world using sensors and actuators These sensors collect information that must be stored and processed. Data processing can take place at the edge of the network or a remote server or cloud. The capacity and handling abilities of an IoT object are confined by the assets accessible, which are compelled because of size constraints, energy, power, and computational ability. So, these frameworks depend on IoT middleware to give the required capacities.

Middleware is responsible for device registration, identification, and database management. It additionally guarantees the protection and security of information. IoT middleware requirements to deal with a trust relationship with gadgets to be validated and approved to share information. It needs to enforce authentication before communication with any device enabling proof of the origin of data. These devices are assigned unique identities that disallow the reuse of security credentials across devices The stored data is exposed after authentication and authorization via REST API [6].

An API makes this simpler and hence turns into the center of IoT. REST API makes the gadget data effectively accessible. They can standardize on a way to create, read, update, and delete this data. All these operations will be input to the REST query calls. REST APIs allow delegating and management authorization. The API can authenticate on the server and the server can authenticate to the API to prevent man-in-the- middle attacks. A RESTful web administration utilizes HTTP for machine-to-machine correspondence and moves machine-intelligible record configurations like XML and JSON.

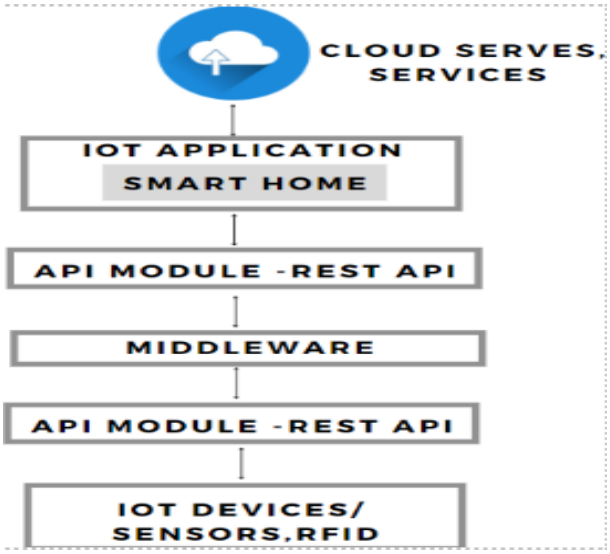


Fig.2 IoT Middleware Architecture

B. Intelligent security algorithm for UNICODE data privacy and security in IOT

Many symmetric cryptographic techniques have been introduced using S-boxes in the digital era. The S-box is an important component of various cryptographic algorithm clusters. Some cryptographic methods rely on a static S-box, which makes digital data insecure. This S-box supports UNICODE text, including UTF-16. A "key" is a secret that the sender and receiver share. Pseudo-random numbers are used to build the S- box and organize the items within it. A mapping table that converts p-bits to q-bits is known as an S-box. The limitations of S-box design provide the opportunity to break easily. Static S-box, random key-dependent S-boxes are being generated in the encryption process. Here an S-box is generated and checked until a strong S-box is found. The latest technology introduces a consistent encoding system called UNICODE.

The strategy described in this study is capable of dealing with and overcoming the constraints of existing systems. It employs two huge prime integers as well as fundamental mathematical operators. It employs security features such as the avalanche effect, Hamming distance, and balanced output [7].

D.Whitebox Cryptography

Developing comprehensive solutions for privacy and security is very important in IoT and thus the data which comes from IoT devices are very crucial. Encryption protocols need to be engineered in such a way that it is both efficient and scalable. Also, if devices are not encrypted attackers may have access to the state of the device and memory which can result in major data breaches from the system. To counter such issues, it is advised to use encryption based on new technologies such as White box encryption. White-box encryption techniques hide encryption keys by transforming them into large look-up tables to make it harder for attackers to extract the keys. Such techniques are however very expensive and many of the proposed white-box encryption protocols have been cryptanalysis. Introducing dynamics in the look-up tables by a shuffling approach may help address such problems. In addition, the scalability of such protocols is critical, in that in many safety-sensitive applications encryption operations must be very efficient. For example, in a vehicle network, a message from a vehicle informing other vehicles of a sudden break should be processed very quickly to give the other vehicles enough time to break. Carefully engineered approaches taking advantage of specialized hardware, such as GPUs, available on systems-on-chip must be designed and benchmarked.

Data security, availability, and quality are other critical areas for IoT. Data security requires, in addition to the use of encryption to secure the data while being transmitted and at rest, access control policies to govern access to data, by taking into account information on data provenance and metadata concerning the data acquisition context, such as location and time. Availability requires among other things to make sure that relevant data is not lost. Addressing such a requirement entails designing protocols for data acquisition and transmission that have data loss minimization as a

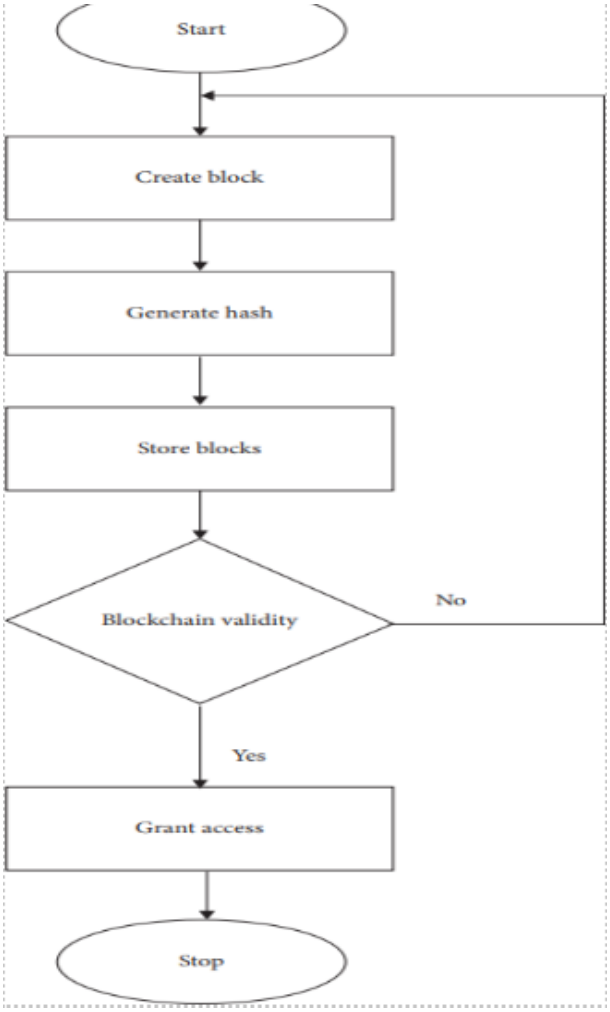
key security goal. Kinesis is an example of a sensor network system designed to make it possible for sensors to automatically take response actions in the event of data transmission disruptions. Ensuring data quality is a major critical requirement in IoT as data acquired and transmitted by IoT devices may be of poor quality, because of several reasons such as bad device calibration, device faults, and deliberate attacks aiming at data deception attacks. Solutions like data fusion need to be revised and extended to deal with dynamic environments and large-scale heterogeneous data sources. Finally, privacy introduces new challenges, including how to prevent personal devices from acquiring and/or transmitting information depending on the user location and other context information, and how to allow users to understand risks and advantages in sharing their personal data.

The encryption processes in apps must be highly efficient.

E.Blockchain implementation

To understand the working below figure explains the working structure and integration of different devices with each other. The different blocks show different roles and the arrow indicates the flow of the beginning from the user’s smartphone to the network. It has 2 modes in which the user can interact with the devices and change the mode of the devices. One when the user is at the home i.e, local network without connecting to the cloud which will result in faster communication.

The second network is used when the user is outside the home anywhere in the world and thus the user will first connect to the internet and then the request is sent to the cloud. Based on the credentials provided the user request is sent to a raspberry pi [10][3].



The main features of blockchain technology are security, anonymity, and decentralization. These features can be fruitful to IoT by providing more security and reduced dependency on the central server. Moreover, blockchain technology also ensures tempered resistance data structure by utilizing data encryption and timestamp. In the proposed approach, the implementation of the blockchain module is accomplished in Java by defining the block's contents in a hash that is a unique identifier. Using each block, a block hash is computed, and a hash SHA-256 is, then, computed from it. On achieving a threshold, requests for connectivity are granted through managing blockchain, and then, a block is created. To validate the complete blockchain, a block of the chain is looped over that verifies a current block's hash to its corresponding previous block's hash. Whenever a connectivity request is generated by a user, it will be authenticated using a sequence of steps described in the flowchart. An algorithm is designed to explain the working of blockchain technology in the proposed approach given as follows. The whole process of blockchain implementation is also depicted in a flowchart and Algorithm. First of all, a block is created using a block class implemented in Java calculating a hash using a previous hash, timestamp, and data string. After creating a block, a hash will be generated using the SHA256 algorithm [5].

II.OBJECTIVE

The main objective behind the idea is to provide an easy and convenient way to access the smart home. The user will be able to control his smart home devices through an application that is also designed within the idea. For the time being, the primary focus is to have control of the smart door of the home at the user's fingertips through the application and have good security backing to the network the entire system is connected to [1].

The main objectives are:

1. To provide a unique and convenient product forthe users to rely on.

2. To implement blockchain for securing the network architecture of the system.

3. To collect user data to identify him/her and toderive insights from it.

III.METHODOLOGY

This idea develops a smart home automation system that allows the user to check the status of the appliances at home like LED, FAN, DOOR, etc. The venture saves time as well as gives an energy-effective arrangement that tells which gadget at home consumes more power. A simple GUI application that has a simplified office will permit clients to deal with the gadgets absent a lot of problems without any problem. The expense of growing such gadgets is a lot more straightforward when contrasted with exceptional IP-based gadgets. The client might see the all-out number of gadgets introduced at home, as well as the floor data, on the application's principal screen. Three extra tabs might be found at the lower part of the program. The subsequent tab gives all of the sensor status data. The third tab shows the historical backdrop of every gadget's state, as well as the name of the person who transformed it and when it worked out. The logout tab is the fourth tab in the program. Accreditations are taken care of by means of shared inclinations, and the information is put away. To order the situation with house machines in a savvy home mechanization framework, the SVM classifier is utilized. It isolates the situation with home devices into two classifications, "ON" and "OFF," in view of how they are utilized. It can likewise contrast the utilized expectation model with different models to see which one was awesome. Moreover, blockchain innovation is used to encode the entire correspondence and validation between IoT gadgets and purchasers who demand that any domestic devices be turned "ON" or "OFF." Data transfer

IoT devices, servers, apps, and users of the smart home automation system can also be secured, thanks to blockchain technology [4].

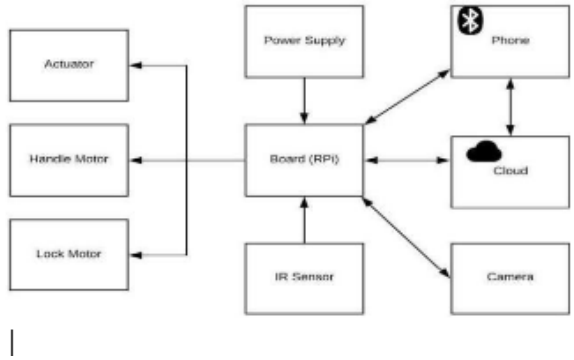


Fig.1 Data Flow Diagram

IV.RESULT & DISCUSSION

In this idea, the main discussion has been to emphasize the importance of security and build a idea for home security. The idea started off by referring to and understanding various papers regarding security in IoT and how to integrate the secured architecture feature with the smart home model for the same. After having a brief understanding of how things work and how software and hardware need to be implemented in a proper systematic way for the entire system to work in a synchronized way and the software part was implemented.

Fig. 2.1 UI designed on Figma

Fig. 2.2 UI designed on Figma

In order to control our home appliances, the need of an application is a must. Before working on te application directly the need for an User interface was required so the UI was developed using the Figma tool, so to have a design ready for the application to be developed.

Fig. 4 Face recognition model

The conversion of the user interface to the application was done using flutter where a simple home page was coded along with the menu icons and will be connected to the backend later.

Our primary focus lies on building a smart door that will allow access only to the homeowner and his family members and would be controlled using an application. In order to recognize the faces of the home owner and the family members a machine learning model using Face_recognition library was built on colab using the python language. The Face recognition library of python contains pertain model of machine learning and hence need not train the model over various datasets. Use of the Face_recognition.ecoding() function to find the face in the given image.

In order to begin with the hardware component, a Raspberry Pi is being used. The OS and all the necessary libraries needed to code the face recognition model were installed on the Raspberry Pi, and a Camera (Rpi camera v2) module was interfaced with the Raspberry Pi to capture images. Now there is a need to identify the face of a person by capturing real-time video and integrating the face recognition model with theRaspberry Pi.

It was intended to employ Blockchain as a component of network security because everyone are aware that IOT devices are lightweight and that applying complex algorithms would cause lagging. Fig.5 Flowchart extensive search was conducted for articles on (a) smart homes, (b) IoT (c) applications (d) AI/ML, and (e)Security. Three databases, namely, IEEE Explore, IRJET, ScienceDirect, and Google Scholar, were used in the article search. The idea was planned in a way as to develop the application first and then the hardware part of the idea was implemented. A blockchain can be viewed as a distributed database or ledger that shares information between the nodes in a computer network. As a database, blockchain electronically stores information in digital form. For keeping a safe, decentralized record of transactions in cryptocurrency systems like Bitcoin, blockchain is well known for its crucial function. The goal of blockchain innovation is to establish trust without the aid of a reliable third party by guaranteeing the accuracy and security of data records.

V.FUTURE SCOPE

As India's per capita income is much less when compared to other nations, an individual tries his best to have a second source of income, to survive the inflation present in the country, and when they can't find anything legal to do and they end up being a thief, India last year has reported 578,000 cases of house thefts which proves that either the traditional key and lock security system is poor or there wasn't any alarm system present to warn the house owners, so a need for a smart, secure and convenient system was much required which would not only let the homeowner have complete

VI.CONCLUSION

Intelligent process innovation for Internet of Things (IoT)-based smart home applications is largely few and fragmented. In this study, the trends and gaps that were already present were examined in order to offer valuable visions for technical environments and researchers. In order toprovide a comprehensive taxonomy of the research landscape, a survey was carried out. An access to the system but also provide network security to prevent cyber thefts.

The future scope, should be tedious to use the key as it requires new attention while carrying means the owner needs to carry the key with him/her all the time, or if a guest visits their home and if there is no one is at home, they need to wait for the owner to come back, as using the proposed model by our group it is easier to access the door from anywhere i.e., the owner can lock or open the door even if the owner is not there at home. Cyber-crimes have been more common now and there is a need for always having a secured network architecture to avoid having all the information leaked online, all this information can be sold online or may be used for setting up a trojan to attack the system, so with the help of blockchain a firewall can be set up to prevent hackers from attacking the system.

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Document Summarization

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***Abstract* — With the boom of the information age in the mid-20th century, a tremendous amount of information has become readily available using computer technology. Although information may be obtained with minimal effort, when it comes to analyzing the data and extracting information from it, we frequently need to wade through mountains of data. Sentences are extracted from the given text file or original document. Here we will discuss how analyzing text data can be made easier using summary generation tools, and we will glance over how these techniques have been implemented in order to make a tool that can aid in summary generation. The tool is called Docu-Summarizer, and it is a Python GUI that summarizes documents using extractive summarization techniques.**

I.INTRODUCTION

Document Summarization is the task of rewriting a document into its shorter form while still retaining its important content. The two types of summarization are as follows: -

1.Extractive approaches generate summaries by extracting parts of the original document usually sentences. In extractive summarizing, sentences are selected from the input articles while in abstractive summarization, sentences may be produced or a new representation of the input articles may be output. We investigate if there are intrinsic restrictions to the performance of extractive summarization algorithms because they are widely used.

2.Abstractive methods may generate new words or phrases which are not in the original document. that can perform even when the size of the data keeps increasing. In order to construct a new set of sentences for the summary, abstractive summarization emphasizes on the most important information in the original text. This method comprises locating crucial components, evaluating the situation, and reinventing them [1]. The algorithm of document summarization is usually considered as the number and order of steps involved in the document summarization process [3]. We usually start with the text and then comes the process of sentence segmentation. We then define compressibility of a document and generalize the summarization models currently in use. We investigate this idea for papers from three different genres before combining new and old summarization techniques into a unified framework. The extractive summarization method is more commonly used as it is compatible with well-known Python frameworks and packages.(Spacy, NLTK, etc.)

This volume of text is an inestimable source of information and knowledge which needs to be effectively summarized to be useful. Natural language processing(NLP) is an interdisciplinary subfield of linguistics, computer science, and artificial intelligence concerned with the interactions between computers and human language. This increasing availability of documents has demanded exhaustive research in the NLP area for automatic text summarization. Automatic text summarization is the task of producing a concise and fluent summary without any human help while preserving the meaning of the original text document [1].

II.METHODOLOGY

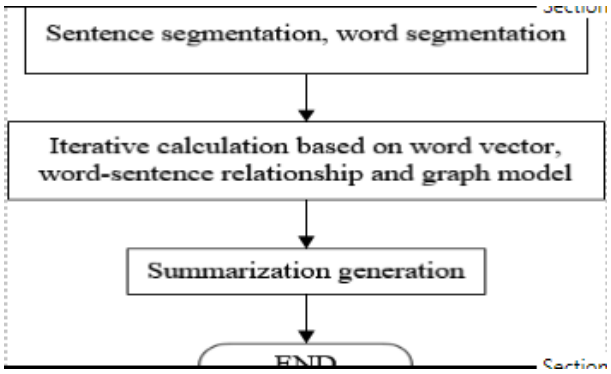
For extractive summarization we can use libraries like spacy, nltk, sumy, gensim and much more. All these libraries are readily available .Python language was chosen because of its flexibility and ease of use, furthermore it also has many existing libraries and packages that can aid in text summarization. The functions were created for each library for implementing the extractive summarization. Spacy and sumy are one of the most commonly used packages for text summarization.

Both of these libraries were used in order to generate the summary of the text. Functions are prepared with respect to the procedure oriented programming which can be later moved to the object oriented programming by implementing classes and creating objects. For creating the graphical user interface, we are using the tkinter python library. With help of this a GUI is created with user friendly approach.

The name of the GUI is Docu Summaryzer. Docu Summaryzer is a python GUI built using the Tkinter library. Through this app, extractive summarization is performed using spacy on documents of types text,.txt and pdf's to provide a summary.Comparer is used to compare summaries from two different packages i.e Sumy, spacy, etc.

Structural Analysis: The project is entirely dependent on the the text input from the user. This is processed either by sumy or spacy then the entire summarization is created. The use of sumy and spacy can be easily selected from the GUI interface. The comparor compare the sumy summarization with the spacy summarization.

Behavioural Analysis: A simple Tkinter GUI is used to implement the functions which are created in the python programming language. The functions are easy to understand and follow the layman language. An user friendly GUI was successfully created to implement the sumy and spacy libraries algorithm to generate the summarization.



As seen in Figure 1, the summarization process starts with sentence and word segmentation followed by iterative calculations.

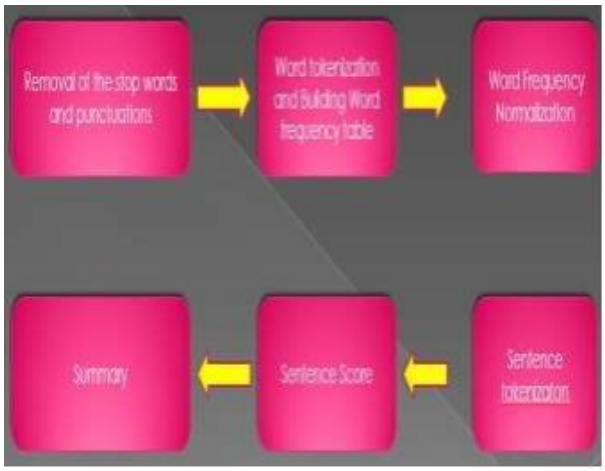


Figure 2: Approach of extractive summarization and steps involved.

As seen in Figure 2, Approach of extractive summarization involves steps like stop word removal, word tokenization, frequency table generation, etc.

III.SYSTEM ANALYSIS

Functional Analysis: The entire system is designed using Python Programming language. We also used python libraries like sumy and spacy for summary generation. The interface is created using the Tkinter GUI library. Separate function are prepared for the separate libraries. This is entirely based on the procedure oriented programming.

Python: Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Its high-level built-in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together.

Platform: PyCharm: PyCharm is a dedicated Python Integrated Development Environment (IDE) providing a wide range of essential tools for Python developers, tightly integrated to create a convenient environment for productive Python, web, and data science development.

IV.RESULT AND DISCUSSION

The GUI consists of 6 tabs namely Home, Text, Text File, Pdf File, Comparer and About Us.The Text tab can be used by the user to directly copy and paste text and get the summary for the same. The Text file tab will allow the user to open a .txt file and then summarize it. The Pdf file tab will allow the user to summarize .pdf files. The user can also save their summaries in a .txt file format.

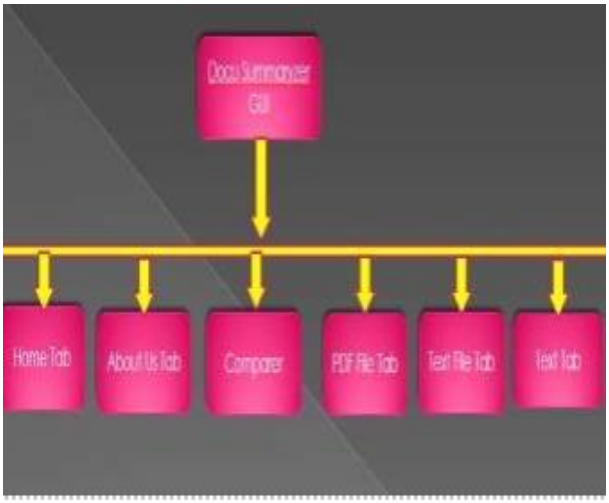


Figure 3: Schema of the GUI

The overall schema of the GUI is depicted in Figure 3 which consists of various tabs like Home, Text, Pdf file, Text file, About Us and Comparer.

Every tab consists of various buttons such as open file, close, clear text, clear results and save. Furthermore, there is also a Comparer tab which allows user to compare the summary generated of the same input text using different libraries and methods.

Figure 4: GUI Interface

The landing page of the GUI is depicted in Figure 4, from this page the user can navigate to different tabs and perform the summarization function to the files of their choice.

A user can navigate through the GUI seamlessly because of the notebook layout used for designing the user interface. The summary for a text which can either be input by hand or by capturing text from a document file is generated once the user clicks on the Summarize button. When the open file button is clicked a system pop up window opens which asks the user to choose an input file from the device memory. The accepted file types are pdf files and text files.

Figure 5: Text Processing Tab

As seen in Figure 5, the text processing tab consists of two text boxes one for input and one for output display and various buttons for performing different functions.

The Reset button clears the text present in the input text area and the Clear Result button clears the summary generated. The GUI window can be closed using the close button which destroys the window. The result provided by the GUI contains the top 30% of the most important sentences from the text. The sentences in the summary are directly extracted from the original input without making any changes to the text.

V.FUTURE SCOPE

More features can be added to the project in the future. Web Scraping is a technique used to gather information from websites. It is also known as online harvesting or web data extraction. The web scraping feature can be added to the GUI where a website's url can be entered and all the text from the webpage will be extracted. Beautiful soup is a python library which can be used for this purpose. Another feature that can be added is a summary size selector which gives the user the freedom to choose the size of the summary they want. The summary size could be chosen either on the basis of the percentage of original text or the number of words/letters. OCR (Optical Character Recognition) is used for scanning and extracting text from images. This feature will allow users to directly add an image to the GUI and get the summary for the same.

VI.CONCLUSION

Document summarization is an old challenge but the current research direction diverts towards emerging trends in biomedicine, product review, education domains, emails and blogs. Automated summarization is an important area in NLP (Natural Language Processing) research. It consists of automatically creating a summary of one or more texts. The purpose of extractive document summarization is to automatically select a number of indicative sentences, passages, or paragraphs from the original document [2]. Document summarization approaches based on Neural Networks, Graph Theoretic, Fuzzy, and Cluster have, to an extent, succeeded in making an effective summary of a document. Both extractive and abstractive methods have been researched. Most summarization techniques are based on extractive methods. Through our project, we provide extractive text summarization which will help users in conserving time while reading long texts articles, and documents. Extractive summarization has applications like Patent Research, E-learning, Financial Research, Newsletter, Social Media Marketing , Resume Shortlisting

We provided a summary of two types i.e first summary using spacy and the second summary using Sumy. It will directly display all the important aspects of the document in a summarized manner. Text summarization is a trending topic since the past few decades, and researchers have tried to propose many techniques to bring improvement in the summarization of text documentation. In doing so there are many techniques available to summarize the text. The summary is itself of two types, extractive and abstractive summary. The extractive summary is well-researched and many researchers have proposed summarization systems. The abstractive summary is a complex task and also requires the extractive summary to constrict an abstractive

summary. That's the reason many researchers have focused on the extractive summary.

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Sanket: ISL Translator

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***Abstract*— India is home to approximately 63 million people of the Deaf and Hard of Hearing community (DHH). There are only about 250 certified sign language translators in India, translating for a deaf population of between 1.8 million and 7 million. So, the ratio of translators to deaf is very small. The total number of smartphone users in India is likely to rise to nearly 83 crores by 2022. Estimates 1% of this are of the DHH community. This paper proposes the project work to provide a platform to the DHH community and bridge the communication gap between them. The project - Sanket aims to develop an android application virtual translator to interpret Speech to ISL and vice versa thereby addressing the issue and proposing a neat solution**

Keywords—component, formatting, style, styling, insert (key words)

I.INTRODUCTION

Around the globe, the majority is of those who can hear. Living in a society where one's language is understood by just a small percentage of people has an impact on how Deaf individuals perceive themselves. A significant obstacle to communication is not knowing sign language. The number of Deaf and Hard of Hearing individuals living in India is estimated to be 63 million (DHH). Although India has between 1.8 million and 7 million deaf people, there are only approximately 250 licensed sign language translators there. Sign language is nothing more than a collection of diverse hand gestures created by a variety of hand shapes, motions, and orientations, as well as facial expressions.

People who are deaf-dumb typically utilize these gestures to convey their thoughts. Dumb-deaf people encounter communication barriers while engaging with regular people in public settings including banks, hospitals, and post offices. To explain their thoughts to hearing persons and vice versa, the deaf may need the assistance of a sign language translator. However, this approach ends up being quite expensive and does not benefit a deaf person for the entirety of their lives. Therefore, a system that can translate speech into sign language and automatically detect sign language motions is required. By implementing such a system, the social divide between the hearing and hearing-impaired would be reduced.

The sign language that is used where you are is influenced by the local culture and language. Indian deaf people communicate using Indian sign language (ISL). Speaking in English and using ISL is a common and well-developed method of communication for hearing-impaired persons in India. For Indian Sign Language, distinct symbols are used for various alphabets. Both word-level gestures and finger spelling are used. Speech to ISL translation and Sign Language Detection has become crucial and effective for humans and research in this area is in progress and is one of the applications of Natural Language Processing(NLP) and Computer Vision(CV). Moreover, Indian Sign Language (ISL) Translator app is the need of the hour to cater millions of DHH community people in India. Sanket project aims to start laying building blocks toward bridging the communication barrier between people from the hearing community and people from the DHH community.

II.REVIEW OF LITERATURE

In our review, we looked at a variety of research and summary papers to gather a better understanding of a Gesture and Voice Detection and translation application. Existing mobile applications use sign language as the only option for communication with Deaf-mute peoples. The proposed application, named as vocalizer to mute (V2M), uses automatic speech recognition (ASR) methodology to convert it into a recognizable form of speech for a normal person.[1] A research paper proposed system used the depth sensing and motion capture features of the Microsoft Xbox Kinect 360 to record motion data for all the various ISL movements. The animations were then made up using Unity3D, and everything was then assembled into an Android application[2].

Another paper by Vishwa Hariharan Iyer titled “Sign Language Detection using Action Recognition” proposed an end-to-end human interface framework that is capable of recognizing and interpreting spoken language and then act out the corresponding ISL gestures to facilitate a very convenient, real time form of conversation between the disabled community and the rest of the population. They made use of the Microsoft Xbox Kinect 360s depth sensing and motion capturing

abilities to capture motion data for all the different ISL gestures and then used Unity3D to set up all the animations and then finally bundle everything into an Android application. [3]

Moreover, a paper titled "Sign Language Recognition Based on Computer Vision" by Wanbo Li, Hang Pu and Ruijuan Wang proposes to develop an improved convolutional neural network (CNN) and long short-term memory(LSTM) neural network combined sign language recognition system, which is different from the current only for sign language recognition and translation, but also for sign language generation function. The model is proposed for American Sign Language.

The paper evidently shows that sign language recognition rate is 95.52% compared with similar algorithms, and sign language (American sign language and Arabic numerals) is 90.3%.[4]. Finally, authors Jai Joshi, Parshav Gandhi and Rupali Sawant highlighted the experimental results of an ASL Learning Platform using LSTM Neural Networks. The accuracy achieved while training ASL words was 99.43%, while training ASL alphabets was 91.01% and while training ASL numbers was 98.80%.[5].

III.COMAPRETIVE STUDY

3.1 OpenCV

OpenCV stands for Open-Source Computer Vision. It is a collection of coding tools for real-time computer vision. The library, which comprises more than 2000 optimized algorithms, is widely utilized worldwide. As a result, Android developers are able to integrate several digital image processing algorithms into Android phone platforms.

3.2. Long Short Term Memory

Long short-term memory (LSTM) is an artificial neural network used in the fields of artificial intelligence and deep learning. The LSTM features feedback connections, in contrast to conventional feedforward neural networks. Such a recurrent neural network (RNN) can analyze whole data sequences as well as individual data points, such as photographs (such as speech or video).

3.3. Media pipe

Media Pipe is a Framework for building machine learning pipelines for processing time-series data like video, audio, etc.

3.4. Tensor flow

TensorFlow is a free and open-source software library for machine learning and artificial intelligence. It can be applied to many other tasks, although it focuses mostly on deep neural network training and inference.

IV.PROPOSED WORK

4.1. Interface 1: Speech to ISL

The first interface is for Speech to ISL translation. We propose to have a real-time audio input and translate it into corresponding ISL signs and display the translated signs via a virtual Model (Sanket).

(a) Translation Algorithm: The Google Speech to Text service available natively in Android was then called upon on click of a button which converted spoken input into parse able Strings. The Speech-to-Text service requires network access and hence all the necessary runtime permissions were explicitly provided for via code. The result of the Speech-toText API was stored as a composite String. This String was passed as an input to our ISL parser. Our ISL parser separates out all the words in an order as prescribed by the rules of ISL. If any word was found not present in our library, that word was broken down into alphabets and each alphabet was processed independently. We also accounted for slangs and offensive words and they are automatically discarded by our system. We had to make use of multiple threads in the background as the enactment of the gesture took a considerable chunk of the processing time on the main thread. All actions had to be synchronized as well.

(b) User Interface: Designing the user interface was always going to be challenging. We adopted a minimal approach in preparing the application layout and kept everything as simple as possible. Our primary aim was to display the 3D character in the center of the screen so that it occupies the maximum available real estate. The speak and the translate buttons were kept in the bottom half of the screen for better accessibility. We also provided for a text input layout just in case giving a voice input was infeasible. Color Scheme was well thought off and calibrated so as to follow the general Android design guidelines

4.2. Interface 2: ISL to Speech

The second module is for ISl to Speech translation. We propose to have a real-time ISL video input stream and display the recognized translation of those ISL signs in form of text below. The translated text will be converted to speech via text_to_speech . In order to achieve ISL to Speech, we need to break down this into smaller problem statements.

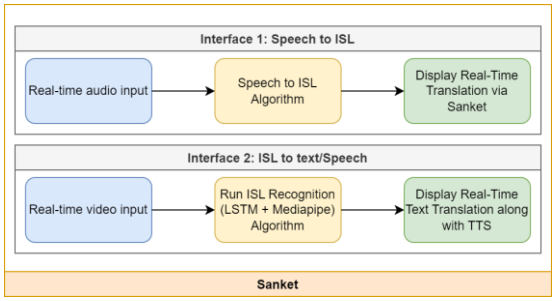

Fig. 1. Proposed Model of Sanket

(a) ISL Recognition - ML model

i. Creation of Dataset: After referring the available datasets, it was decided that we'll be making our own dataset as all the dataset images where of the zoomed hand (palm region) and we wanted human pose images. For dataset of our project Sign Language Recognition, we'll need the data i.e either image/videos of all the ISL sign corresponding to each letters (a to z), digits(0 to 9) and 5-10 predefined words. The dataset will be created by collecting key points (plotted onto the realtime input feed (Open CV)) from mediapipe holistic and collect a bunch of data from keypoints i.e., our hands, on our body and on our face and save data in the form of numpy arrays.

ii. Algorithm Implementation: We'll use Sequential approach which consisted of layers of LSTM model which were stacked together via Dense layers. LSTM stands for long short-term memory networks. It is a variety of recurrent neural networks (RNNs) that are capable of learning long-term dependencies, especially in sequence prediction problems. LSTM has feedback connections, i.e., it is capable of processing the entire sequence of data, apart from single data points such as images. Sign language involves static as well as motion signs. Now for this we'll require our model to predict signs for not only image captures for a particular instance but in fact for a series of gesture that combines to form a particular sign. Hence for this LSTM proves perfect as long-term temporal dependencies can be captured effectively by LSTM, without suffering much optimization hurdles.

iii. Model evaluation: Evaluation of trained model will be done by real time hand gesture detection and simultaneously convert the gesture to speech.

(b) App Implementation:

The ISL to Speech interface will be created inside our flutter app after which the trained model will be imported into our application and desired output will be tried to achieve.

V.METHODOLOGY

5.1. Technology

Table I. Tools And Technologies Used

Sr No.	Tools	Specification
1.	IDE	Android Studio Jupyter Notebook
2.	Frameworks / Libraries	Flutter Mediapipe Tensorflow OpenCV Numpy text_to_speech speech_to_text
3.	Language	Dart Java/Kotlin Python 3.10.0
4.	Cloud Platform	Play Store

5.2. Methodology flow

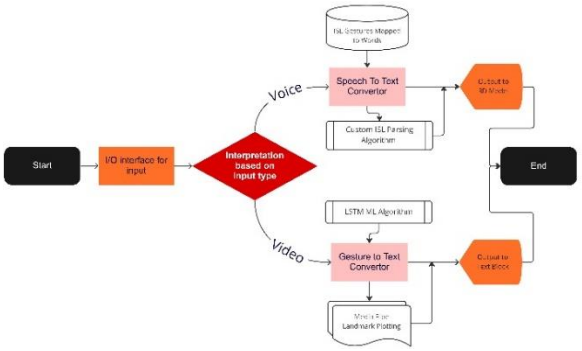

Fig. 2. Proposed data flow of Sanket

The Proposed Data Flow of the Sanket system is shown in Fig.2. For the first interface viz. Speech to ISL, speech_to_text package is used to convert audio to string and upon that we formulated our own algorithm of string manipulation to essentially translate the string input to appropriate Indian Sign Language. Upon which the Blender model - 'Sanket' performs the translated ISL sign gestures.

For the second interface viz. ISL to Speech, we did a bunch of research and actually found that most of state-of-the-art models or models that are currently out there tend to use a number of CNN layers followed by a number of LSTM layers so specifically some people using a pre-trained mobile net followed by a number of LSTM layers so we trained with a similar number of sequences that we did in this project so we think about 45 different sequences per class so that would be 450 sequences in total and we was just getting nowhere near the level of accuracy that was going to be actually useful. So quickly we sort of transitioned and started using

media pipe holistic combined with the LSTM layer now the reason that we ended up doing this is:

1. We needed less data to produce a hyper accurate model.

2. It was a much denser neural network so rather than having around 30 to 40 million parameters in CNN neural network we had around about half a million parameters which means it was going to be way faster to go ahead and train that particular model.

3. The neural network was a lot simpler and meant that it was going to be a whole heap faster when it comes to detecting in real time.

VI.RESULT AND DISCUSSION

6.1. Speech to ISL

To create the user interface, we have used the Flutter framework. Screenshots of a working prototype of Speech to ISL interface is shown in Figure 3.

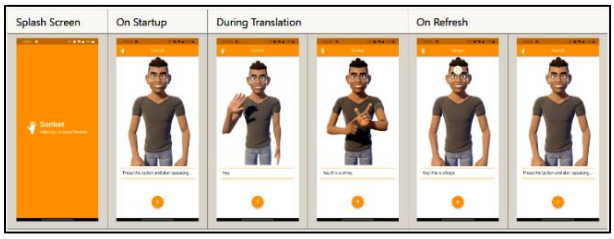

Fig. 3. Speech to ISL

6.2. ISL to Speech

We used 4 layers of LSTM with params 64, 64, 128, 64 sequentially. Model was compiled with 'Adam' optimizer and we tried to fit the model with 1000 epochs. The model summary is shown in Fig 4.

```
In [33]: model.summary()
         Model: "sequential_1"
         _________________________________________________________________
          Layer (type)                 Output Shape              Param #
         =================================================================
          lstm_3 (LSTM)                (None, 10, 64)            442112

          lstm_4 (LSTM)                (None, 10, 64)            33024

          lstm_5 (LSTM)                (None, 10, 128)           98816

          lstm_6 (LSTM)                (None, 64)                49408

          dense_3 (Dense)              (None, 64)                4160

          dense_4 (Dense)              (None, 32)                2080

          dense_5 (Dense)              (None, 27)                891

         =================================================================
         Total params: 630,491
         Trainable params: 630,491
         Non-trainable params: 0
         _________________________________________________________________
```

Fig. 4. Model Summary

The model graph was observed to yield categorical accuracy close to 100% (i.e 1) as the epoch reached towards 1000 epochs.

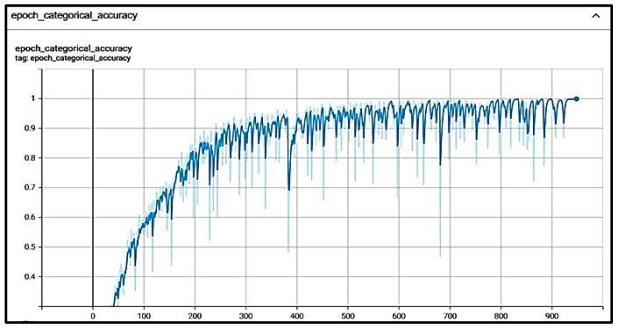

Fig. 5. Epoch Categorical Accuracy Graph

This model yielded an accuracy of ~ 91.66%.

```
In [45]: accuracy_score(ytrue, yhat)
Out[45]: 0.9166557337704918
```

Fig. 6. Accuracy From Final Model- 0.9166(91.66%)

Further, testing and android implementation of this interface - ISL to Speech is still in progress. Work towards building an android compatible media pipe holistic interface is being done. Post which the model will be tested on an android prototype.

VII.CONCLUSION

In the proposed model we have experimented with various Machine Learning Algorithm to find the best suited algorithm for our problem statement. Sanket's novel approach to translate Speech to ISL and recognize the Indian sign language using Long ShortTerm Memory (LSTM) and Media pipe Holistic is presented in the paper. The proposed system can be used to translate more than 10 ISL words, 26 alphabets and 10 digits. LSTM neural network model is used after identifying key points using media pipe holistic which includes face, pose and hand features. Sequential model of 4 LSTM layer and 3 Dense layers is used to classify the sign which gives an average accuracy of 91.66%.

VIII. FUTURE SCOPE

This paper presents a novel solution that is Sanket Real-Time Translation and shares light on the development work of the project. This paper serves as a foundation for the concept of virtual translator for DHH community people. Combining emerging technologies like machine learning with a self-proposed ISL to Speech algorithm we have achieved the results as discussed above. For improved outcomes, we can work towards increasing the ISL dataset in our backend for both ways of translation. We can employ more features in our application such as speech control of model in Speech to ISL translation. Furthermore, we may also employ NLP for better translation.

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Learning Indian Map Using Gaming Technology for Remembering Indian Heritage

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***Abstract*—India is a country endowed with rich cultural heritage especially renowned architectural sites of which 37 are UNESCO listed heritage sites. Cultural heritages connects generations over time and we need to preserve them. Architects, historians, travelers etc. They visit many historical sites where it often becomes difficult for them to identify and get historical details about the monument they are interested in. The task of archiving, documenting and sharing the knowledge of these cultural assets is challenging due to the scale and reliability of the information. An accurate prediction of the images to its correct label (heritage site) allows more proficient searches through specific terms, thus helping in the studying and understanding the heritage assets. Classification of data, which involve images, is complex and also time consuming. This paper focuses on making a 3D game which will help people learn about Indian heritage & culture more easily**

I. Introduction

India's culture is among the world's oldest; civilization in India began about 4,500 years ago. Many sources describe it as "Sa Prathama Sanskrati Vishvavara" — the first and the supreme culture in the world, according to the all world Gayatri Pariwar (AWGP) organization. Western societies did not always see the culture of India very favorably, according to Christina De Rossi, an anthropologist at Barnet and Southgate College in London. Early anthropologists once considered culture as an evolutionary process, and "every aspect of human development was seen as driven.

By evolution," she told Live Science. "In this view, societies outside of Europe or North America, or societies that did not follow the European or Western way of life, were considered primitive and culturally inferior. Essentially this included all the colonized countries and people, such as African countries, India, and the Far East." However, Indians made significant advances in architecture (Taj Mahal), mathematics (the invention of zero) and medicine (Ayurveda). Today, India is a very diverse country, with more than 1.2 billion people, according to the CIA world Facebook, making it the second most populous nation after China. Different regions have their own distinct cultures. Language, religion, food and the arts are just some of the various aspects of Indian culture. Games have been a vital part of human culture for centuries, serving not only as entertainment but also as a means of preserving cultural traditions and values. In India, games have played a significant role in transmitting cultural heritage from generation to generation. Indian games such as Snakes and Ladders, Pachisi, and others not only provide entertainment but also offer insight into the cultural values and beliefs of India's ancient society. For example, Snakes and Ladders represents the Hindu concept of karma, where good actions lead to rewards and bad actions lead to penalties. Pachisi, on the other hand, is based on the ancient Indian game of chaupar and reflects the importance of strategy and luck in Indian culture.

II. Problem Defination

Games are largely misunderstood in our society. They aren't necessarily trivial or sophomoric. Gaming is just a young medium, a resource and support clearinghouse for game developers, non-profit organizations, and educators. Better yet, they make that exploration fun, even addicting. We usually learn from textbooks or worksheets, but because you automatically learn while you play it.

III. Literature Survey

Gamification is the act of applying the techniques found in game design to typically non-game domains such as business and education. While certainly not new, the rise of video games in the 1970s and 1980s brought a new emphasis and wave of research into gamification. In the last decade, great strides have been made in gamification of classrooms, technical learning, and computer science. Some of these experiences are mediated directly by technology, using software platforms, video games, and other digital tools. There have been many technical papers on foreign cultural and heritage games published in various countries. These papers cover a wide range of topics, including game design, game programming, game art and animation, game audio, and game user experience in the context of cultural and heritage games. In the United States, for example, institutions such as the Massachusetts Institute of Technology (MIT) and the University of California, Berkeley have produced numerous technical papers on cultural and heritage games. These papers discuss the role of games in preserving cultural heritage, the cultural content and interactive nature of these games, and their potential as a tool for promoting cultural awareness and understanding. In Japan, institutions such as the University of Tokyo and Kyoto University have produced many technical papers on cultural and heritage games. These papers explore the design and development of games based on Japanese culture and heritage, as well as their cultural content and

interactive nature. In South Korea, institutions such as the Korea Advanced Institute of Science and Technology (KAIST) and Hanyang University have produced numerous technical papers on cultural and heritage games. These papers cover topics such as the design and development of games based on Korean culture and heritage, as well as their cultural content and interactive nature. In the United Kingdom, institutions such as the University of Portsmouth and the University of Abertay Dundee have produced many technical papers on cultural and heritage games.

These papers cover topics such as the role of games in preserving cultural heritage, the cultural content and interactive nature of these games, and their potential as a tool for promoting cultural awareness and understanding. Overall, there have been many technical papers published on cultural and heritage games in various countries, and these papers can provide valuable insights and resources for those interested in the design and development of games based on foreign cultures and heritage. Making games based on Indian culture and heritage allows for an opportunity to showcase the rich and diverse history, tradition and values of India to a wider audience. It also helps to promote and preserve the cultural heritage for future generations, by making it interactive and engaging through the medium of games. Additionally, it can also help to create a sense of national pride and identity among Indian players. There are several reasons to make games based on Indian culture and heritage, including:

1. Promoting cultural awareness and education: Games can provide an interactive and engaging way to learn about Indian culture, history, and heritage, making it more appealing and accessible to a wider audience.
2. Preserving cultural heritage: Games can help to preserve cultural heritage by making it accessible and relevant to future generations.
3. Boosting national pride and identity: By showcasing Indian cultural elements in games, it can help to create a sense of national pride and identity among Indian players.
4. Growing the gaming industry: By creating games based on Indian culture and heritage, it can help to promote and grow the Indian gaming industry.
5. Creating a unique gaming experience: Indian culture and heritage provide a rich source of inspiration for game designers, which can result in unique and creative gaming experiences for players.

IV. Proposed Methodology

An open-ended questionnaire consisting of cross sectional, exploratory, questionnaire based noninterventional survey was conducted was developed, after identifying what type of game would our audience like we came to an conclusion of making an quest type game. Responses were collected through online portals and social websites like WhatsApp and Facebook. Only a completely filled up questionnaire was used for analysis. The idea is to encourage people to learn about Indian heritage and culture through our game. Generally people fell very boring learning through books and websites or any online source. So our game will encourage people to play and learn about our country and they will enjoy playing our game.

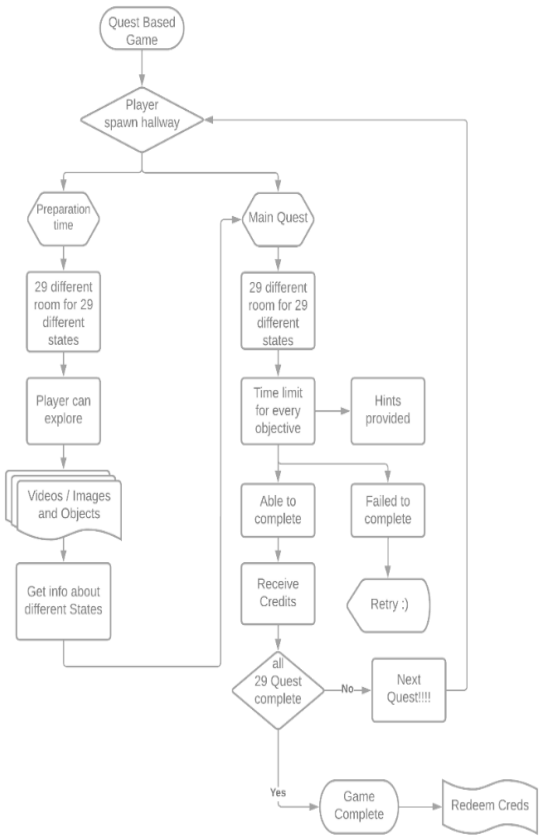

Fig. 1. Flow of our Game

V. Result And Discussion

Gamification has been shown to have a dramatic effect on learning outcomes, primarily through increasing the student's intrinsic motivation. Extrinsic motivation drives a student to progress because of a grade or requirement, some external motivation. Intrinsic motivation drives a student to attend class because "they hunger for more information, they want to be there, they are involved and their self-efficacy soars." In order for a classroom to move from extrinsic to intrinsic motivation, it must become student-centric and the gamification of learning can be an important tool in that transformation.

The core game concepts of goal-focused activity, rewards, and progression provide the learner a situation and set of tools for the learner to take a more active role in the learning experience. These external markers motivate the student to continue progressing, provides the student with a clear understanding of how she is progressing, and affords the student with (often incremental) steps to continue progressing. This progress reinforces the positive effects of learning and drives the student to work harder to progress more. In many cases, the use (or combination) of cooperation and competitiveness compounds these motivation factors. Cronk found that adding gamification elements to undergraduate learning increases student participation in discussions In their experimental study, Barrio, Morillas, and Soriano showed "that the impact of variables such as learner motivation, attention and learning performance

are significantly higher in those learners exposed to gamification techniques." Below are the few examples of locations that can be implemented in the game.

Fig. 2. Map 1

Fig. 3. Map 2

Fig. 4. Map 3

Fig. 5. Map 4

Fig. 6. Quest System

VI. Conclusion

In conclusion, the use of Unreal Engine in the development of educational games provides a unique opportunity for individuals to learn about and experience Indian culture and heritage in a fun and interactive way. By combining the power of technology with traditional methods of learning, individuals can gain a deeper understanding of India's rich cultural heritage and preserve it for future generations. Games can play a significant role in understanding and appreciating Indian culture and heritage. By providing a glimpse into the values and beliefs of India's ancient society, games serve as a valuable tool for preserving cultural heritage and transmitting it from generation to generation. In this way, games help to ensure that the rich cultural heritage of India will be remembered and cherished for years to come.

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Leaf Disease Detection using Machine Learning

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***Abstract*— The detection and diagnosis of plant diseases is one of the major contributors to crop production and agricultural output yield loss. Any observable characteristics in any part of the plant that allow us to identify between two plants—technically, any spots or colour shades—are studied in the field of plant disease. The sustainability of the plant is among the most crucial aspects for the growth of agriculture. Identifying plant diseases accurately can be quite difficult. It takes a lot of effort, knowledge, and expertise in the field of plants to diagnose some diseases. Hence, image processing is used to detect plant diseases. The transfer learning model help us in identification of features with high accuracy. In this paper, we'll demonstrate how to identify plant diseases by obtaining photos of their leaves. We will also go over the image pre- processing and image extraction techniques that is employed in this project.**

Keywords—Machine Learning (ML), Convolutional Neural Network (CNN), Plant

I. INTRODUCTION

Plant diseases can significantly reduce crop production and pose a serious threat to the world's food supply. For timely execution of management measures, early and precise detection of plant diseases and it's cure is crucial. In India, Farmers have a great diversity of crops. There are lot of external factors and external pathogens which affect growth and production of a crop resulting in less yield and financial loss. Various diseases are observed on the plants and crops. The main identification of the affected plant or crop are its leaves. The various coloured spots and patterns on the leaf are very useful in detecting the disease. Observing the plant and keeping a track of all the diseases is a tedious task yet it was the only way in the past. These methods were indeed inaccurate and very time consuming. Normally we go in a laboratory and wait for a few week until we receive a report on what is the problem with the soil and overall plant. Hence, we are using Machine Learning, Deep Learning, and Image Processing concept to solve the problem.Machine learning is a subpart of Artificial intelligence where the machine learn by continuous validating and testing the dataset. Recent developments in machine learning have demonstrated promising results in automating the process of plant disease diagnosis to overcome these problems.By training machine learning algorithms on large datasets of plant images, it is possible to develop computer vision systems that can accurately identify plant diseases. By using algorithms to analyse large amounts of data, machine learning can identify patterns and features that indicate the presence of a disease. These systems can be used to support plant disease diagnosis and to improve the efficiency and accuracy of the diagnosis process

II. HARDWARE USED

(A.) Android Mobile Phone

Using machine learning on an Android mobile phone for plant disease detection involves creating a machine learning model trained on a large dataset of plant images, both healthy and with various diseases, and deploying the model on the mobile device. The phone camera can be used to capture images of a plant and the machine learning model can then classify the plant based on the image and detect any signs of disease. This allows for quick and easy diagnosis of plant diseases in the field without the need for laboratory equipment or expertise.

III. SOFTWARE USED

(A.) Android Studio

Android Studio is used for android application development. It provides a set of tools and features for developing, testing, and debugging Android applications, including a code editor, a visual layout editor, and an emulator for testing apps on various devices. Android Studio also supports integration with popular tools such as Gradle for building and managing app projects, and Git for version control. Additionally, it offers a wide range of plugins and libraries to help developers with common tasks and enhance their workflow.

Fig2. Android Studio

Fig3. Docker

(B.) Android App

An Android app is a software application which has gain popularity in recent years. Its wide uses and features have created a new market around the world. Constantly thousands of apps are being deployed in app store. Each app is different and have its own internal structure. We have built an app that will help in disease detection in plants. The name of our app is "LEAFY." The interface is simple and user-friendly and even an illiterate can use it. As we open the app we see a capture icon which provide us with two option: either we can click the photo of the leaf directly or use image from our gallery. This makes sure that we can diagnose a plant even when we just have a photo of it. After capturing the image an API call is made to a model which is stored in Docker. The image is compared with the other leaves and internally it looks for a pattern which would match the image in dataset. Along with this a confidence score is returned which tells the user how confident it is based on a percent which vary from 0 - 100%.

(C.) Keras

keras is a high-level python language which is used in neural networking models. Though there are many libraries available in the internet, karas has gain popularity due to its rich library and constant upgradation and development. Through Keras we can train, validate, and test our models with ease. It includes a wide range of optimization algorithms and loss functions. Viewing the overall structure of our dataset is no longer a tedious task as we use to have earlier. The active community of keras also encourages new users to explore the library and this is another reason which has made it a popular library.

(D.) TensorFlow Lite

Our dataset is large and when a corresponding model is made with respect to this the model becomes heavy for mobile devices and embedded systems. TensorFlow lite empowers us to transfer our model to a mobile application without worrying about model's stability and accuracy. The high performance provided along this also attract app developers towards it. This also include a wide range of different models like deep neural network and convolution neural network.

(E.) Docker

Docker is an application which is used for quick testing and development of application. We have kept our model inside the docker and we will be calling this through an Application Programming Interface (API).Docker is used because it offers many features like easy of maintenance and higher security. It has also lesser dependency.

(F.) CNN

Convolution neural network (CNN) is a deep neural network which is used for image classification. It is not just limited to image but classifications of video can also be done. In image classification features of a leaf are extracted from dataset and the model is trained as to give a required output. . The primary advantage of using CNN is that it automatically detects and extract the key features even when the orientation and variation in image occur. We observe an image and with the help of our neural network we categorize and based on memory we name it or label it. However, computer is different and it interprets an image as an array of numbers. These numerical values are put in a numerical array. Here after, they are allotted respective node in a network and based on input they create neural network after going through multiple iterations. Object detection, face detection, geographical categorization, group categorization and medical image categorization are some of the many applications where CNN models are extensively used and required.

IV. CLASSIFICATION

Feature classification is an important part in leaf disease detection. Initially when the photo of the leaf is captured it is converted to numerical array and this array is compared with the array of a healthy leaf. If it matches, then no further classification is done however when arrays are different that indicates a difference in the leaves and further it is compared with different diseased leaves and when a match is found the leaf is declared as a diseased plant belong to a particular class. Classification may seem like easy process but it is a building block for the categorization of things into a particular class from a range of classes.

V. FLOW OF SYSTEM

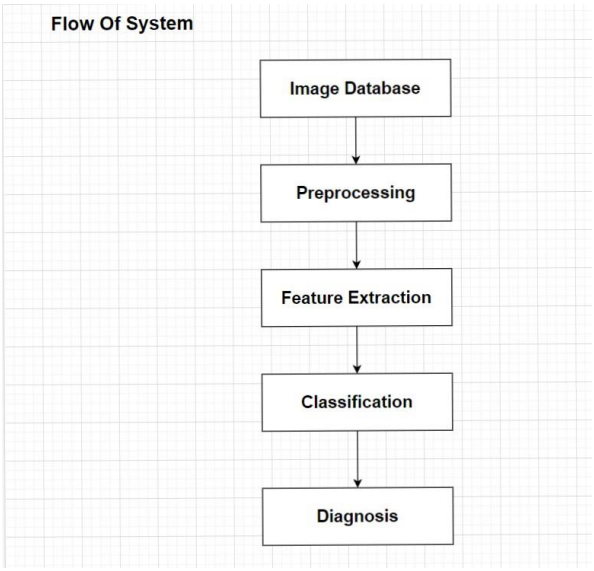

Fig4. Flow of System

VI. IMPLEMENTATION METHODOLOGY

Our proposed system is a software application which help us in detecting the kind of leaf disease and then its remedies. Initially we built a TensorFlow model and then this model was fined-tuned into TensorFlow lite model. This lite model will ensure that quick responses are generated when the photo or the image is uploaded in the model. When an image is clicked on the app the image through API requests the model which is stored in Docker to give a output corresponding to the model. The model gives the highest probability to the one that matches with the image numerical value. The confidence of how sure the model is also shown on the screen. We have also experimented our dataset with different model which include basic convolution neural network model, InceptionV3 and ResNet152V2.

Our proposed methodology is as follows: Dataset:

The dataset consists of 20,626 images of plant leaves which are divided into 3 classes. The dataset consists of 3 types of plant species and 12 types of plant diseases. The dataset contains the images of both diseased and healthy ones. The datasets focuses on 3 different vegetables that contain potatoes, tomatoes and pepper bell. The dataset is divided into 3 parts. The proportion of training, validating, and testing part of dataset is 80:10:10. The training part of the dataset is important since neural networks is made and corrected by validating data. Each image is resized and some data augmentation is applied both of which falls under pre-processing of data.

Image acquisition:

We are having a camera module which captures the photo of the leave of a plant. Since the camera quality, size of the image and the dimension of the image may differ from device to device when it is important to pre-process these images before sending them for further actions. The main goal of which will be to maintain a standard for all the image so that this doesn't affect the output of the result.

Fig5. Mobile Application Interface Image pre-processing:

The foundation of a good image analysing application is processing the image before working on the model. A good pre-processing ensures that all the images are free from noise and maintains the same size and some similarities. Some of the important concepts which are utilized in this project are as follow:

a.) Image resizing: In this method the image size of the datasets which are being used during training all have the same size be it 256*256 pixels or 224*224 pixels depending on the model which we are using. ResNet152V2 by default use 224*224 pixel which are passed while feeding the model with inputs.

b.) Image segmentation: This refers to finding and extracting the important features from a image. This is essential when it comes to object detection of feature detection. Since we are using a pre-trained model based on transfer learning technique this part is done internally as it has already learnt from his past inputs.

c.) Data augmentation: In this method various transformation are applied on the image so that we can improve accuracy of our training model. This method is super useful when we have limited or less number of images and still we want to train our model and get high accuracy at it. Transformation such as flipping, cropping, rotating and zooming are applied on the original image.

VII. FEATURE EXTRACTION

Every Image is unique and the way we observe an image is different from the computer perspective. The computer interprets the an image like a matrix of number and creating direct artificial neural network will require

tremendous computational power and hardware requirement like GPU, TPU or NVIDIA Titan series which comes with a lot of cost. Hence to solve this issue we try to reduce overall computational power. This is achieved in this way:

1. Image are nothing but 2-D arrays and they can be converted into matrix. Instead of looking at the whole picture we will specifically look for those features that make it unique. E.g., Those special features can be eyes, ears, nose and other body parts in case of a picture of an animal. These features can be filtered out by using convolution. Convolution is simply filtering those features from the original picture or mathematically by multiplication of matrix of original image and the filtering matrix to get a feature map. There will be many feature maps that we will get by performing this convolution and this can become 3-D feature map. Then finally pooling method is applied. Pooling method is used to reduce the size of image. We are using the Max Pooling in order to increase the accuracy and extraction of specific features. It takes the maximum number from the set of matrices and remove everything else. The figure summaries the pooling method. This combination of Convolution and Pooling is applied multiple times in order to reduce the computational power. Convolution and Pooling come together to make one epoch. Having higher epoch is better but since we are using a pre-trained model which take into account 60.4 million parameters we will restrict ourself with using only 20 epoch.

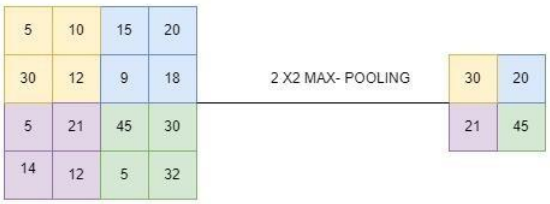

Fig6. MaxPooling

VIII. DISEASE DETECTION AND CLASSIFICATION

There are two steps which are involved in detection of disease i.e., the type of leaf and disease type. This is done with the help of Convolution neural network. We are using ResNet152v2 which is transfer learning model. This is a pretrained model and is designed specifically for the extraction of patterns and features as a result of analysing large set of dataset in collaboration with complex and expensive hardware setups. We get classifier after training our model by learning from the pretrained model as well as our new data. A process named flattening is done which converts the pooled image into a single dimensional vector. Working with vector is easy for the computers and classifying becomes easy. We get a numerical value of how likely is the leaf matching to a particular class. In case of a healthy leaf since there is no classification it is declared as healthy leaf. When classification is done in case of a diseased plant it come with a certain confidence level. Classification requires two numerical arrays. When the numerical array matches further decision on whether it is healthy or diseased leaf is taken. Classification is simple yet extremely essential in order to give proper result.

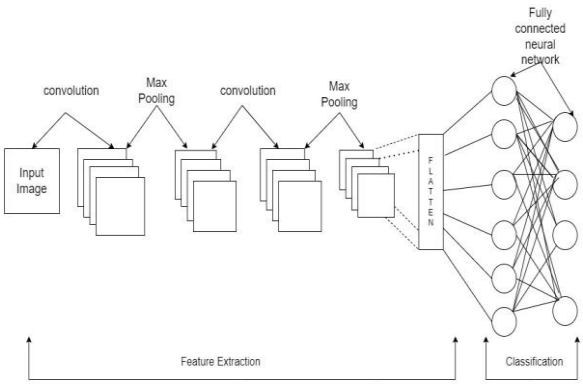

Fig7. Convolution neural network overview

IX. RESULT AND DISCUSSION

The accuracy of the overall model is close to 96 percent. This is a very good score and making further adjustment can increase its capacity but will require we meet experts from this field. After clicking the photo, it takes 10 sec and after which it displays the disease and list of remedies. The interface of the app is simple and it is user friendly.

X. CONCLUSION

In order to identify crop diseases, the Convolutional Neural Network Deep Learning method is applied in this study. To prevent occlusion, the image of the leaf is suggested to be taken with a plain background. Basically, the model is evaluated on three plant species that have distinct plant diseases. The system is implemented on Android, and the model was created using the Tensor Flow and Keras frameworks. The modifications and additions outlined in the project's future scope will be made as an extension.

XI. FUTURE SCOPE

Only a few different plant diseases can presently be detected by the model because it was trained using a dataset. To further broaden the system's application, we will provide the system with much more training data on different other plants and diseases. So as to increase the accuracy. By assessing the diseases with better algorithms that will undoubtedly enable the users to prevent such diseases in the future, we also hope to boost the accuracy of the remedies and their cure for crop diseases. Currently, the app is only relevant to plant

leaves, this application will eventually be able to distinguish between healthy and diseased fruits and vegetables as well. This feature can assist a buyer to select best quality grocery. Finally, we want to turn it into an online store where we can sell the plants and fertilizers that our software recommends while providing remedies for the diseases. Also, the application will recommend a landscape designer according to the user's preference.

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Stock Market Prediction Using Machine Learning

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***Abstract*— In Stock Market Prediction, the aim is to predict the future value of the financial stocks of a company. The recent trend in stock market prediction technologies is the use of machine learning which makes predictions based on the values of current stock market indices by training on their previous values. Machine learning itself employs different models to make prediction easier and more authentic. The paper focuses on using Regression and LSTM-based Machine learning to predict stock values. Factors considered are open, close, low, high, and volume. Stock market prediction has attracted much attention from academia as well as business. Due to the non-linear, volatile, and complex nature of the market, it is quite difficult to predict. As the stock markets grow bigger, more investors pay attention to developing a systematic approach to predict the stock market. Since the stock market is very sensitive to external information, the performance of previous prediction systems is limited by merely considering the traditional stock data. New forms of collective intelligence have emerged with the rise of the Internet (e.g. Google Trends, Wikipedia, etc.). The changes on these platforms will significantly affect the stock market. In addition, both the financial news sentiment and volumes are believed to have an impact on the stock price.**

Index Terms- Close, high, low, LSTM model, open, regression, and volume.

I. INTRODUCTION

Stock market prediction is the act of trying to `determine the future value of company stock or other financial instruments traded on an exchange. The successful prediction of a stock's future price could yield significant profit. The efficient-market hypothesis suggests that stock prices reflect all currently available information and any price changes that are not based on newly revealed information and thus are inherently unpredictable. Others disagree and those with this viewpoint possess myriad methods and technologies which purportedly allow them to gain future price information.

A correct prediction of stocks can lead to huge profits for the seller and the broker. Frequently, it is brought out that prediction is chaotic rather than random, which means it can be predicted by carefully analyzing the history of the respective stock market. Machine learning is an efficient way to represent such processes. It predicts a market value close to the tangible value, thereby increasing accuracy. The introduction of machine learning to the area of stock prediction has appealed to many researchers because of its efficient and accurate measurements .

The vital part of machine learning is the dataset used. The dataset should be as concrete as possible because a little change in the data can perpetuate massive changes in the outcome . In this project, supervised machine learning is employed on a dataset obtained from Yahoo Finance. This dataset comprises of following five variables: open, close, low, high, and volume. Open, close, low, and high are different bid prices for the stock at separate times with nearly direct names. The volume is the number of shares that passed from one owner to another during the time period. The model is then tested on the test data.

II. LITERATURE SURVEY

Forecasting the way of stock prices is a widely deliberate subject in many fields including trading, finance, statistics, and computer science. Depositors in the stock market can maximize their yield by export or selling their investment if they can determine when to enter and exit a position. Specialized traders typically use essential and/or technical analysis to inspect stocks in making venture decisions. The vital analysis involves a study of company fundamentals such as proceeds and profits, market position, growth rates, etc. Technical analysis, on the other hand, is based on the study of historical price oscillations.

In [7], the paper investigates the use of machine learning models in predicting stock market indicators using historical data and Twitter sentiment analysis. The study finds that the support vector machine model with a radial basis function kernel outperforms other models in predicting the direction of the stock market movement with 74% accuracy. However, the authors note the limitations of the study, including potential biases in Twitter data and the study's limited scope.

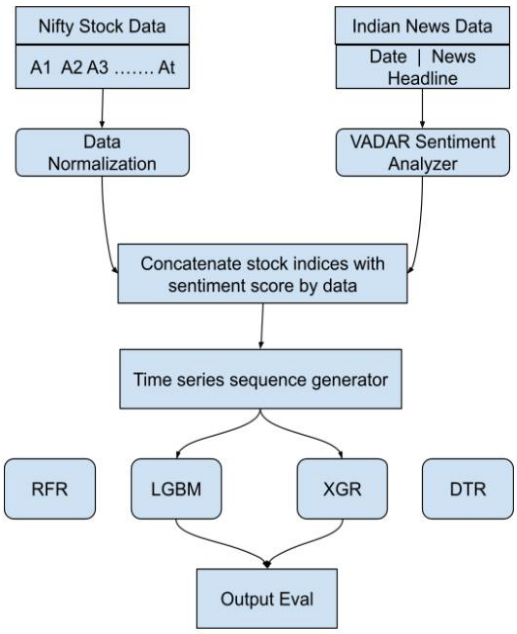
For [8], the CNN-BiLSTM-AM method is a machine-learning approach for stock price prediction. It combines a convolutional neural network (CNN), bidirectional long short-term memory (BiLSTM) network, and attention mechanism (AM) to analyze historical stock data and make predictions. The CNN is used to extract features from the input data, which are then fed into the BiLSTM network to capture temporal dependencies. The attention mechanism helps the model focus on important time steps in the input sequence. The result is a model that can predict future stock prices based on past performance.

In [9], the paper presents a method for predicting stock price movements based on the sentiment expressed in microblogs. The method, called "Collective Sentiment Mining of Microblogs," uses machine learning techniques to analyze sentiment from large volumes of microblogs and predict stock price movements for a 24-hour period. The model combines several sentiment analysis techniques and considers the sentiment expressed by multiple microbloggers. The results show that the proposed method can outperform traditional stock prediction models and demonstrate the usefulness of social media data in improving stock price predictions

In [10], the paper proposes a deep learning-based approach for feature engineering in stock price movement prediction. The method uses convolutional neural networks (CNNs) and long short-term memory (LSTM) networks to automatically extract relevant features from stock market data, such as price and volume, without manual feature engineering. The approach was tested on a large dataset of US stocks and compared to traditional machine learning models. The results show that the deep learning-based approach outperformed the traditional models and produced more accurate predictions. The paper demonstrates the effectiveness of deep learning-based feature engineering in stock price prediction.

In [11], the "Stock Market Forecasting Based on Text Mining Technology" paper proposes a method for predicting stock prices using support vector machines (SVM) and text mining technology. The approach involves analyzing news articles and other textual data to extract sentiment, named entities, and other relevant information, which is then used to train the SVM model. The paper compares the performance of the SVM method to other machine learning approaches and finds that it outperforms them in terms of accuracy. The paper demonstrates the potential of using text mining technology to improve stock price prediction, particularly in the context of news articles and other textual data

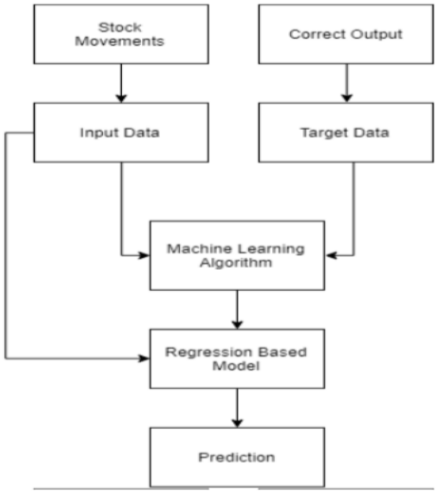
III. PROPOSED SYSTEM



The process that was followed was a simple process of applying sentiment analysis in the historical news dataset to analyze the news trend of good or bad. The other side was applied with different Arima model time series processes to catch the trend of the technical data and predict the future result for it. After both parts are done through the Time series sequence generator we will combine both the dataset and by merging the new dataset new models would be used for good prediction accuracy and results. The database used in the paper was of Historical Numerical data and News data for that duration. The Arima model was used for numerical data and the Sentiment analyzer was used for News data for getting the sentiments of the news for the better accuracy of the final output. By combining both the data through date time series the new dataset will form and would be applied for further models.

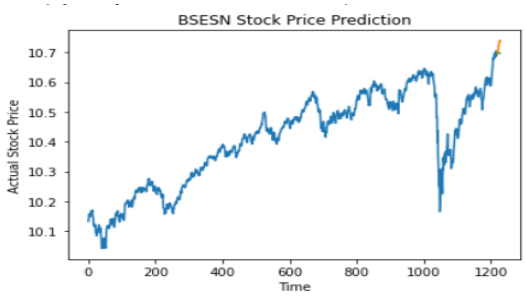
IV. SYSTEM DESIGN AND IMPLEMENTATION

Stock market prediction seems a complex problem because there are many factors that have yet to be addressed and it doesn't seem statistical at first. But by proper use of machine learning techniques, one can relate previous data to the current data and train the machine to learn from it and make appropriate assumptions. Machine learning as such has many models but this paper focuses on two most important them and made predictions using them.



Regression is used for predicting continuous values through some given independent values [5]. The project is based upon the use of linear regression algorithm for predicting correct values by minimizing the error function as given in Figure 1. This operation is called gradient descent. Regression uses a given linear function for predicting continuous values: Where, V is a continuous value; K represents known independent values; and, a, b are coefficients. Work was carried out on CSV format of data through the panda library and calculated the parameter which is to be predicted, the price of the stocks with respect to time. The data is divided into different train sets for cross-validation to avoid overfitting. The test set is generally kept at 20% of the whole dataset. Linear regression as given by the above equation is performed on the data and then predictions are made, which are plotted to show the results of the stock market prices vs time [6].

V. RESULTS



We were successful in predicting the stock price for a future time stamp. The prediction for this was made by the ARIMA model. Using the concept of Euclidean distance to calculate the root mean square error. We found the metric value to be 0.02. This shows that the predicted value was not very far off the original trend. Also, we are on the way to searching and scoping with new models in the market which are related to prediction models and testing them by applying the models without data which can conclusively show us which model will be more accurate and which model should we recommend to our viewers or customers. Some models like the random forest, xgboost, and decision tree are related models to our project and will be perfect for executing them.

VI. CONCLUSION AND RECOMMENDATION

Hereby, it can be proposed that no trading algorithm can be 100% effective, not only 100%, it will typically never be close to 70% but to attain even accuracy of 40% or 35% is still good sufficient to get a good forecast spread. Although extreme attained accurateness was 39%, it was still able to closely forecast the predictable outcome and have coordinated against the company graph. Making our expectations more efficient, it can be done by including bulky data sets that have millions of entries and could train the machine more powerfully. Different activities of stocks can lead to diverse raises or lows in the forecast price, use these movements to magistrate whether a company should be traded in or not. No training Data can ever be stable, hence there is always some unevenness that can be seen in the above data spread, but to still forecast close to a consequence will also lead to a good approach if it has greater than 33% accuracy. While developing a strategy traders should always think to always have a nominal imbalance while still being above 33%accurate.

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Advanced System for Ensuring Pedestrian Safety "Real-time Pedestrian & Infrared Image Detection"

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***Abstract*— Human detection is a technology that detects human shapes in the image and ignores everything else. However, modern person detectors have some inefficiencies in detecting pedestrians during video surveillance at night, and the accuracy rate is still insufficient. Therefore, this paper aims to increase the accuracy rate for automatic human detection at night from thermal infrared (TIR) images and real-time video sequences. For this purpose, a new architecture is proposed to enhance the backbone of the Tiny-yolov3 network. The enhanced network used the YOLOv3 algorithm's tasks with the K-means clustering method to extract more complex features of a person. This network was pre-trained on the MS. COCO dataset to obtain the initial weights. Through the comparison with other related methods showed that the experimental results have achieved the significantly improved performance of human detection from thermal imaging in terms of accuracy, speed, and detection time. The method has achieved a high accuracy rate (90%). In addition, the model has achieved a good TP detection for multiple small size of person. By improving the performance of human detection in thermal imaging at night, the method will be able to detect intruders in the night surveillance system.**

Keywords: Human detection · Thermal infrared (TIR) imaging · Surveillance · Tiny-yolov3.

I. INTRODUCTION

Object detection is an essential task in the computer vision field. This task is to determine the different classes of objects, including a person. Due to security and safety development using computer vision technologies, research has turned to human detection. Human detection involves both the detecting of human existence in the images and the recognition of the boundaries that surround each individual. In recent years, human detection technology plays an essential role in many areas, such as identity verification, autonomous driving, surveillance, robot, and search and rescue (SAR).. In general, object detection and recognition technologies fall either within the machine learning-based approaches or deep learning-based approaches (or modern methods). Compared with the early method, modern methods have higher accuracy, shorter computing time, and easier processing. Because these methods used rapid libraries (e.g., OpenCV, Tensorflow, cvlib, etc.) available in computer vision with GPU acceleration can provide optimized results at comparable frame rates and make them attractive first option. Moreover, most of the problems present in early object detection methods have been substantially solved using deep learning methods, in which fixes are introduced at the expense of more calculations. Therefore, there have been great efforts to design state-of-the-art methods based on deep learning approaches that are typically used in object detectors. These approaches indicated that to detect objects with high-precision definition features. However, it is still challenging to classify images that contain more than one object.

Most of the previous studies indicated that the efforts to obtain satisfactory performance for human detection and recognition. However, some studies have some problems and difficulties because each individual in the dataset has a unique appearance and body shape. Based on the above reasons, there have been significant developments in computer vision technologies for human recognition. Although object detection in the visible spectrum (or RGB) domain imaging has matured, thermal imaging detection lacks effectiveness. Nevertheless, some modern methods have been proposed to detect people from thermal images. For example, the YOLO method was used to detect humans in thermal imaging captured at different distances from the thermal camera with the telephoto lens under various weather conditions. In addition, the attention guided encoder–decoder based on CNNs used for pedestrian detection at night in infrared images. Besides, the YOLOv3 Human model used the integrated method for face and gait recognition to address the human detection in thermal images at night. Besides that, Wang et al. learn the model to detect pedestrian in night surveillance. However, the current human detection methods are still challenges for achieving satisfactory performance from thermal imaging in night surveillance. Based on the previous studies, there is an unsatisfactory performance of real-time human detection at night from thermal imaging with less detection time. Therefore, this research was directed

to address the above problems using the Enhanced Tinyyolov3 network trained on a subset of the thermal data. The method can be achieving a high accuracy rate for human detection in real-time with less delay of detection time.

This paper aims to propose a new method for the automatically human detector in thermal infrared (TIR) images and real-time video frames at night. This study's contributions mainly relate to the following four points: (1) design a novel human detector model that can detect pedestrians or intruders at night. (2) Development of the RGB YOLO person detector to detect small and large size of people in TIR images using the enhancement of the Tiny-yolov3 backbone. (3) The proposed method leads to improving the accuracy rate of the person detector when the person walks in night surveillance areas, in relatively increase the speed and less the detection time. Therefore, the proposed method is designed differently from other related methods in network architecture, image processing, and person detector method. Thus, this method provides a new network with different deep convolution structures that involves tasks of the YOLOv3 algorithm with the K-mean clustering method, as shown below:

• Proposed network architecture includes the thermal imaging enhancement network and person detector manner network interconnected by the UP-sampling layer

• Three convolutional sets (dense/fully connected layers) were designed to classify the image and produce the outputs.

The trained model was learned on different night databases (e.g., DHU Night Dataset and FLIR Dataset), which can identify the human body via similarities according to the data obtained from a thermal camera under different walking conditions, different human activities, and various weather conditions. Thus, the enhanced network can work on a new image, test it, and predict detections in real-time simultaneously. To verify the method, a comparative analysis with other related methods is conducted on the same databases. Finally, the results of the proposed method were outperformed in terms of accuracy, speed, and detection time.

II. RELATED WORKS

2.1 Real-time object detection using YOLO networks

In 2016, Joseph Redmon et al. proposed the first version of the YOLO (YOLOv1) network, which does not need to go through the boring processes on the image to detect objects in real-time. Moreover, YOLO has benefits over other object detection methods. The YOLO network is extremely fast. And the YOLO network sees the entire image during training and testing times, so it implicitly encodes contextual details about the object classes and their appearance. Therefore, the

YOLO algorithm maintains high average detection accuracy with the fastest speed detection. However, YOLO has limitations that make it ineffective in detecting all objects because the objects in the vicinity (or nearby) cannot be predicted, especially for small objects in the same groups.

Redmon and Farhadi conducted further research on the YOLOv1 network; they were led to the publication of another paper for the second version of YOLO (or YOLOv2) entitled . Moreover, YOLOv2 has a relatively low recall. Hence, in YOLOv2, they mainly focused on improving localization and recall while maintaining classification accuracy. To encounter complexity and reduce accuracy, a Darknet-19 classification model has been proposed for use as the backbone for YOLOv2.

In April 2018, many researchers worked in deep learning methods with many experiments and error efforts to pursue the third version of YOLO. YOLOv3 is a hybrid approach between the Darknet-19 network used in YOLOv2, so it has some shortened connections to perform feature extraction. The new approach has 53 convolutional layers and a new detection metric (called Darknet-53). In YOLOv3, object detection is not sensitive enough for complex scenes, although small objects walking across the road. Despite the advantages of the YOLOv3 network, it faces complexity in its layers. The simplified Tiny-yolov3 structure has only seven convolutional layers with a small number of 3×3 convolutional layers. To achieve dimensionality reduction to extract more features, the simplified Tiny-yolov3 used the pooling layers instead of YOLOv3's convolutional layer with a step size of the improved Tiny-yolov3 network adds three convolutional layers and improves detection accuracy to extract features better. Although the improved network enhanced the detection accuracy, the parameters are increased geometrically; thus, significantly increasing the amount of computation and taking up memory resources.

Moreover, the Improved Tiny-yolov3 network increases the non-linear excitation function and enhances the extract of the most important information of data (or features) capability. Besides that, the Improved Tiny-yolov3 network detects more than 80 different object classes as YOLOv3, including a Person class.

2.2 YOLO algorithm

YOLO algorithm applies only CNN to process the images simultaneously. This algorithm divides the image into regions, predicts the multiple bounding boxes, and class predictions for those boxes. On the other hand, the YOLO algorithm only looks at the image once. After non-max suppression by the detection algorithm, the

object is recognized with a bounding box. The IoU (Intersection over Union) for object detection has been adopted for testing the clustering effect, thus avoiding the error caused by the box scale. IoU is the cluster box's overlap ratio and the center box.

The whole process of the YOLO function uses scaling losses to facilitate optimization, called sum-square errors (SSE) for the loss function. The loss is just adding a set of errors, including coordination errors, IoU errors, and classification errors (clsErr).

The problem of equivalent error values is affected by the detection of large and small objects because the localized deviation is much smaller than the corresponding position error. Thus, the total loss is specified during training data samples by the Loss function in .

The 1st row of the total loss function makes use of the sum-square error to predict location. The 2nd row uses the root-number error as the width and height loss function. The 3rd and 4th rows use SSE as the confidence-loss function. In the 5th row, SSE uses as a function for class loss of probability. Ultimately, the IoU error and classification error's loss function is determined using the function of Cross-Entropy binary classification in the YOLOv3 algorithm.

III. METHODOLOGY

This research proposes a new approach for detecting pedestrians in real-time at night, which can be implemented in safety and security systems. The new approach aims to develop the RGB YOLOv3 person detector to detect the person from thermal imaging at night. Therefore, the new deep learning network is proposed, which differs from others in deep convolution layers. The proposed person detector manner (PDM-Net) was designed by adding extra convolutional layers. In this method, the TIR image is the input of the model, which is enhanced by TIE-Net. This image is passed through the Up-sampling layer and then fits into PDM-Net. Next, the person's features are extracted via Darknet-53 and then inserted into the person detector layer for classification. Besides that, the YOLOv3 algorithm is used to detect persons in real time. Because this algorithm uses the K-mean clustering method to cluster image data for obtaining excellent priority boxes of the targets. Moreover, the method calculated the IoU scores and chose the specific k values to detect only one object (Person) class according to the body features. Finally, the proposed method's results were evaluated compared to previous results on the FLIR and DHU Night datasets in terms of accuracy, speed, and detection time.

3.1 Network architecture

The proposed network is inspired by the Enhanced Tinyyolov3 network backbone with Darknet-53 architecture. In addition to creating the necessary txt files in the YOLOv3 compatible format for training and testing. The proposed network (update the Tiny-yolov3 backbone) is trained with the previously extracted person's features using the YOLOv3 algorithm's task. Moreover, the performance is effectively improved by adding three image classification scales.

The size is reduced twice each time it crosses the convolution layer. Every time is passed through the deconvolution layer, and the size is doubled. Asymmetrical network architecture occurs with serial communication during deconvolution. This part is useful for further reducing information loss when transmitting information between the convolution layers. Besides, the accuracy of person detection in TIR images will increase significantly.

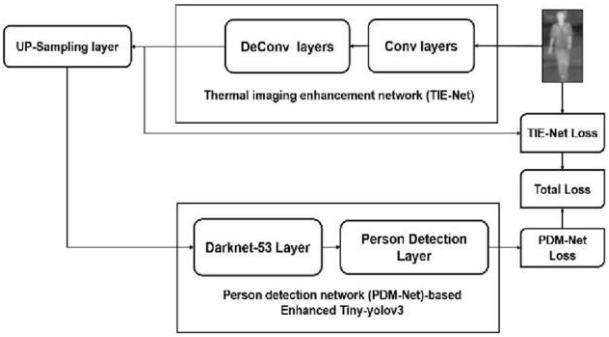

Fig. 1: The proposed network block diagram

When the process is performed on the sequenced samples, the sequence approximation for the image sampling is produced at a lower rate (or density).

This layer takes a high-resolution image as guidance based on an observation that depth discontinuities often cooccur with color or intensity changes. The need for the Up-sampling instructions is because the pooling indicators computed at the max- pooling stage from the encoder corresponding to the non-linear sampling are required to be used in the person detection network.

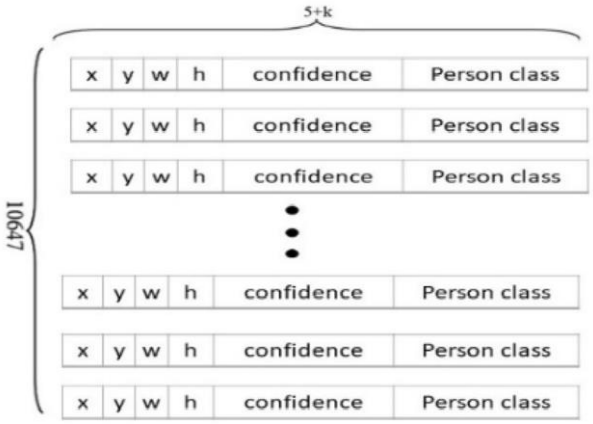

Fig. 2: Network output format

Although there are several separate predictors for each image, they were all calculated simultaneously; this indicates that the network is powerful and fast.

3.2 Training

This section is concerned with collecting and preparing data for training. To learn a model, it is necessary to set up an experimental environment for the learning model and choose an appropriate dataset. First, make sure you install the Python 3.0 program with OpenCV and Tensorflow on a GPU computer. We recommended using the Tensorflow GPU with an Nvidia GPU. The setup environment for the experiments. Once set the environment, make a folder for this project and use the method to train the custom PDM-Net.

3.3 Dataset

There are a lot of existing thermal imaging databases in the literature. However, most thermal databases are didn't fully match in detecting people in various security scenarios such as unauthorized movement in secreted areas, and sneaking around protected places for different distances from the camera at different weather conditions when the people walking at night. Additionally, some databases didn't include annotations in the YOLO format. Due to the limited availability of the thermal imaging databases with annotations, a custom DHU Night Dataset is used to better fits the set goals of real-life people's conditions during the night time.

Table 1: Setup the experimental environment

Names	Related configuration
Operating System	Windows 10 Pro 64-bit
CPU	Intel ® Core (TM) I710750H CPU @ 2.60 GHz (12 CPUs) ~ 2.6 GHz
Memory	32.00 GB RAM
GPU	NVIDIA GeForce GTX 1080, 1
GPU Acceleration Library	CUDA 9.0, CUDNN7.4

The LabelImg Open-Source software was used to annotate/label data for all video sequences of persons into two YOLO and PASCAL VOC formats. The annotation framework must be available with tagged persons in the learning set and the test set and serve as the ground truth.

In February 2017, Marina et al. were collected the FLIR Dataset. This dataset is recorded people during the night time in different walking and weather conditions at different ranges from the camera. The images or videos captured a person moving in the normal walking, hunched walking positions, normal walking speed, and running. After recording the videos, the video frames were individually extracted to create the dataset. 15,000 images were obtained with a telephoto lens on clear, fog, and rain conditions, and about 6000 images were taken with the normal lens on clear weather conditions. For the training, 1000 images were used for each weather condition. The thermal images were manually annotated using the VGG Image Annotator (VIA).

3.4 Prepared data for training

This stage serves the proposed network training on our custom dataset. The pre-trained model-based method is used to train the DHU Night Dataset, which has Tiny-yolov3 architecture within the Darknet-53 framework. In this case, the trained weight has formed the original author of YOLO, and then we adjusted the threshold parameter to improve the results. Moreover, the proposed network can be evaluated on our custom (DHU Night Dataset) dataset to validate. Note, the DHU Night dataset was the first-time training based on the YOLO network. Let us create the data_obj.data files that are compatible with Darknet-53 frameworks, such as:

• Classes.txt file—the file was used earlier with LabelImg and contained the object classes. The class file defines the number of object classes that we are training the network to detect the person. In our case, this file contains one class (person).

• Train.txt file—darknet53 expects a text file that lists all the images used for training and validation. 60–70% of the total dataset has been allocated to training, and the remainder was kept for testing.

• Test.txt file—the file contains all images which will be used for testing.

• Backup file—the file defines the place where the darknet53 will save the trained weights.

Once these text files have been created, they must be stored, left, and worked on conveniently in the My Project directory. Our formed data will be used for training and testing to detect the person. Finally, the current network architecture allows an end-to-end training model with high average precision. In addition, it has a delay in detection time of 4.88 ms (milliseconds) while the model trained on the DHU Night Dataset and 10 ms on the FLIR Dataset.

3.5 Training protocol

The proposed model was pre-trained on visual (RGB) images and then trained on night (TIR) images. This

model tries to achieve compatibility with trained models to achieve a large number of object classes including person class, as well as obtain the initial weights. Besides, the labels and classification of the TIR images are useful for reducing the field gap between RGB and TIR images. This type of processing provides a dynamic range, contrast, and blur. Since no preprocessing can cover all aspects individually, supplying the Tiny-yolov3 with preprocessing combinations allows more than one thing to be tackled at once, thus enhancing the output.

There are two aspects to improve accuracy and increase detection time: Improve the image quality and select an object detection algorithm. In our case, TIR images were processed to optimize the dataset. The dataset is then trained using the YOLO detection algorithm. This algorithm generates the primary weights of training.

IV. EXPERIMENTAL RESULTS AND ANALYSIS

The experimental results were obtained by applying Python 3.0 code on a GPU computer to evaluate the person detector model's performance in the TIR images. There are several standard criteria used to evaluate the model in terms of accuracy and speed. The average precision (AP) value is the primary one in terms of accuracy. The various thermal imaging databases, such as models of the YOLO, TF-YOLO and YOLOv3 Human.

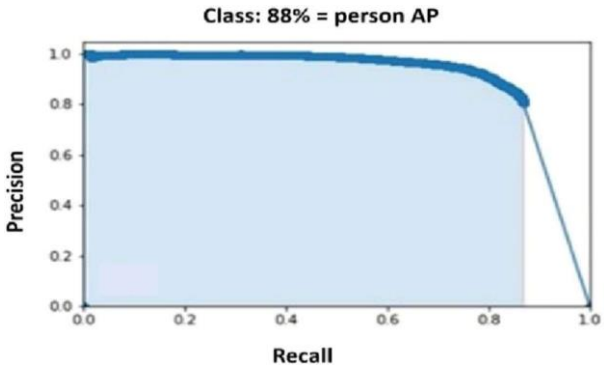

Fig. 3: Evaluation test of TF-YOLOv3 model trained on the DHU Night Dataset

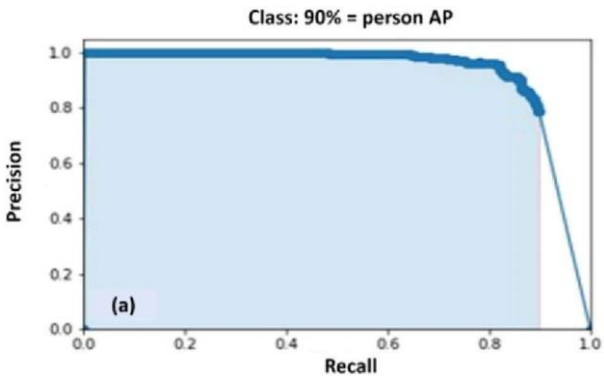

Fig. 4: Evaluation test of the proposed method trained on the DHU Night Dataset

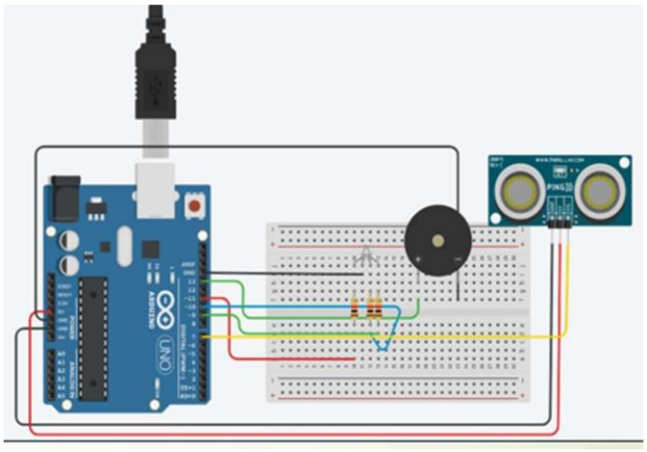

Fig. 5: Circuit Diagram

Finally, to facilitate the person detector in real time, pedestrian videos were recorded from a thermal camera in real-time. They chose four different appropriate clips in front of, right side, left side, and pack side for testing. The trained network is looking at the TIR image only once; if someone is detected in the image, the network predicts the person's boundary boxes and then observes the screen's output (Fig. 6). Figure 6 shows the detected person is illustrated on the green rectangle bounding box. Each detected person was presented in a boundary box, including the confidence score demonstrating the reliability of detection.

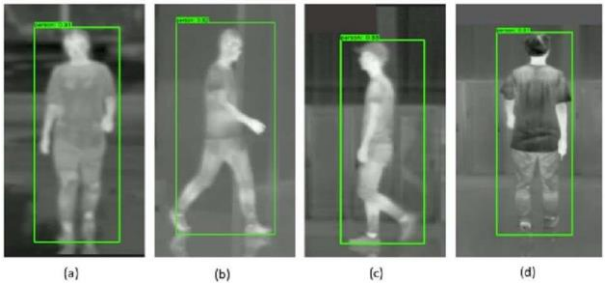

Fig. 6: Person detection process at different regular walking conditions: a the person in front of the camera (0°); b the person on the right side from the camera (90°); c the person on the left side from the camera (180°); d the person is behind the camera (360°).

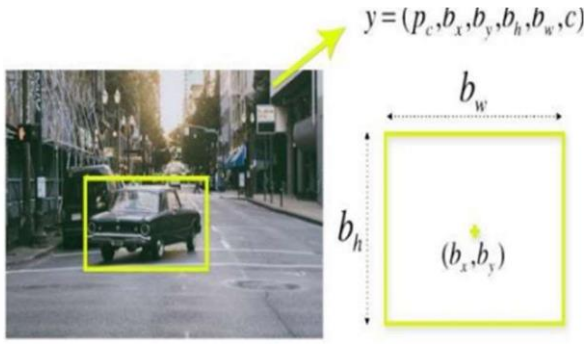

Fig. 7: Bounding Box Regression technique used by YOLO algorithm

In contrast, the AP value of the proposed method is less than the AP value of the YOLOv3-Human model (67.54) [25]. This is due to use of a fusion method of combining

different parameters (e.g., the general body transactions and gait features) to extract a person's features in the YOLOv3-Human model, while the current method used only human body transactions for feature extraction. However, the detection time of the proposed method (8 ms) to detect a person in an image is less than the TF-YOLO (10 ms) and YOLOv3Human (8 ms) models. Furthermore, the method was evaluated based on true positive (TP) detection of a person in real time under different situations. As a result, the TP detection of the proposed method is better than the TP detection of the YOLO model (Fig. 6) for the detection of small and multiple people

Figure 8 shows examples of the real-time human detection results for the proposed method and the YOLO model on the FLIR dataset regard to thermal images captured at different distances from the thermal camera with the telephoto lens under various weather conditions. The YOLO model has the TP detection of a person in the normal walking case on TIR images at rain

Depending on the above results showed that the learning on thermal imaging database is significant improvement the human detection at night under different human activities and various weather conditions; especially when the human walking at different distances from the thermal conditions, with a distance of 70 m from a camera, Fig. 7. Besides that, the person is also correctly detected in the YOLO model while in the same rain condition in the case of the hunched walking at 100 m distance, Fig. 8. In contrast, the YOLO model had TP detection only in a normal walking at fog condition with a distance of 50 m, Fig. 11c. Interestingly, in the same weather condition and distance, the YOLO model failed to detect the person when a person was hunched. On the other hand, the change in the behavior of the people and their activity (normal walking, hunched walking, hiding walking, and running) under the changed weather conditions did not affect the TP detection results of the small persons in the proposed model, and the results are shown in Fig. 11d, e, f, respectively.

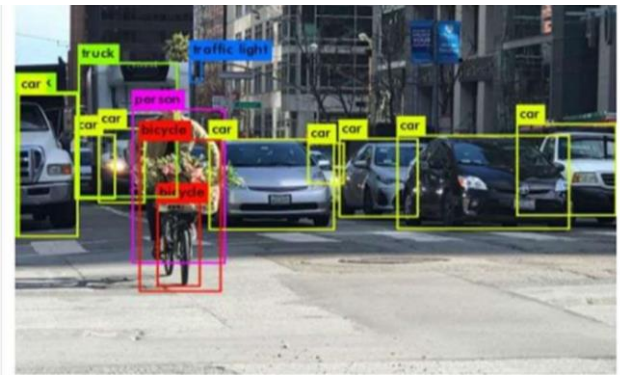

Fig. 8: Detection of vehicle and humans

Furthermore, the boxes in the YOLO model have ignored some scores less than the threshold; while this does not happen in our method. To obtain the thresholding by object confidence, the boxes are filtered based on their abjectness score. As a result, the final score's confidence of the method is 50% or more (The threshold depends on the accuracy). Camera and the environment is large. Finally, the method achieved a good balance between the accuracy, speed, and detection time; and this was ideal for pedestrian detection under real time environments.

V. CONCLUSION

This paper aims to propose a novel efficient deep person detector that detects pedestrians from TIR images, real-time video frames at night. To achieve the goal, convolutional layers are enforced contrast at the channel level to enhance. The TIE-Net is used to process and optimize the TIR image by reducing information loss when transmitting information between the initial convolution layers. The PDM-Net mainly includes the Darknet-53 and PDL-Net. The person's features are extracted from the TIR image through the passing the Darknet-53 and then fit into the PDL-Net for classification. A detailed comparison is presented between the proposed method and the other related results on the different night databases for validation. Furthermore, the method is also a higher accuracy rate (48.8%) than the YOLO (29.36%) and TFYOLOv3 (29.8%) for detecting the multiple small size of persons on the FLIR Dataset. In contrast, the method has a lower accuracy than the YOLOv3-Human (54.68%), but the delay in detection time (6 ms) is less. As a result, the proposed method outperformed compared with the other previous relevant studies; in addition to adapting when detecting video frames in complex night environments by running under sufficient speed and detection time. Thus, this method can be implemented within the surveillance system to protect humans and public facilities from intruders at night times. Although the model has achieved a better accuracy rate with the lowest detection time, the accuracy rates for detecting the small or large size of people at night are not accurate enough. Besides that, human detection in full darkness needs some condensation in future studies. Finally, we are recommended for future work to use the method for detecting different objects with multiple classes in full darkness or underwater.

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Diseases Prediction using Machine Learning

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***Abstract*—The prevalence of computerized technology in the healthcare industry has resulted in the accumulation of electronic data. With so much data, doctors face the challenge of accurately analyzing symptoms and recognizing disease early. However, supervised machine learning (ML) algorithms show great potential to outperform standard disease diagnostic systems and assist medical professionals in early detection of high-risk diseases. The purpose of this paper is to identify trends in different kinds of supervised ML models in disease detection by examining performance metrics. The most prominently discussed supervised ML algorithms were Naive Bayes (NB), Decision Trees (DT), and K-Nearest Neighbor (KNN). According to the results, support vector machines (SVM) are best suited for detecting kidney disease and Parkinson's disease. Logistic regression (LR) is very good at predicting heart disease. Finally, random forests (RF) and convolutional neural networks (CNN) accurately predict breast disease and common disease, respectively.**

Keywords: Decision tree, machine learning, Naive bayes, random forest, cnn, logistic regression.

I. INTRODUCTION

Disease prediction systems using machine learning have the potential to revolutionize healthcare by providing early and accurate diagnoses, enabling early intervention, and ultimately improving patient outcomes. The field of machine learning has seen significant advances in recent years, and this technology is increasingly being applied to the medical domain to predict a wide range of diseases including cancers, cardiovascular diseases, and infectious diseases.

Machine learning algorithms use mathematical models to learn from data and make predictions. In the context of disease prediction, machine learning models are trained on medical data such as patient records, demographic information, and lab test results. The algorithms use this data to identify patterns and relationships between various risk factors and disease outcomes. Once trained, these models can make predictions about the likelihood of a disease given certain symptoms or risk factors.

One of the most commonly used algorithms for disease prediction is logistic regression, which is a statistical method used for binary classification problems, such as predicting the presence or absence of a disease. Other algorithms include decision trees, random forests, Naive Bayes, and support vector machines.

One of the benefits of using machine learning algorithms for disease prediction is that they can handle large amounts of data, including both structured and unstructured data. They can also handle non-linear relationships between input features and disease outcomes, which is often the case in medical data. Additionally, machine learning algorithms can learn from historical data, continuously improve their predictions, and provide new insights into disease risk factors.

However, it is important to be mindful of the limitations of machine learning algorithms in the context of disease prediction. One of the main limitations is that machine learning models can only make predictions based on the data they have been trained on. This means that if the training data is biased or incomplete, the predictions made by the model may not be accurate. Additionally, machine learning models are only as good as the data they are trained on, so it is important to ensure that the training data is of high quality.

Another important consideration is the ethical and legal implications of using machine learning algorithms for disease prediction. For example, machine learning models may reveal sensitive information about patients, such as their genetic predisposition to certain diseases. This information could have serious consequences for individuals and their families, and it is important to ensure that appropriate safeguards are in place to protect patient privacy.

Machine learning algorithms have the potential to significantly impact healthcare by enabling early and accurate disease prediction. However, it is important to be mindful of the limitations and ethical and legal implications of using this technology in the medical

domain. Further research is needed to evaluate the accuracy and reliability of machine learning models for disease prediction and to develop methods for ensuring the privacy and security of patient information.

II. PROBLEM STATEMENT

Despite advances in medical technology, disease diagnosis remains a challenging task for healthcare providers. Traditional methods of disease diagnosis are often time-consuming, labor-intensive, and can lead to missed or delayed diagnoses. The aim of this project is to develop a machine learning-based disease prediction system that can accurately predict the presence or absence of a disease at an early stage, enabling early intervention and improved patient outcomes. The system will analyze patient data, including demographic information, medical history, and lab test results, to identify patterns and relationships between risk factors and disease outcomes. The goal is to create a reliable and efficient system that can assist healthcare providers in the diagnosis and treatment of diseases.

III. METHODOLOGY

WThe methodology for a disease prediction system using machine learning would typically involve the following steps:

Data Collection: The first step in the development of a disease prediction system using machine learning is to gather and organize relevant data. This could include patient records, demographic information, lab test results, and other relevant medical data. The data should be obtained from reputable sources and should be of sufficient quality and quantity to train machine learning algorithms.

Data Pre-processing: Once the data has been collected, it must be pre-processed to ensure that it is in a format suitable for training machine learning algorithms. This may involve cleaning the data, dealing with missing values, and transforming the data into a numerical format. It may also involve normalizing the data to ensure that all variables are on the same scale, as well as transforming categorical variables into numerical variables using one-hot encoding or other methods.

Feature Selection: The next step is to select the most relevant features, or input variables, to include in the machine learning models. This may involve using exploratory data analysis techniques such as correlation plots and feature importance plots to identify the features that are most strongly associated with the disease outcome. It may also involve using statistical methods such as chi-squared tests or ANOVA to assess the significance of individual features.

Model Selection: The next step is to select an appropriate machine learning algorithm for the problem. There are many different types of machine learning algorithms that can be used for disease prediction, including logistic regression, decision trees, random forests, and neural networks. The choice of algorithm will depend on the specific requirements of the problem, such as the number of features, the complexity of the relationship between the features and the outcome, and the computational resources available.

Model Training: Once the machine learning algorithm has been selected, the next step is to train the model using the pre-processed data. This involves using techniques such as cross-validation to evaluate the performance of the model on a separate validation dataset. The goal is to identify the best set of parameters for the model that result in the highest accuracy, precision, recall, and F1 score.

Model Evaluation: The trained machine learning model must be evaluated to assess its performance. This may involve using metrics such as accuracy, precision, recall, and F1 score to evaluate the model on a separate test dataset. It may also involve using visualizations, such as ROC curves and confusion matrices, to further assess the performance of the model.

Model Deployment: Once the machine learning model has been trained and evaluated, it must be integrated into a software application or platform for use in routine patient care. This may involve integrating the model into an existing electronic medical record system, or developing a standalone application that can be used by healthcare providers.

Validation and Testing: The final step is to validate and test the machine learning model in real-world settings. This may involve using the model to predict disease outcomes on a large and diverse dataset, as well as evaluating its performance in comparison to other existing methods of disease prediction. The goal is to ensure that the model is reliable and can accurately predict disease outcomes in real-world settings.

This methodology provides a general overview of the steps involved in developing a disease prediction system using machine learning. The specific methodology may vary depending on the disease being targeted, the data sources available, and the goals of the project. However, the overarching aim is to develop a reliable and efficient system that can assist healthcare providers in the diagnosis and treatment of diseases.

The steps in our suggested methodology are as follows:

i. I will first compile data sets on symptoms and their physiological problems.

ii. After that, I will gather data linking the symptoms to potential diseases and compiling data on related diseases.

iii. I will then collect the patient's symptoms as input and use multilinear regression to analyze them.

iv. Subsequently, multilinear regression makes predictions about potential diseases based on those acquired symptoms.

v. Following that, the system will display the diagnostic as the worst possible disease and the best possible disease.

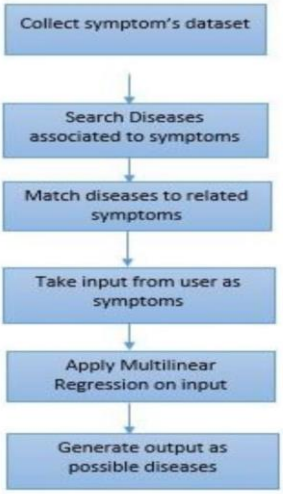

Fig 1: Flow chart of proposed method

IV. SCOPE OF PROJECT

There is an urgent need to develop more complex ML algorithms to increase the efficiency of disease prediction. Additionally, after the training phase, the learning model should be tuned more frequently to improve its performance. Additionally, the dataset should be extended to different demographics to avoid overfitting and increase the accuracy of the models used. Finally, more relevant feature selection methods should be used to improve the performance of the learning model.

V. REQUIREMENT SPECIFICATION

In this project we have used two algorithms of Machine Learning- Naive Bayes Algorithm and Bayesian Theorem.

The Naive Bayes algorithm is a probabilistic machine learning algorithm that is widely used in medical diagnosis and disease prediction. The algorithm is based on Bayes' theorem, which states that the probability of an event occurring can be calculated based on prior probabilities and the likelihood of the event given evidence.

In the context of disease prediction, the event is the presence or absence of a disease, and the evidence is the patient's symptoms and test results. The Naive Bayes algorithm uses Bayes' theorem to calculate the probability of each class (disease present or absent) given the patient's symptoms and test results. The class with the highest probability is the prediction made by the algorithm.

The "naive" aspect of the algorithm refers to the assumption that all features are independent, which is usually not the case in real-world scenarios but helps simplify the calculations. This independence assumption makes the algorithm computationally efficient, allowing it to be applied to large datasets in real-time.

The Naive Bayes algorithm can be implemented using either the Gaussian Naive Bayes, Multinomial Naive Bayes, or Bernoulli Naive Bayes algorithm. The choice of algorithm depends on the type of data being used for training. For example, Gaussian Naive Bayes is used for continuous data, such as age, whereas Multinomial Naive Bayes is used for discrete data, such as the presence or absence of symptoms.

In a disease prediction system using ML, the Naive Bayes algorithm can be trained on a large dataset of patient records and symptoms. The training process involves estimating the probabilities of each class given the patient's symptoms and test results. These probabilities are used to make predictions on new patients.

One of the advantages of using the Naive Bayes algorithm is that it is fast and efficient. The algorithm is capable of handling large datasets and can make predictions in real-time. Additionally, the algorithm is easy to implement and does not require extensive pre-processing of the data.

Another advantage of the Naive Bayes algorithm is its ability to handle noisy and missing data. The algorithm is robust to missing values and can still make accurate predictions even if some of the data is missing. Despite its advantages, the Naive Bayes algorithm has some limitations. The independence assumption may lead to incorrect predictions if the features are highly dependent on each other. Additionally, the algorithm may not perform well on small datasets, as it requires a large amount of data to estimate the probabilities accurately.

In conclusion, the Naive Bayes algorithm is a powerful tool for disease prediction in medical diagnosis. The algorithm is fast, efficient, and can handle large datasets and missing data. However, the independence assumption may lead to incorrect predictions and the algorithm may not perform well on small datasets. Despite its limitations, the Naive Bayes algorithm is widely used in disease prediction systems due to its ease of implementation and accuracy.

Table 1: Comparative study using various algorithms in the literature review

Year	Author	Purpose	Technol-ogy used	Accura c-y
2017	MIN CHEN et al, [1]	Proposed a disease prediction system in his paper where he used machine learning algorithms.	CNN-UDRP algorithm, CNN-MDRP algorithm, Naive Bayes, K-Nearest Neighbor, Decision Tree	94.8%
2018	Sayali Ambekar et al, [2]	Recommended Disease Risk Prediction and used a convolution neural network to perform the task	CNN-UDRP algorithm, Naive Bayes and KNN algorithm	The highest accuracy of 82% is achieved by Naïve Bayes
2015	Naganna Chetty et al, [3]	Developed a system that gives improved results for disease prediction and used a fuzzy approach	KNN classifier, Fuzzy c-means clustering, and Fuzzy KNN classifier	Diabetes: 97.02 % Liver disorder: 96.13 %
2019	Dhiraj Dahiwade et al, [4]	Designed a model for prediction of the disease using approaches of machine learning	K-Nearest neighbor (KNN) and Convolutional neural network (CNN)	KNN: 95% CNN: 98%
2016	Dhomse Kanchan B. et al, [6]	Studied special disease prediction utilizing principal component analysis using machine learning algorithms	Naive Bayes classification, Decision Tree and Support Vector Machine	Diabetes Disease: 34.89 % Heart Disease: 53%

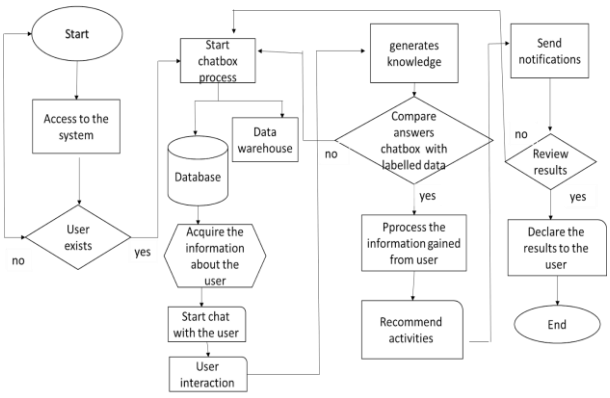

Fig 2. Implementation

VI. RESULTS AND DISCUSSION

The technique known as illness prediction using machine learning makes predictions about diseases based on symptoms provided by patients or other users. The user's symptoms are processed by the algorithm, which then outputs the likelihood that the user will get the condition.

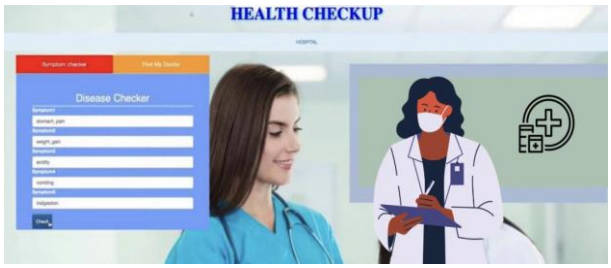

Fig 3. Entering symptoms

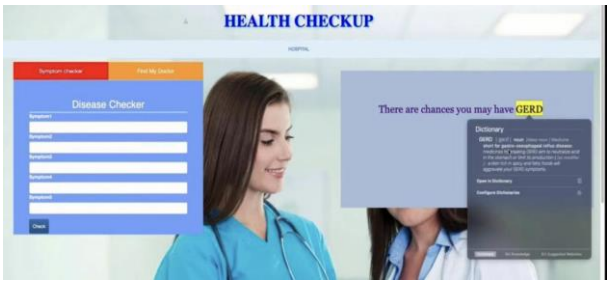

Fig 4. Predicting diseases and accuracy

It is part of the project for participants to input symptoms that can be used to predict diseases. Users can select a minimum of one symptom and maximum of five symptoms. The accuracy will be lower if only one symptom is entered. The more symptoms there are, the more accurate the prediction. The purpose of this systematic review is to determine the performance, limitations, and future use of software in health care. It may be helpful in informing future developers of Disease Predictability Software and in promoting personalized care for patients. Future research must focus on developing more sophisticated ML algorithms to improve the accuracy of illness prediction. In addition, for possible improvements, learning models should be calibrated more often following the training period. Performance. Additionally, datasets should be expanded on various demographics to prevent overfitting and improve the deployed model's accuracy models. The use of more pertinent feature selection techniques should be made to improve the learning models' performance.

VII. CONCLUSION

Multiple data mining and machine learning algorithms and techniques have been compiled to predict diseases. The proposed system can be utilized in accordance with one's requirements, and each algorithm has its own performance in disease prediction. If independent variables or features are chosen more accurately, the algorithm's performance and accuracy can also be improved. After investigating these approaches, it was discovered that the accuracy of predictions is enhanced when we have a structured dataset. For a given disease, the most accurate predictions can be made by collecting millions of structured datasets, and data mining can assist us in doing so.

These reviews have demonstrated that any machine learning model can be enhanced through multiple revisions and modifications to the algorithms it employs. There are times when it benefits the model, and there are times when it harms the model's performance.

In conclusion, a review of the available literature revealed that, while a single algorithm may not be very effective, it is possible to significantly increase accuracy by combining it with other algorithms. Therefore, the combination of these algorithms ought to be used in multiple sequences, and a comparison ought to be made to determine which of these combinations accurately predicts the disease better than the others.

These prediction systems' performance, scalability, and accuracy could all be enhanced by taking advantage of a wide range of future options. Although the following research options can be carried out in the future, it is not possible to investigate each and every option in this short amount of time. To determine how much accuracy has been improved, a variety of decision trees and neural networks, as well as multiple classification and regression techniques, should be utilized.

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Gesture Control for Disabled People

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***Abstract*- India is the world's largest democracy. And to elect the leader of that democracy, world's largest electoral process in conducted throughout the country. When it comes to electing a leader, it is the responsibility of its people to select the best who can represent them and their point of views the best. It is a right of every individual who is eligible to cast a vote and support their representative. Although the government has been trying to implement different features in the election process to increase the accessibility for the disabled people still there is a lot of room for improvement. The product is designed in such a way that it becomes easier for the disabled people to vote and cast their opinion in the election process.**

I. INTRODUCTION

According to World Bank data, India has 40 to 80 million persons with disabilities whereas the 2011 census pegged this figure at 26.8 million, number disputed by disability rights activists, who say that the actual figure is much higher.

Persons with disabilities have been fighting for long for their right to vote on a par with other citizens. Voters having one of the 21 disabilities, mentioned by the Rights of Persons with Disabilities Act 2016, are termed as voters with disabilities. The 21 disabilities include blindness, low vision, dwarfism, locomotor disability, intellectual disability, mental illness, among others. For the PwD category, the barriers to electoral participation, experts say, have been many: inadequate or inaccessible voter education, difficulties in voter registration and physical access to polling stations , inability to vote independently and privately, and the absence of or inappropriate assistance from poll personnel. So far, the focus has mostly been on wheelchairs, the ramps and braille, which many activists call the one- size-fits-all approach. No wonder then persons with disabilities will tell you there is a long way to go before the elections can truly become accessible for them.

Generally Disability have three categories i.e. Quadriplegic, Paraplegic or Hemiplegic.

A. Quadriplegic: Affected by or relating to paralysisof all four limbs.

B. Paraplegic: affected by or relating to paralysis ofthe legs and lower body. effective prototype of electoral voting machine for disabled people, thus providing a solution to their long fought right.

II. LITERATURE SURVEY

1. Diksha Goyal and Dr. S.P.S Sain: Presented the "Accelerometer-based hand gesture controlled wheelchair "Which describes the work in gesture reorganization use as an application as a wheelchair. In this case, was conducted is gesture is recognized through 3 axes accelerometer sensor. A system is consisting of use sensors for detecting gestures or hand movements. In this system, the gesture is recognized by the MEMS accelerometer sensor (Micro Electro Mechanical System). An accelerometer is an electromechanical device that measures the acceleration forces. This accelerometer sensor is 3 axes sensor it will attach to the fingertips and back of the hand. It is a movable device. When it moves the gesture is recognized and the wheelchair will operate according to the movement of the sensor. After studying the design of an "Accelerometer-based hand gesture controlled wheelchair "one come to know the system totally depends on the sensor. If the sensor cannot move in an angled position or direction this system cannot work hence this system is not as much as user-friendly. This system does not provide reliable support for a disabled or handicapped person.

2. Feng-shengChen, Chin-Ming Fu, and Chung–LinHuang: Presented the "Hand Gesture Recognition using a real-time tracking method and Hidden Markov Models" which describes the introduction of a hand gesture reorganization system to recognize the continuous gesture before stationary background. In this system, the motion of the object gives important and useful information for object localization and extraction. The

overall system includes four modules such as follows real-time tracking, extraction, feature extraction, and Hidden Markov Model (HMM) training. To trace the moving hand and extract the hand region when applying the real-time hand tracking and extraction algorithm. To characterize the spatial feature and motion analysis to characterize the temporal feature use a Fourier Descriptor (FD).combine the spatial and temporal feature from input image sequences as our feature vector then apply the HMM model then recognize the input gesture. After studying a design of "Hand Gesture Reorganization using a real-time tracking method and Hidden Markov Models" we observe that this system depends on the

HMM model to recognize the gesture. To recognize the gesture the complexity is more and accuracy is less so it not beneficial and not compatible with the user.

3. IoT: SmithaPaulose, M.P.Fathima, Anooda GeethuMohan, M.S.Sajana, K.A.Anupama: The author presented by "Automatic Wheelchair Using Gesture Reorganization Along With Room Automation "using MEMS Accelerometer sensor This system approaches to real time detection, Tracking and reorganizational direction of hands which is used for interaction between human robot and intelligent wheel chair. This system intended that the accelerometer sensor is used foe to convert fingers and hand gestures into computer interpreted signal. The accelerometer data is calibrated and filtered for gesture or finger reorganization. For the wheelchair control we use a 3 axis accelerometer, which effectively translate finger and hand gestures into computer interpreted signal. This system is not affordable for patients for handling view so it not so user friendly.

4. IoT:Devikarani Patil, Varalakshmi B.D: Presented the "Hand Gesture Recognition for MP3player using Image processing Technique and PIC16F8779" describes the at gesture is recognized by the image processing through Web camera. This system proposed the gesture image is taken from web camera and image will be processed in remote interface using MATLAB controller. When capturing image is forwarded to the MATLAB it campers to the database via the (x, y and z) readings of particular objects. The movement of the object in any direction then values is noted by accelerometer the movement of accelerometer to the particular set of directions it will recognize the gestures or particular direction to operate application. This system used the K-L Transform for recognizing purpose through image processing. One problem of this system is the captured image is always in the puzzling task of separating different sources of images when its different or noisy so it is not as much as effective.

III. TOOLS USED

Sr No.	Tools	Specification
1a	HTML	Used to make the Structure of the whole Voting Portal.
1b	CSS	Used to style the webpages.
1c	PHP	Used to make dynamic webpages and execute the code on the server side.
1d	MY SQL	Used to make the database to store all the information.
1e	XAM PP	Used to create live servers using Apache and connect database through SQL.
2a	Python	Used to write the main script of the eye controller.
2b	Open CV	Used to process and manipulate images and videos, etc.
2c	Media pipe	Used to design a facemesh.
2d	Pyauto gui	Used to pass mouse and keyboard functions to python script.

IV. PROPOSED METHODOLOGY

A. Analysis:

I. The whole project is based on the Voting website and eye controller.

II. The voting website makes it very easy to login and cast vote to the desired candidate via the eye controller.

III. The eye controller runs from a python script written with the help of various libraries such as OpenCV, Mediapipe and Pyautogui. User can move their head for the mouse cursor to move and can blink their eye for a click to happen.

IV. This gives great flexibility to do the work the model is designed to work.

B. Voting Portal:

I. Build a voting portal using HTML, CSS, PHP.

II. Create an index page and route it to other pages such as the Dashboard, Logout page, Register page and also to API pages such as the Connection, Login, Register and Vote.

III. Create a Database file using MYSQL and linking it to the PHP model. Lastly we use XAMPP to run Apache servers and run the database too.

IV. This altogether creates a simple working voting portal which can be used for real-time voting, vote-count, etc.

C. The Eye-controller :

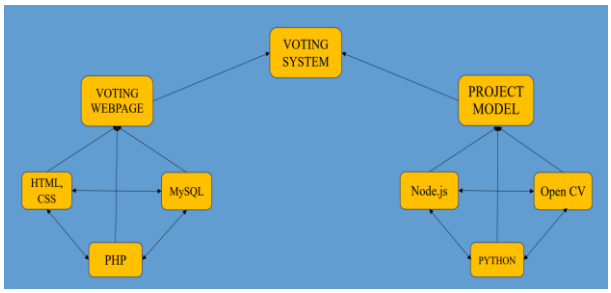
I. The Eye-Controller is an eye controlled mouse application which will be helpful for running the mouse cursor and do tasks with the help of our eye.

II. The code was written in Python and libraries used were OpenCV, Mediapipe and Pyautogui.

III. OpenCV enables us to perform various operations on images and video formats. Mediapipe will be used to gather a facemesh in order to highlight the face landmarks that are essential to us, example: the eyes, and pyautogui helps us to pass on the functions of keyboard

or mouse to the point or condition mentioned in the python script.

IV. The code was well-written and compiled and worked with no errors, thus showing one's self face and moving and clicking the mouse cursor through our eye's movement, right eye for movement and left eye for clicking purposes respectively.



V. CONCLUSION AND FUTURE SCOPE

By using this system the disabled people can find an easy way to vote freely without any external help. This provides ease of operation to the disabled person. Thus, an effective smart EVMB is developed for the differently-abled which does not take much effort to operate.

In the next models there can be much more upgrade made i.e. we can upgrade the model to assist and help other disabled people and also we can use machine learning or the artificial intelligence so that it will detect and analyze the voice command of the user/voter.

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Digitization and Storage of Personal and Public Records in Open Standard Storage Format

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***Abstract* – Technological advances around the world have made industries technology-driven. Technologies such as cloud computing, artificial intelligence, Internet of Things, etc. have become important reasons for various organizations to digitize their data and records for efficient management and storage. Digitization of records is the conversion of paper records into electronic documents, alleviating the tedious burden of maintaining and managing records and other important related issues. Government agencies use digital images to improve productivity, provide greater access to certain types of information, and as retention options. Digital images offer many benefits, including improved distribution and publishing, improved accessibility, streamlined workflows, and significantly less physical storage space. Digital files accessible over the internet allow government agencies to quickly and efficiently provide information to partners or the public. Through optical character recognition (OCR) software using Python, digital images can be turned into text-searchable files to increase accessibility and usability. It can then be stored in a database using php or a file management system in an open standard storage format.**

Keywords— Digitization, OCR, Python, php, file management system, open standard storage format.

I. INTRODUCTION

Digitization can be implemented by converting traditionally printed/printed data/documents into a computer readable digital format. Digital transformation improves processing efficiency and reduces the risk of errors. This allows you to digitize your business processes. Digitization is necessary because it is a key step in digital transformation. In the early days of the digital revolution, when much of printed information was uploaded to the Internet, manually entering such vast amounts of printed data (such as newspaper collections) became a time- and patience-consuming task. Digital images are a popular option for access and long-term storage, but they are investments that are likely to have very high upfront costs. Ongoing investment in all aspects of the imaging process continues to be required. Digital visualizations must have monetary value for the institution. In order for digitized records to be fully admissible in court, they must last for a period of accurate, complete, and approved record retention. This data entry task is also prone to human error. The result of this problem was the birth of OCR. It was invented in the early 80's. OCR is now advanced enough to extract meaningful information by extracting letters and words from images. This technique achieved near-perfect text recognition accuracy. An OCR tool, or Tesseract, can be used to convert images containing written text into a machine-readable format. Once the OCR processing is complete, it can be saved to a database using php in an open standard storage format.

II. LITERATURE REVIEW

Through a review of the recent literature, this paper presets a review on the optical character recognition techniques. Optical Character Recognition is a mobile application. The goal is to develop a user-friendly application that converts images into editable text. OCR takes an image as input and produces plain text (editable text) as output. Our proposed algorithm was based on the Tesseract library. This system can be useful in a variety of applications such as banking, legal industry, other industries, print media, and home and office automation. The authors of this article focused on creating an interface that can receive input as an image and extract text from an image by applying various preprocessing techniques centered on OCR to recognize text in an image.[1]

The purpose of this review is to summarize in a handwritten document the results of research conducted in the field of character recognition and to identify research areas. Given the ubiquity of handwritten documents in human work, optical character recognition is a science that can transform many types of documents or images into parseable, editable, and searchable data. [2]

Unlike current cloud storage solutions, which are mainly centralized storage providers, this paper proposes a decentralized storage system based on blockchain technology that can make full use of the remaining space on personal hard drives of users around the world. The storage provider issues a data integrity certificate to the user, and after verifying that the verification has passed, the user pays the storage fee to the storage provider using Lightning Network technology. [3]

Text recognition from natural images is still an urgent task in modern society. This study provides a detailed understanding of text recognition, which extracts data from handwritten or printed invoices and automatically updates them into a database. This article proposes a deep learning method for text detection and extraction that uses the EAST algorithm to parse characters and words from images or scanned documents into a machine-readable format. Then the use of Open CV with RNN

was done to recognize the text in the image and automatically update it in the database. [4]

In a study by Duke University, file formats can affect long-term preservation and reuse. While researchers may use proprietary file formats for analysis, converting data to open and/or standard formats will help ensure the data can be rendered and accessed in the future. Researchers can also chose to make data available in both preservation-friendly formats and original file formats. Best practice suggests selecting formats that are open/documented standards, non-proprietary, unencrypted, uncompressed, and commonly used by your research community. For example, when you have spreadsheet-based (aka tabular) data save the file as Comma-separated values (.csv) instead of Excel (.xls, .xlsx) and for text files use Plain text (.txt) or PDF/A (.pdf) instead of Microsoft Word (document, .docx).[6]
The concept of blockchain was introduced as the Bitcoin cryptocurrency in a 2008 white paper by the mysterious Satoshi Nakamoto. Blockchain has applications in many areas such as healthcare, Internet of Things (IoT) and data management. Data governance is defined as the collection, processing, protection and storage of information about an organization that helps make better business decisions for the company. Collected information is often shared between organizations without the consent of the information provider. Information must therefore be protected from unauthorized access or use. Therefore, organizations must ensure the transparency of the system in order to gain users' trust. This white paper presents the architectural design and development of a blockchain-based system for managing personal data. [8]
In this research paper, the authors explained how OCR systems are currently used and their advantages and limitations. This article also describes various OCR applications for collecting, managing, and processing data from document scanners. Tesseract-OCR is an optical character recognition engine available under the Apache 2.0 license. Compatible with multiple programming languages and frameworks via shell. One such wrapper is Pytesseract. Using Pytesseract and OpenCV, the author has created a simple OCR model that can perform several functions: character detection, word detection, digit only detection, handwriting to computer readable text, and multilingual text detection. The features of this model are also described in this research paper. [12]
Many offline information or contact forms available from some government agencies and similar companies use text boxes to enter information. Data from these manually filled forms must be manually entered into a machine's database and human data entry is required. The proposed system uses a combination of machine learning techniques to extract text data from these formats and automatically converts them into text that can be processed and understood by computers. [10]
Digitization and digital preservation are fast becoming standard forms of preservation for libraries, archives and other cultural heritage institutions, but there is still much confusion about their meaning and uses.

III. PROPOSED SYSTEM

3.1 Proposed System

This project develops a system which is able to digitize the entire process of storage of records. The whole system, basically reads the text data from the image and displays it in a block within the GUI. When the code is executed, the GUI interface will be seen which will allow the user to browse and upload the document. All the documents in the user's system will be accessed by the application. Once the document is browsed and uploaded, then we can read the data from image by clicking simply clicking on the button "Read data from image". The main advantage of this application is reading data from a table. Suppose an image contains a table, then by clicking on "Read tabular data from image", the text in the table will be displayed. When the output is saved and opened it will automatically open in MS Excel and the document will be editable. Now, once the document is browsed, uploaded and the data inside the image is displayed on the interface, the text data can be stored in various open standard storage formats such as .txt, .json and .csv. A new file with these extension will be made and it can be accessed in the project folder. The system also has an option to store the extracted text document on block chain as well as on databases such as MySQL.

3.2 Implementation

We use Optical Character Recognition (OCR) technology to digitize and store records. Optical character recognition systems convert a two-dimensional image of text, which may include

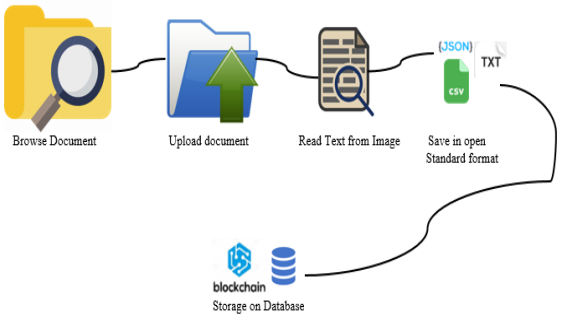

Fig 1: Proposed System

typed or handwritten text, from a graphical representation to machine-readable text. There are many OCR programs in the world and we will be using Tesseract. The optical character recognition process is shown in the flowchart above. API requests are sent to perform OCR operations. It reads the input image and preprocesses it accordingly. Text is formatted and extracted from images. Images sent to the OCR engine are computed using the trained dataset. The OCR engine analyzes the characters in the image and finds an appropriate solution. When the engine finishes parsing, it sends the data to the next preprocessing and formatting

stage to remove any unnecessary elements. After this process is complete, we finally have the text data we need. You can then generate an API response to the user with the text data converted from the image. Once you get the information you need, you can create a database using php, MySQL, etc to store it.

This project is very suitable for development because it requires only a one-time investment in software and only application customization. Once the application is set up, no additional costs are required, and new paid features can be implemented to monetize future products.

3.3 Project Inputs and Outputs

The input in our project is any image from which the text is to be extracted. The image is selected from the system and uploaded. The path of the image is displayed on the GUI as well.

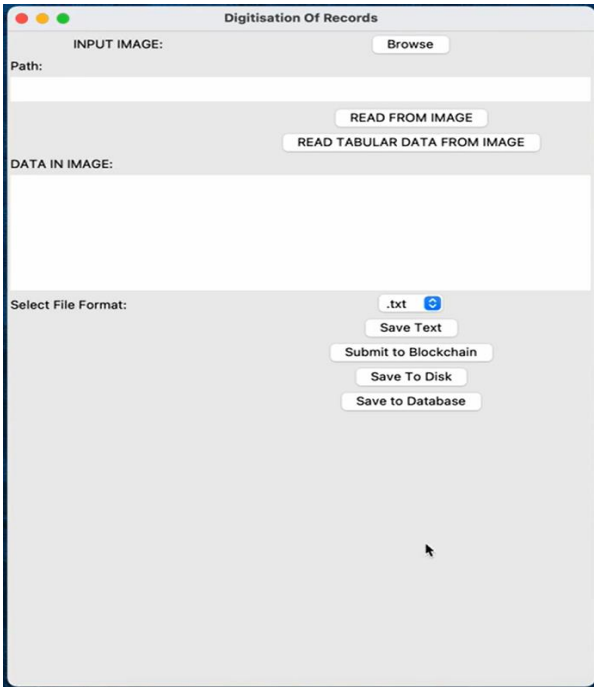

Fig 2: GUI Interface

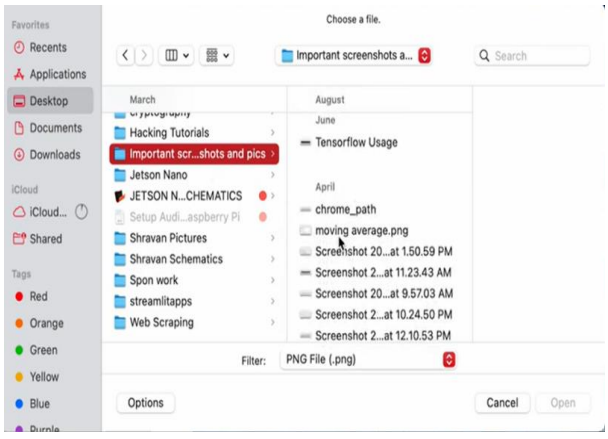

Fig 3: Input (image selection)

After selecting the image, the option of read from image is available. The text in the image will be displayed in the block as output. If the image contains any tabular data, the option of read tabular data from image is to be selected.

Fig 3: Output (text extracted)

IV. CONCLUSION AND FUTURE SCOPE

4.1 Conclusion

The expected result is a software that uses OCR technology through which digital images can be used to create text-searchable files which increase access and use. It can be then stored in the database using php or file management systems in open standard storage format. Digitization is an important process in today's world. Also, to live up to current challenges it has to go digital that is to provide online services. Digitization of records is the conversion of the paper-based records to electronic documents which simplify the tedious burden of record maintenance and management as well as other major related matters.

Through the application of optical character recognition (OCR) software using python, digital images can be used to create text-searchable files which increase access and use. It can be then stored in the database using php or file management systems in open standard storage format. Digital images can be converted into text-searchable files using optical character recognition (OCR) software written in Python. Then the required data can be stored in the database using MySQL and also can be stored using blockchain technology and the user can choose between csv, txt and json file types. This is a perfect software for scanning clean documents and comes with pretty high accuracy output also it is extremely compatible to use.

4.2 Future Scope

New features can be added in the software application. Changes can be made to improve the system's graphical interface and make the system more interactive for users. Since it currently only recognizes digital text, the system

can be upgraded in the future to extract handwritten text and store it on the backend.

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Automated Skin Diseases Alerting System Using Machine Learning Approach

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***Abstract*— Skin diseases are some of the most common diseases in the world. Their diagnosis is very difficult due to problems with skin texture, presence of hairs on the skin, and color. Methods such as machine learning need to be developed to improve diagnostic accuracy for various types of skin diseases. Machine learning techniques are widely used in the medical field for diagnostics. These algorithms use feature values from the image as input to make decisions. The process consists of three phases consisting of training phase, feature extraction phase and testing phase. The process uses machine learning technology to train itself on different skin diseases types. The goal of this process is to improve the accuracy of skin disease detection. Three important features in image classification are texture, color, shape, and their combination. In the proposed system Convolutional Neural Network is used for image-based skin diseases classification. The system provides an accuracy of 80% in the testing phase.**

***Keywords—— Skin diseases, Deep Learning, Convolutional Neural Network (CNN), Image Processing*.**

I. INTRODUCTION

Dermatology is the area of biology that deals with the diagnosis and treatment of conditions that primarily affect the skin. Due to temperature, humidity, and other environmental conditions, the vast spectrum of dermatologic illnesses varies geographically as well as seasonally. Due to its unevenness, tone, hairiness, and other mitigating factors, human skin is one of the most unexpected and difficult surfaces to mechanically synthesize and evaluate. Even while many studies are done to identify and simulate human skin victimization (using PC Vision techniques), very few have focused on the underlying medical paradigm of the problem. Due to the absence of medical services in the outlying areas, patients typically disregard early symptoms that could possibly worsen over time. scenario changes over time. Consequently, there is a growing need for high accuracy automatic skin disease detection systems. In order to classify skin diseases into their primary classes, such as vascular tumors, exanthems and drug eruptions, urticaria hives, ringworm candidiasis, herpes HPV, basal cell carcinoma of the actinic keratosis, atopic dermatitis, and bullous disease, a multiclass deep learning model is developed. Deep Learning and CNN is used to train the model. The machine self-learns, divides the supplied data into levels of prediction, and provides accurate findings in a short amount of time, encouraging and supporting development of Dermatology.

II. REVIEW OF LITERATURE

To identify the many types of skin diseases, several researchers have suggested image processing-based approaches. Here, we go over a few of the methods that have been documented in the literature. In [1], a system is suggested for the color image-based dissection of skin disorders without the requirement for medical assistance. The method has two stages: the first involves identifying diseased skin using color image processing, k-means clustering, and color gradient algorithms, and the second involves classifying the disease kind using artificial neural networks. The method was evaluated on six different skin disease types, and the first stage and second stage accuracy averages were 95.99% and 94.016%, respectively. The first stage in the approach of [2] for detecting skin disorders is the extraction of picture features. In this process, the more image features that are extracted, the more accurate the system becomes. The strategy was used to classify nine different skin disease types and an accuracy of 90% was achieved. Melanoma is a form of skin cancer that, if not detected and treated in its early stages, can be fatal. In [3], the major focus was given on the analysis of various segmentation methods that may be utilized to identify melanoma through image processing. The segmentation procedure that used the boundaries of the diseased spot to extract more information. The research of [4] suggested creating a tool for diagnosing melanoma in people with dark skin utilizing specific algorithm databases that also included photographs from other melanoma websites. Similarly, [5] studied classification of skin illnesses using the technology support vector machine, including melanoma, basal cell carcinoma (BCC), nevus, and seborrheic keratosis (SK) (SVM). From a variety of other procedures, it produced the most accurate results.

III. COMPARATIVE STUDY

3.1. OpenCV

OpenCV stands for Open Source Computer Vision. It is a library of programming functions for real time computer vision. The library has more than 2000 optimized algorithms and has been widely used around the world. Befitting from this, android programmers are

able to implement many digital image processing algorithms in Android phone platforms.

3.2. Convolutional Neural Network (CNN)

.A Convolutional Neural Network (CNN) is a type of deep learning algorithm that is particularly well-suited for image recognition and processing tasks. It is made up of multiple layers, including convolutional layers, pooling layers, and fully connected layers.

3.3. Flask

Flask is a lightweight WSGI web application framework, which uses python as a backend and allows various web technologies at the front end. We have implemented flask's framework on the complete web application, to make it robust and support more devices.

3.4. Tensorflow

TensorFlow is a free and open-source software library for machine learning and artificial intelligence. It can be used across a range of tasks but has a particular focus on training and inference of deep neural networks.

IV. Proposed Work

4.1 The proposed system aims at automatic computer-based detection of skin diseases to reduce life risks. Convolutional Neural Network (CNN) is used for the image-based classification of skin diseases which is a Deep Learning Algorithm.

Deep Learning:

Deep learning is a machine learning technique that teaches computers to do what comes naturally to humans. In deep learning, a computer model learns to perform classification tasks directly from images, text, or sound. Models are trained by using a large set of labeled data and neural network architectures that contain many layers.

In the project 4002 images are trained to classify 22 skin diseases.

Convolutional Neural Network (CNN):

A Convolutional Neural Network (CNN) is a Deep Learning algorithm which can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other.

They are comprised of

- Node Layers
- Containing An Input Layer,
- One Or More Hidden Layers
- An Output Layer.

4.2 The workflow of CNN in our project will be as follow:

- Input Image
- Convolution Layer (Kernel)
- Pooling Layer
- Classification—Fully Connected Layer

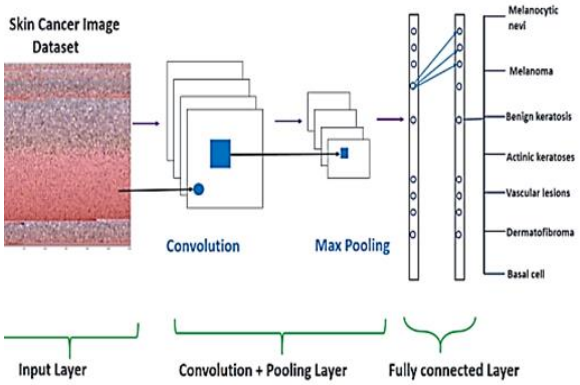

Fig. 1 Convolutional Neural Network (CNN)

The dataset is taken from Kaggle which is a compilation of 4002 photos of 22 common skin conditions, including eczema, melanoma, acne, and rosacea.

Fig. 2 The first image is acne, the second Rosacea; the third is Eczema, and finally Melanoma.

V. Methodology

5.1. Technology

Table 1: Tools and Technologies used

Sr No.	Tools	Specification
1.	IDE	Visual Studio Code Google Collab Notebook
2.	Frameworks / Libraries	Flask Tensorflow OpenCV Numpy CNN
3.	Language	Python 3.10.0 HTML CSS JavaScript
4.	Cloud Platform	Online Website

5.2. Methodology flow

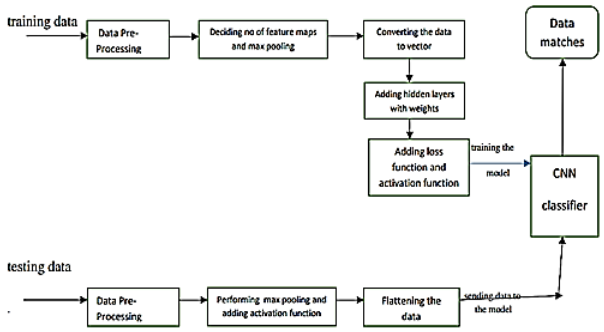

Fig. 3 Proposed Data Flow of the system

This section describes the proposed system's methodology for image-based detection, extraction, and classification of skin disorders. Preprocessing, feature extraction, and classification are some of the components that make up the entire architecture. Fig. 3 displays the system's block diagram.

The three main stages for prediction and classification of skin diseases based on CNN is as following:

Preprocessing: High performance skin disease detection systems need to overcome several significant obstacles. like building a database and standardizing picture dimensions. An input image is either made larger or smaller to address the issue of various image sizes in the database. The same number of features will be obtained from all photographs by standardizing the image size. Additionally, shrinking the image speeds up the system by reducing processing time.

Feature Extraction: CNN by itself detects the filters and features in the training phase from the input images so there is no need of specifically applying in feature extraction

Classification: Classification is a computer vision method which classifies different images based on the disease predicted after extracting features.

VI. Result & Discussion

In this study, a deep learning approach using Convolutional Neural Network (CNN) was proposed for the diagnosis of skin diseases. The system was trained on a dataset of images of different skin conditions and was tested on a separate set of images. The results showed that the system achieved an accuracy of 80% in the testing phase and was able to predict 22 common skin conditions with high accuracy. This represents a significant improvement over previous models, which could only predict a maximum of 6 skin conditions with a maximum accuracy of 75%.

The results of the study highlight the potential of deep learning algorithms for the diagnosis of skin diseases. The use of deep learning algorithms for skin disease diagnosis can offer a reliable and automated method for dermatological illness diagnosis, reducing the time between diagnosis and treatment and providing a non-intrusive method for preliminary skin disease diagnosis.

6.1. Skin Disease Alerting System

A custom website was developed using the Flask framework to implement the proposed skin disease detection model. The website provides a user-friendly interface for uploading images and displaying the results of the diagnosis. The user can upload a sample image of a skin condition, and the model will predict the most likely skin condition based on the features extracted from the image. The results are displayed in the form of a predicted diagnosis, along with the confidence score of the prediction. Additionally, the website provides information about the predicted disease, including the symptoms, causes, and treatments.

6.2. Flow of the Website

1. The user visits the website, registers or logins to his account, selects the option to upload an image for diagnosis.
2. The user selects the image file to be uploaded and clicks the "Submit" button.
3. The image is processed by the custom skin disease detection model and the predicted result is displayed on the website.
4. The website displays the predicted skin condition, along with the confidence score and information about the disease, including symptoms, causes, and treatments.

The following is a sample image of a skin condition and the predicted result from the model:

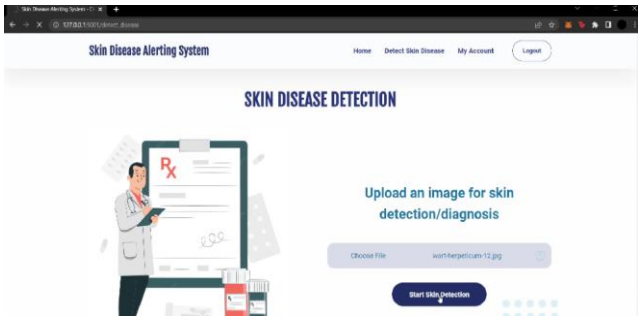

Fig. 4.1 Uploading Image for Prediction

Fig. 4.2 Predicted Skin Disease and its Accuracy

This demonstrates the potential of the custom website for accurate and reliable skin disease diagnosis, offering a valuable tool for dermatologists and patients alike. The website provides an easy-to-use interface for skin disease diagnosis and offers information about the disease, including symptoms, causes, and treatments, making it a valuable resource for those seeking information about their skin conditions.

6.3 Accuracy Table for Skin Disease Detection Model

Table 2: Accuracy Table for Skin Disease Detection Model

Disease	Accuracy
Acne	95%
Rosacea	89%
Atopic Dermatitis	90%
Bullous Disease	92%
Cellulitis and Impetigo	94%
Eczema	90%
Exanthems and Drug Eruptions	88%
Hair Loss and Alopecia	93%
Herpes, HPV, and other STDs	89%
Melanoma and Nevi	94%
Nail Fungus and other Nail Disease	91%
Poison Ivy and Contact Dermatitis	95%
Psoriasis and Lichen Planus	92%
Tinea, Ringworm, Candidiasis, and Fungal Infections	93%
Vascular Tumors	90%
Warts, Molluscum, and other Viral Infections	94%

The above table shows the accuracy of our custom skin disease detection model on different skin diseases. The model is trained on a large dataset of skin images and tested on a separate set of images. The accuracy values are approximate and may vary depending on the image quality and the severity of the disease.

VII. Conclusion

Even though skin conditions are the fourth most common cause of sickness in people, many people still avoid seeing doctors. We provided a reliable and automated approach for the dermatological illnesses' diagnosis. When skin conditions are treated early on, they are less disfiguring and more successful. In this study, deep learning algorithms are used to create a model for the prediction of skin illnesses. It has been discovered that utilising deep learning and feature assembling, we can predict more diseases with greater accuracy than we could with any other model developed in the past. As the previous models developed for this application could only indicate a maximum of six skin conditions with a maximum level of 75% accuracy. Using CNN, the suggested approach will forecast 22 common skin illnesses. Deep learning algorithms offer a tremendous potential for diagnosing skin diseases in the real world, according to extensive study. The accuracy can be further improved by using even more advanced hardware and software, together with a very large dataset, and the model can be utilised for clinical experiments because it does not involve any intrusive procedures. As it will shorten the time between diagnosis and treatment, further work can be done to standardize this model for preliminary skin disease diagnosis.

VIII. Future Scope

Future research in the field of skin disease diagnosis using machine learning has several promising avenues to explore. One such direction is the integration of clinical data with image features to provide more robust and accurate results. Additionally, there is potential to improve the accuracy of the current model by exploring different machine learning algorithms and fine-tuning the feature extraction process. Implementing the model in a real-time setting, such as a mobile app, can increase accessibility and make it more user-friendly. A multimodal approach, incorporating other imaging modalities such as dermoscopy images, thermal imaging, and optical coherence tomography, can provide a more comprehensive view of the skin condition and improve the accuracy of the diagnosis. Finally, expanding the model to include other skin conditions, such as skin cancers, can contribute to the development of a comprehensive diagnostic tool for various skin conditions.

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Connect+: A Learning App for Specials

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***Abstract*–"Equal access to high-quality education and lifelong learning allows disabled persons to fully participate in society and improve their quality of life." There is a shortage of technological advancements for the growth of the impaired youngsters especially in India. It is the right of all the disabled children also to obtain a proper education for them to grow and develop personally. The project is a token gesture to these children. Our android application is an alternative media that focuses on bridging the gap between professional teachers and challenged learners with visual, hearing, physical, and communication issues, as well as cognitive and neurological issues. Alternative media are forms of content that operate as an extension of equivalent content and are delivered in various ways, but with the same overall learning goal. We will be using Java on Android Studio, which will allow us to rapidly establish a safe and maintainable platform to support smoother communication between teachers and children with special needs.**

Keywords—impaired, neurological, alternative media, cognitive

I. INTRODUCTION

For generations, children with disabilities have lived on the outskirts of society. The search for inclusion started primarily in the post-1960s, because of the struggle of organizations defending the rights of disabled persons. Until now, there has been a dearth of resources, inclusion, or motivation for these youngsters to achieve in sports, education, the arts, and so on. Today, we live in a time of expansion and popularization of the processes of acquisition, retention, and sharing of knowledge in virtual media. Platforms geared towards digital learning now play a fundamental role in mediating knowledge processes. At a time when the possibilities of eLearning and online education are in the public spotlight through interest in the development of the massive open online course (MOOC), and at a time when enrolments in online courses are rising at a much higher rate than those in traditional face to face learning and teaching in higher education, it is disturbing to find this limited and belated approach to access for people with disabilities. eLearning holds many possibilities for inclusion for people with disabilities, however the online platforms utilized must provide access for all students or a learning platform for the community of disables is one of the other solutions for their inclusion.

II. REVIEW OF LITERATURE

E-learning systems are becoming increasingly popular. They represent genuine opportunities for many people to receive a higher quality education. However, people with disabilities continue to face numerous challenges in gaining access to these systems. The main issue is that most available e-learning systems are inaccessible to people with disabilities and do not take their special needs into account.

The number of children with learning difficulties and disabilities has grown over time. However, thanks to advances in technology, we can now provide free apps for students with learning disabilities to help them reach their full potential and avoid feelings of insecurity. These apps for learning disabilities can gain child's trust by assisting them and improving their cognitive abilities.

Some of these applications are listed below:

1. *MentalUp*

Check out the MentalUP brain exercise games like attention, memory, verbal intelligence, and word games, developed by academics and game designers, to help your children's learning disabilities improve. MentalUP's scientific games help your child's learning process to overcome learning disabilities.

Your children may have a reading disorder (dyslexia), a learning disorder (dysgraphia), adaptation issues (dyspraxia), or a learning disorder in mathematical operations (dyscalculia). It should be noted that specific learning disabilities are not visual or auditory disorders; rather, they are disabilities that necessitate multifaceted approaches.

2. *Otsimo*

Otsimo Special Education is a visually and auditorily engaging app that engages children's motor and cognitive skills through assistive matching, drawing, choosing, and ordering.

It consists of learning games for all subjects and skill levels based on Applied Behavioral Analysis therapy principles. Otsimo is a customizable app that allows you to meet the developmental needs of your children. As a result, it is one of the most effective learning disability apps.

3. *ModMath*

ModMath is one of the iPad reading apps for learning disabilities that is aimed at helping students with dyslexia and dysgraphia succeed in math. This top special education app was created by parents of a child with dysgraphia and remains focused on providing a clear tool for solving math problems without ever picking up a pencil.

4. *Miogym: Speech Therapy*

The Miogym application allows you to turn training (developing facial muscles, logopedic treatment, and face yoga) into an exciting game.

This speech app is intended to turn "speech therapy into a fun game." Each speech therapy exercise has a unique game card with captivating animation to ensure that the child interacts with the app.

This app is a must-have for families looking for apps for kids with learning disabilities or apps for students with learning disabilities.

There are 100s of such applications in the market which are based mostly on games to increase engagement with the children and gain their interest in learning. However, we haven't come across any real-time applications which directly connect the teacher and children. Furthermore, these applications are mostly centered to learning disability people. It's true that covering other disability type is a difficult process and the challenges are uncountable but we have to find a way. This project will try to cover the other disabilities too.

III. Objectives

Our objective is to create a platform where disabled students can connect online since it gives them more time and space to work. They can have one to one interaction with the specialist teacher in their area of disability. Students with dyslexia or visual processing disorder can change digital text using IT systems and software by changing the font style or size, which helps them digest information more successfully. To implement integrated technologies such as voice-to-text and voice-activated programs are available for pupils who cannot type. The adaptive technologies like braille converter or voice-to-text software and audio recordings are provided for their learning. Children can choose their teacher according to the needs and connect to them whenever required. Hence, they can have immense knowledge and guidance on their fingertip. The objectives are many but it's fair enough to concentrate on one and develop a part from these objectives.

IV. Understanding the barriers

A. Learning Disability

Learning disabilities are professionally diagnosed difficulties with reading, writing, speaking, listening, spelling, reasoning or doing math. People with learning disabilities have trouble taking in information through their senses and processing that information accurately to the brain-Usually they will receive scrambling information like a distorted radio signal or fuzzy television picture. A child with Learning Disability appears to exhibit emotional problems due to adjustment difficulties resulting from academic failure. Sometimes kids have trouble expressing their feelings, calming themselves down, and reading nonverbal cues, which can lead to difficulty in the classroom and with their peers. Students with undetected learning disabilities might demonstrate undesirable behavior for a variety of reasons. They might feel angry, sad, lonely, frustrated, or hopeless as a result of focusing on their difficulties. Special needs students are deprived of a suitable education when they are taught at a mismatched level with students how are significantly above their level. Children with learning disabilities may have problems with Academics, social, home and emotional aspects. These problems they may over come through attending special education classes and parental attention. There is a need for special education for children with learning disability and conduct awareness programs regarding learning disability and their common problems.

B. Physical Disability

School and college buildings in most countries lack basic infrastructure to make the institution physically accessible for students with disabilities. These institutions lack ramps for wheelchairs and proper tile markings for blind students. Institutions with multi-level buildings lack elevators or lifts. Washrooms are often inaccessible. Heavy doors and narrow and dimly lit entrances to make institutions inaccessible for students with disabilities. Higher institutions or universities lack the facility of accessible hostels for students with disabilities. In most cases, the burden ultimately falls on the parents to take their ward to and from school in any way they can manage.

C. Lack of Awareness

Again, one of the most common causes that create barriers for students with disabilities is lack of awareness. Interestingly, this lack of awareness hits students with disabilities from multiple directions. Many times, parents. are unaware of the laws giving equal rights to education to children with disabilities. They lack information about the availability of special schools and special rights provided to disabled students by the law. Things do not become easy even in cases where parents are aware of things and willing to provide education to their disabled children.

D. Lack of Individualization

This is perhaps the least talked about barrier faced by students with disabilities. In most countries. a blanket approach is used for students with disabilities. These blanket approaches are designed based on preset categories formulated based on disability or weaknesses. The strengths of individual students with disabilities are not assessed. A student with a disability, for example, might be strong and sporty despite her disability but in most cases, institutions fail to recognize these individual strengths and provide the disabled student proper opportunity to develop on her strengths. Students with some types of disabilities, like students with ADHD, require personalized attention. But, due to the lack of individualization needs of these students are ignored. Teachers are often not trained to provide individual attention where needed. So, they keep on going with the pace of curriculum or the bright students (based on teaching strategy), and some students with disabilities are left behind.

E. Negative Attitude and Stereotypes

Almost every country of the world has some stereotypes and negative connotations related to disability. Being a part of society, educational institutions too are affected by these negative attitudes towards students with disabilities. Not only fellow students but school staff too have been bullies for students with disabilities in many

cases. Teachers, in many instances, discourage students with disabilities directly or indirectly to pursue their studies.

V. Methodology and Tools

F. Methodology

i. Define the Problem: The first step in building any application is to define the problem you are trying to solve. In this case, the problem is connecting disabled children with specialist teachers who can provide them with the support and resources they need to succeed.

ii. Identify the Target Audience: Next, we need to identify the target audience for the application. In this case, the audience is disabled children and their parents or caregivers, as well as specialist teachers who can provide the necessary support.

iii. Conduct Research: Once we have identified the problem and target audience, you need to conduct research to better understand the needs and requirements of both groups. This can involve surveys, interviews, and focus groups.

iv. Define Features: Based on the research, we can define the key features that the application should include. These might include things like a search function to find specialist teachers, a messaging system to communicate with teachers, and a library of resources for children and parents.

v. Choose a Technology Stack: With the features defined, we can choose a technology stack that is best suited to building the application. This might include programming languages, frameworks, and libraries.

vi. Design the User Interface: Once we have chosen your technology stack, you can begin designing the user interface for the application. This should be done with the needs of disabled children and their caregivers in mind, with a focus on simplicity and accessibility.

vii. Develop the Application: With the design in place, we can begin developing the application. This will involve coding, testing, and debugging.

viii. Launch and Test: Once the application is developed, it needs to be launched and tested. This can involve beta testing with a small group of users to identify and fix any bugs or issues.

ix. Iterate and Improve: Finally, we can iterate and improve the application based on user feedback and usage data. This will ensure that the application continues to meet the needs of disabled children and specialist teachers.

G. Tools

i. Wireframing tools: Miro, Figma to create a visual representation of the application.

ii. Programming language and Software: Java ,Android Studio

iii. Video conferencing tools: Integrating application with the video conferencing tools like Zoom or Skype for video consultations between the disabled children and specialist teachers.

iv. Chat functionality: Use chat tools like Slack or WhatsApp to facilitate communication between the disabled children and specialist teachers.

v. Feedback tools: Use feedback tools like UserTesting or SurveyMonkey to gather feedback from the disabled children and specialist teachers to improve the application.

H. Features

i. Sign up: Disabled children, their parents or caregivers, and specialist teachers can sign up for the app.

ii. Profile creation: Users can create their profiles by providing their personal details, educational background, and areas of expertise.

iii. Search: Disabled children or their parents/caregivers can search for specialist teachers by subject, location, and other criteria.

iv. Book sessions: Once a specialist teacher is found, the user can book a session with them.

v. Video conferencing: The app will have a video conferencing feature that will allow the specialist teacher and the disabled child to communicate in real-time.

vi. Interactive tools: The app will also have interactive tools that can be used during the session, such as whiteboards, chat boxes, and screen sharing.

vii. Feedback: After each session, both the specialist teacher and the disabled child can provide feedback about their experience.

viii. Progress tracking: The app will also have a progress tracking feature that will allow both the specialist teacher and the disabled child to monitor their progress over time.

ix. Payment: The app will have a payment feature that will allow the specialist teacher to receive payment for their services.

Overall, the Connect+ learning App aims to make education more accessible for disabled children by connecting them with specialist teachers who can provide tailored support.

VI. CHALLENGES

Designing learning applications for individuals with disabilities can be a complex process that requires consideration of various factors to ensure accessibility and inclusivity. Some of the main challenges in making learning applications for disabled individuals are:

I. Accessibility

One of the primary challenges in designing learning applications for disabled individuals is ensuring accessibility. Applications should be designed to cater to various disabilities such as visual, auditory, and physical impairments. This requires careful consideration of elements such as text size, color contrast, audio descriptions, and alternative text for images.

J. User Experience

A good user experience is critical for any learning application, and this is especially important when designing for individuals with disabilities. The application should be easy to navigate, and the content should be presented in a way that is easy to understand.

K. Technical Limitations

Some individuals with disabilities may have technical limitations, which can affect their ability to use certain types of learning applications. For example, an individual with a physical impairment may not be able to use a touch screen device, while someone with a visual impairment may require a screen reader to access content.

L. Cultural Sensitivity

When designing learning applications for individuals with disabilities, cultural sensitivity is also important. The application should be designed to accommodate the cultural and linguistic diversity of the target audience.

M. Cost

Finally, cost is another significant challenge in making learning applications for disabled individuals. Designing accessible applications can be more expensive than designing non-accessible ones, which can be a barrier for smaller organizations or individuals.

N. Is it ever enough?

Implementing the entire solution outlined above for our problem statement is a challenging task. Because we don't know the amount of a child's disability, no child with a handicap can be treated the same. Meeting the wants and satisfying most of our small children can be difficult. To do this, we must solicit comments from students as well as the teacher's specialist in the relevant field on a regular basis while carrying out the project.

O. Creating the community

It would be very important for us to find some specialist teachers. We must communicate one on one with the special children and teachers. We can approach to Special Needs School and make them realize that how this platform can act as a great supplementary resource for these children as well the teacher and it would be possible to reach out to more children

P. Communication Gap

Bridging the communication gap with students with disability is one of the greatest challenges. We need to find the actual need of each one of them to get a better idea to develop a fruitful software for them. Non-verbal communication plays a great role in such scenarios.

In summary, designing learning applications for disabled individuals requires careful consideration of accessibility, user experience, technical limitations, cultural sensitivity, and cost. By addressing these challenges, developers can create inclusive and effective learning applications that cater to a wider audience

VII. CONCLUSION

In conclusion, developing a learning application for disabled individuals is a crucial step towards creating a more inclusive society. By providing access to educational materials in a format that is accessible to everyone, we can help bridge the gap between disabled and non-disabled individuals, and ensure that everyone has an equal opportunity to learn and grow.

The development of these applications requires careful planning and attention to detail, with a focus on creating a user-friendly and accessible experience for individuals with disabilities. By leveraging technology and the latest innovations in software development, we can create learning applications that are tailored to the needs of each individual, regardless of their disability. With the right tools and resources, we can empower disabled individuals to achieve their full potential and succeed in their educational pursuits. Whether through audio and video formats, text-to-speech capabilities, or other innovative features, there are countless ways to make learning more accessible and inclusive for everyone.

Ultimately, the success of these learning applications will depend on the ongoing collaboration and partnership between developers, educators, and disability advocates. By working together, we can build a better, more inclusive world that provides equal opportunities for all.

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A Novel Approach to Optimize Different Types of Optimization Problems

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***Abstract* - Optimization is the mathematical discipline which is related with findings maximum and minimum of the functions with respect to constraints. Optimization plays an important role in any type of engineering and non-engineering problems.. There are various optimization techniques to solve the different types of problems in real world and our day to day life. There are some analytical methods to solve any types of optimization problems like linear and non-linear etc. But analytical methods takes the number of iteration and more time to get the exact optimum solution. There is novel technique which is used to solve any linear and non-linear programming problems in less iteration & to get the exact optimum solution. i.e. optimization tools in MATLAB , which is useful to get the exact optimum solution for any type of optimization problems.**

Keywords : Optimization tools , LPP,NLPP

I. INTRODUCTION

Optimization is an act to obtain best possible solution in an available alternatives under given situations. It is needed to optimize each and everything in our day to day life. The word “optimum” is Latin, and means “the ultimate ideal;” similarly, “optimus” means “the best.” Therefore, to optimize refers to trying to bring whatever we are dealing with towards its ultimate state. There are number of engineering and non engineering applications of optimization like in civil,mechanical, electrical engineering, transportation etc. There are various optimization techniques/methods like conventional as well as advanced methods.

The technique of obtaining the best possible solutions out of the available alternatives under the given circumstances is called as optimization. Optimization is the mathematical discipline which is concerned with finding the maxima and minima of functions, possibly subject to constraints. Optimization is a precise procedure using design constraints and criteria to enable the planner to find the optimal solution. Optimization techniques have been applied in numerous fields to deal with different practical problems. Optimization is an important tool in making decisions and in analyzing physical systems. In mathematical terms, an optimization problem is the problem of finding the best solution from among the set of all feasible solutions.

There are various approaches to optimize any types of optimization problems in easy way , less iterations and less time to get the exact optimum solutions. optimization tools available in MATLAB. These tools are very much useful to find optimum solution for different types of optimization problem. There is a novel approach to get the exact optimum solution in less time and iteration. i. e. Optimization tools . Optimization deals with selecting the best option among a number of possible choices that are constraints and unconstraint optimization problems. MATLAB can be used to optimize parameters in a model to best fit data, increase profitability of a potential engineering design, or meet some other type of objective that can be described mathematically with variables and equations.

Optimization problems may include linear programming problems and non linear programming problems consisting of equality constraints (e.g. =), inequality constraints (e.g. <, <=, >, >=), objective functions, algebraic equations, differential equations, continuous variables, discrete or integer variables, etc

II. ALGORITHM FOR OPTIMAL DESIGN

There are various algorithms which are used to find optimum solution. So it is very easy to apply algorithm for any type of problems. To optimize the solution, proper techniques/methods plays an important role in any optimization problem or any other type of problems. There are various advanced optimization techniques are available like Ant colony, PSO, gradient based algorithms etc. To solve any optimization problems, first it is necessary to design algorithm and from this algorithm. So by using proper techniques, we can optimize the solution for any type of problem. But first it is need to identify the type of problem any apply the appropriate technique.

Algorithm:

1] To read the given problem/data carefully
2] To select the design variables as per the given data
3] To formulate the constraints (equality or inequality) as per limits given.
4] To formulate the objective function as per the given requirement.
5] To identify the types of optimization problem i.e. linear or non- linear programming problem.
6] According to the types of optimization problems , apply the optimization tools .

7] Run the program & get the results i.e exact optimum solution.
By applying this steps , for any type of problems , we can optimize the solution in accurate manner.

III. NOVEL APPROACH

Optimization tools which are available in MATLAB software. It is an add-on product to MATLAB, and provides a library of solvers that can be used from the MATLAB environment. The toolbox was first released for MATLAB in 1990. Optimization toolS is a function that extend the capability of MATLAB. Optimization Toolbox™ provides functions for finding parameters that minimize or maximize objectives function while satisfying all the constraints.

It is collection of function which extend the capability of MATLAB. The toolbox includes unconstraint optimization, constraint non linear optimization , include goal attainment problem , minimax problems and semi infinite minimization problem and semi infinite minimization problem ,non linear least square and curve fitting , non linear system of equation solving, constraints linear least square, specialized algorithms for large scale problems.

For large scale problem , it is not possible to obtain optimum solution . so it is necessary to apply optimum method MATLAB's Optimization Toolbox can be applied for any linear and non –linear programming problems.

IV. LINEAR AND NON-LINEAR PROGRAMMING PROBLEMS

Linear programming is an optimization method applicable for the solution of problems in which the objective function and the constraints appear as linear functions of the decision variables.

If the objective function and all constraints are linear functions of the decision variables (e.g., no squared terms, trigonometric functions, ratios of variables), then the problem is called a Linear Programming (LP) problem. LPs are much easier to solve by computer than problems involving nonlinear functions.

Maximize $Z = 11x1 + 4x2$
STC
$7x1 + 6x2 \leq 84$
$4x1 + 2x1 \leq 32$
$x1 , x2 \geq 0$

Nonlinear programming is the process of solving an optimization problem defined by a system of equalities and inequalities, collectively termed constraints, over a set of unknown real variables, along with an objective function to be maximized or minimized, where some of the constraints or the objective function are nonlinear.[1]

It is the sub-field of mathematical optimization that deals with problems that are not linear. Nonlinear programming deals with optimization problems, where the objective function or some of the constraints are nonlinear.

Maximize $f = X(1.5 – X)$

$= 1.5X - X2$

$X = 0.0$, Step size = $S = 0.05$

V. COMPUTATIONAL DIFFICULTIES IN ANALYTICAL METHODS

Any optimization problem can be solved by using the classical methods .When we apply all these tabular methods, it requires too much computation time to solve large-scale problems. There is possibility to get inaccurate solution because of complicated calculations. If there are large number of variables and constraints, then calculation part makes complicated. So it is necessary to apply another method, which reduces computation time & iterations and also get the exact optimum solution.

In MATLAB, there are various optimization toolbox are available, that can apply to linear programming, nonlinear programming problem, quadratic programming, integer programming, single and multivariable constraint and unconstraint optimization problem to get the optimum solution in less time and iterations.

In are such types of problems, then it is necessary to implement another simplified method to get the accurate & optimal solution, which takes less iteration & less computation time.

In MATLAB, there are various toolbox are available to solve the each & every complicated problem. To solve optimization problem, optimization toolbox are available in MATLAB. The advantage of these optimization tools is that, it takes very less computation time & iteration. & there is no chance to get the inaccurate solution.

But when we use the optimization toolbox in MATLAB , there is no need to identify each method separately only to identify it is linear or non linear programming problem & according to that apply the proper syntax .

VI. OPTIMIZATION TOOLS FOR LPP AND NLPP

Table: I

Toolbox	Types of Optimization Problems
fminsearch	Non-linear programming problems.
fminunc	gradient-based, nonlinear unconstrained, includes a quasi-newton and a trust-region method
fmincon	Non-linear programming problems.
linprog,	Linear programming problems
intlinprog,	mixed-integer linear programming problems
quadprog	quadratic programming problems

Syntax for LPP

x = linprog(f,A,b)

x = linprog(f,A,b,Aeq,beq)

x = linprog(f,A,b,Aeq,beq,lb,ub)

Table: II

S.N.	Parameter	Description
1	f	Objective function (Coefficient vector)
2	A	Linear inequality constraints (LHS of the constraints)
3	B	Linear inequality constraints (RHS of the constraints)
4	Aeq	Linear22 equality constraints(LHS of the constraints)
5	Beq	Linear equality constraints (RHS of the constraints)
6	Lb	Lower bound
7	Ub	Upper bound

VII. MATLAB OPTIMIZATION TOOLBOX EXAMPLE:

Linear Programming Problem:

Table: III

	Novel Approach-Optimization Tools
Given Problem	Max f = x1 + 4x2+ 5x3 STC 3x1 + 6x2 + 3x3 ≤ 22 x1 + 2x2 + 3x3 ≤ 14 3x1 + 2x2 ≤ 14 x1 ,x2 , x3 ≥ 0
Step :1 Standard form	Min f = -x1 - 4x2 -- 5x3 STC 3x1 + 6x2 + 3x3 ≤ 22 x1 + 2x2 + 3x3 ≤ 14 3x1 + 2x2 ≤ 14 x1 ,x2 , x3 ≥ 0

Step2:
 	
MATLAB Coding
	Input data
	f=[-1 -4 -5];
	A=[3 6 3;1 2 3;3 1 0];
	b=[22 14 14];
	lb=[0 0];
	[x,fval]=linprog (f, A, b, [ ], [ ],lb)

Step3: Result	X= 0 , 2, 3.33 fval=-24.66

Non –Linear Programming Problem

Minf(x)=e^(x_1) (4x_1+2x_2^2+ 4x_1 x_2+ 2x_2+ 1

Program

M-file %

objective function

L = @(x)
exp(x(1))*(4*x(1)^2+2*x(2)^2+4*x(1)*x(2)+2*x(2)+1)
;

u0=[-1,1]; % Initial guess

[x,fval,exitflag,output]=fminunc(L,u0)

Results; Optimization terminated: relative infinity-norm of gradient less than options. Tol

Fun. x = 0.5000 -1.0000 fval = 1.0983e-015

VIII. CONCLUSION

Optimization plays an important role in any type of problems. From the above discussion, it is clear that, there are various toolbox are available in MATLAB. Here we discussed about the optimization toolbox available in MATLAB. For any type of optimization problem consisting of large number of design variables and constraints, analytical methods are more complicated & takes more computation time & iterations and possibility to get inaccurate solution because of more calculations . It is important to show the effects of optimization toolbox to get the exact optimum solution in minimum time & iterations. A i. e. optimization toolbox in MATLAB used for any type of optimization problem, only need which is is the best , more useful , less computation time & most accurate method. Many real world problems like industrial , transportation , production , Research etc consisting of large number of

variable & constraints can be easily solve by using optimization toolbox in MATLAB. We can use solver based or problem based methods to solve any type of optimization problem. Also we can explored the use of toolbox as an economic , tool to reduce the complexity over computation using introduced algorithm.

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Security Based Applications For Building And Factory Automation Using IOT

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***Abstract* : The link suggests a useful use for IoT, which is the monitoring and management of money-related packets while they are using the entire internet. The user interface of the cutting-edge computerization form combines a variety of sophisticated devices. They can communicate with the high-level automation network using a web area, as well as through systems for low-strength correspondence such as Zigbee, remote, and other similar technologies. This effort aims to control commercial machinery using mobile phones connected to wi-fi networks. The customer will be able to avoid interacting with the device itself using a web interface that is accessible over the internet. However, the customer will still be able to control devices such as lights, fans, and the front lock using a simple website page. A reward is shipped off the remote that arranges with the capability of any heart to connect an encouraging note and an image. The expert can collaborate with the course equipment circuits to design a strategy for the contraptions that will be strolling about the task. The client can select a product with a lesser reputation thanks to the contact with the specialist. The customer can select the appropriate tool during their communication with the specialist. The conversations held by the experts over the troubling headway. If the online association is down or the master isn't working, the conveyed form board will direct and function the devices locally. We can provide a business automation system that is scalable as well as cost-effective by leveraging this.**

Keywords- Building automation, Internet of Things, Data security, Industrial control

I. INTRODUCTION

In these days solid affiliation business centers, the affiliations face creating necessities to additionally foster way efficiencies, investigate ordinary recommendation, and meet corporate monetary targets. Given the making period of different present-day frameworks and the extraordinary business-producing business center, reasonable and unimportant expense business robotization structures are depended upon to work on the capability and execution of such structures, all around, business computerization structures are perceived through spurring out exchanges. in any case, the wired computerization structures require outrageous verbal trade interfaces with be mounted and much of the time remained mindful of, and in this manner, they are not regularly done in business plants by their huge expense [4]. as such, there's a true necessity for savvy distant robotization structures that award huge cash related hold saves and reduce air-poison floods through upgrading the association of current plans. WSNs, the conviction of insignificant cost implanted business robotization structures have become practical [5]. In the one's turns of events, distant little sensor community focuses are related on endeavor gear and reveal the cutoff points basic for each gadget's efficiency fundamentally settled on several appraisals like vibration, temperature, strain, and power quality. this information is then to some degree transported off a sink community that evaluations the information from every sensor. Any end loads are told to the plant workers as a perplexed warning framework. This awards plant staff to fix or abrogate contraptions, sooner than their sufficiency drops or they flop. Consequently, miserable device screw-ups and the related fix and substitution expenses might be stayed away from, simultaneously as consenting to genuine natural guidelines. The accommodating considered IWSNs brings two or three benefits over customary disturbed out the business following and control structures, which unite self-affiliation, quick blueprint, flexibility, and intrinsic wily dealing with limit. In such a manner, WSN plays a basic breaking point in making an unequivocally dependable and self-recuperating present-day gadget that quickly reacts to consistent occasions with genuine activities. in any case, to comprehend the imagined current applications and, therefore, take the upsides of the support benefits of WSN, productive dispatch shows, which can manage the right disagreeable conditions presented through such frameworks, are required. The imaginative improvement inside the worldwide has during that time-shifted direction and measures to show sports associations are being made to allow let free to encounters and guide for giving clients [6]. this is a delayed consequence of the staggering name for assets reasonable in helping industrialists with achieving put forward targets and foster applications for the supporting of time transportation of materials and set out a chance for expanded data [7]. The significance of introducing a pleasantly unprecedented model wi-fi Sensor social class (WSN) in business take a stab at programming can't be over-featured; as needs are, this experience tends to the

great master in intersection the distance among the accessibility of OK after information offering all due appreciation to cultivate the current turns of events and the standard methodology for endeavors. WSN is a progression wherein basically confined focuses help each other in sending loads of information through the local vehicle to the spot for moving unendingly. The WSN joins focuses that can send and get messages in a cross fragment plan and a middle that can fill in as a switch and can also hand-off messages for its neighbour. through thusly, Wi-Fi group encounters will notice their course to the predetermined occasion spot, using transitory focuses with reliable correspondence procedures. WSN programming sways from one locale to another. different fields including fire, equipped power establishments, contamination, machine success, and regular parts following fuse gifted creating insubordination inside the execution of this time in checking sports incorporate them. In many preposterous areas, clear controlling is utilized because in reality the area, at the indistinct time as new flooding-based thoroughly time, offers the open door and advantages, especially in gigantic affiliations.

II. LITERATURE REVIEW

Mrutyunjaya Sahani, [et.al, 2015] the arrangement and improvement of a spic and span shrewd checking and controlling machine for kitchen biological factors in genuine time otherworldly with the relative magnificent turn of events. As in a condition of amicability with offering a clarification for in the paper proposes a top tier Raspberry pi based kitchen seeing contraption through site page with ZigBee based time with the part. Inside the organized and played out a decreased wi-fi sensor area web limit of climate. The contraption can show the standing of the kitchen and send an email or conceivably a pre-arranged SMS through GSM social class precisely to clients with point by point genuine elements. It can coordinate through the web. The trouble of getting email is researched through the overall calculation managed into the Raspberry pi and sometime later the contraption reacts to the differentiating mentoring and high security huge.

Ravi.M.et.al.[2015] As trustworthy with the fashioner's suggestion an avocation for robotization utilizing in wi-fi report has made the frameworks more stunning and modernized correspondence structure .inside the time utilized The nearby spot area additionally sends a making SMS aware of a predefined flexible wide reach. it might add far off the machine if a breaking point passes the cutoff inside the proposed device, the patient's physiological conditions are acquired with the associate of technique for the far away sensors communities related at the impacted individual edge, and are then passed on to the far off base-station. The base station is normal for the use of a Raspberry Pi. The Raspberry Pi is an ARM eleven processor with highlights like progressive discussion and Ethernet, etc

Keerthi Vallap Reddy.et.al.[2014] in this paper, the producer has proposed a completely altered enlistment code insistence instrument with a point-by-point design. inside the legitimization, for learn at orchestrating a framework that unequivocally gets the photograph of the show up a plate of an auto. the ones genuine elements had been fanned out the utilization of Raspberry Pi processor for affirmation.

Fabio Leccese et.al.[2014] In the paper, A shrewd city application has been found and examinicelyner. In the paper distance, the controlled isle of light posts essentially settled on new advances with shape. According to the pristine organized and created in cautious moderate layers machine, which performs nearby exercises to substantially deal with the light posts and send assessments with each other for far away make due. Locally, every light set up remembers an electronic card for contraptions for management and a ZigBee affiliation. The flow thought network sends encounters to a significant control unit, which deals with the total isle in research craftsmanship. The huge unit is perceived with a Raspberry Pi regulate card because of its appropriate figuring all-around execution at an unimaginably insignificant cost in the framework.

Oğuz Gora et.al.[2015] In the most recent years inserted plans have gotten more importance. those frameworks are explicitly dedicated to unequivocal responsibilities which may be overseen through unfathomably further evolved responses.

V. Ramanath et.al.[2015] This paper makes a specialty of utilizing face comprehensiveness approach for vehicle start, rather than the typical strategy of utilizing keys. Face insistence is a short-making, strengthening area constantly packaged. The face notoriety procedure empowers face certification of genuine clients of the vehicle to be sought after an information base.

III PROJECT INTRODUCTION

3.1 AIM

The standard clarification for this attempt is to design the controlling and checking for building and gathering office Automation the usage of IoT.

3.2 DESCRIPTION:

The endeavor proposes a strong execution for IoT utilized for checking and controlling the financial gatherings using the field giant net. The automation system involves steady contraptions as a UI. they could converse with the financial computerization network through a web entrance, through procedures for low-

pressure shows like Zigbee, wi-fi thusly in this task objective controlling business machines through cellphone the utilization of wi-fi as correspondence gathering and nodemcu. The partner here will pass truly with the plan through a web interface.

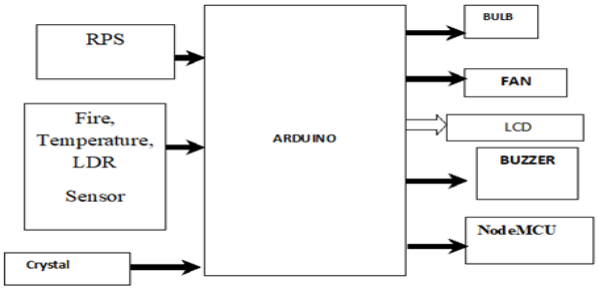


Fig 1:- Block Diagram

IV. ARDUINO

Overview:

Arduino Uno is a microcontroller board subject to the ATmega328P (datasheet). It has 14 pushed data/yield pins (of which 6 can be used as PWM yields), 6 crucial data sources, a 16 MHz finished resonator (CSTCE16M0V53-R0), a USB affiliation, a power jack, an ICSP header, and a reset button. It contains all that normal to help the microcontroller; on a fundamental level interface it to a PC with a USB affiliation or power it with an AC-to-DC connector or battery to start. You can meddle with your Uno without anguishing significantly overachieving something incorrectly, most fundamental result conceivable you can exchange the chip for a couple of dollars and start again.

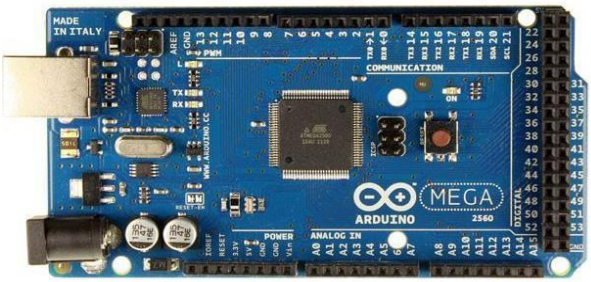


Fig 2:- Arduino Board

"Uno" recommends one in Italian and was picked to stamp the presence of Arduino Software (IDE) 1.0. The Uno board and structure 1.0 of Arduino Software (IDE) were the reference types of Arduino, direct made to ceaselessly current releases. The Uno board is the first in the advancement of USB Arduino sheets and the reference model for the Arduino stage; for an expansive once-over of current, past, or old sheets see the Arduino report of sheets.

NodeMCU

NodeMCU is an unimportant expense open-source IoT stage. It at first included firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems and stuff that depended upon the ESP-12 module. Sometime later, support for the ESP32 32-cycle MCU was added. NodeMCU joins "center" and "MCU" (small scale controller unit). The articulation "NodeMCU" thoroughly talking suggests the firmware rather than the connected progression packs.

Fig 3 : NODEMCU Module

V. FIRE SENSOR

Fig 4:- Fire Sensor

There are several types of flame detector. The optical flame detector is a detector that uses optical sensors to detect flames. There are also ionization flame detectors, which use current flow in the flame to detect flame presence, and thermocouple flame detectors.

Infrared Flame Detector

Infrared (IR) flame detectors work within the infrared spectral band. Hot gases emit a specific spectral pattern in the infrared region, which can be sensed with a thermal imaging camera (TIC) a type of thermo graphic. False alarms can be caused by other hot surfaces and background thermal radiation in the area as well as blinding from water and solar energy. A typical frequency where single frequency IR flame detector is sensitive is in the 4.4 micrometer range. Typical response time is 3-5 seconds.

LIGHT DEPENDENT RESISTOR

INTRODUCTION:

An LDR (Light dependent resistor), as its name suggests, offers resistance in response to the ambient light. The

resistance decreases as the intensity of incident light increases, and vice versa. In the absence of light, LDR exhibits a resistance of the order of mega-ohms which decreases to few hundred ohms in the presence of light. It can act as a sensor, since a varying voltage drop can be obtained in accordance with the varying light. It is made up of cadmium sulphide (CdS).

An LDR has a zigzag cadmium sulphide track. It is a bilateral device, i.e., conducts in both directions in same fashion.

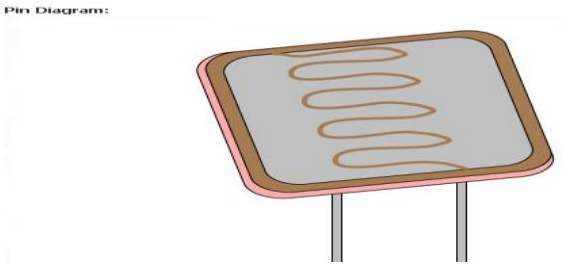


Fig 5:- Pin Diagram LDR

A Light Dependent Resistor (aka LDR, photoconductor, or photocell) is a device which has a resistance which varies according to the amount of light falling on its surface.

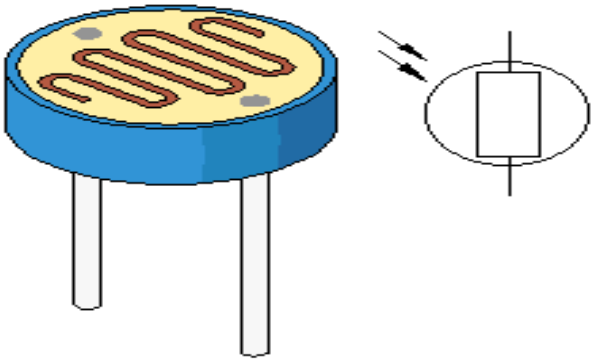


Fig 6:- Working of LDR

A typical light dependent resistor is pictured above together with (on the right hand side) its circuit diagram symbol. Different LDR's have different specifications, however the LDR's we sell in the REUK Shop are fairly standard and have a resistance in total darkness of 1 MOhm, and a resistance of a couple of kOhm in bright light (10-20kOhm @ 10 lux, 2-4kOhm @ 100 lux).

Uses for Light Dependent Resistors

Light dependent resistors are a vital component in any electric circuit which is to be turned on and off automatically according to the level of ambient light - for example, solar powered garden lights, and night security lighting.

An LDR can even be used in a simple remote control circuit using the backlight of a mobile phone to turn on a device - call the mobile from anywhere in the world, it lights up the LDR, and lighting (or a garden sprinkler) can be turned on remotely!

Light Dependent Resistor Circuits

There are two basic circuits using light dependent resistors - the first is activated by darkness, the second is activated by light. The two circuits are very similar and just require an LDR, some standard resistors, a variable resistor (aka potentiometer), and any small signal transistor

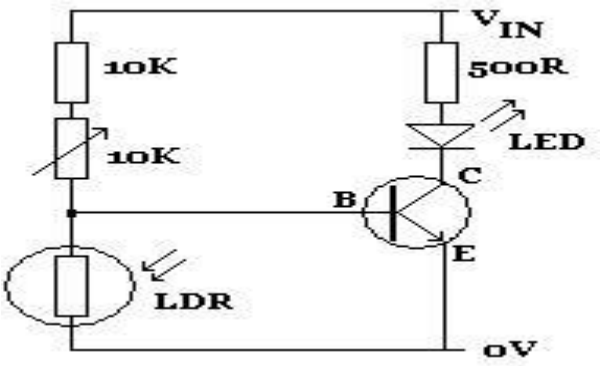
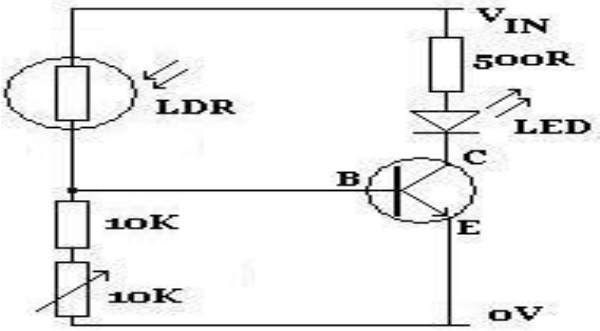


Fig 7:- Circuit Diagram LDR

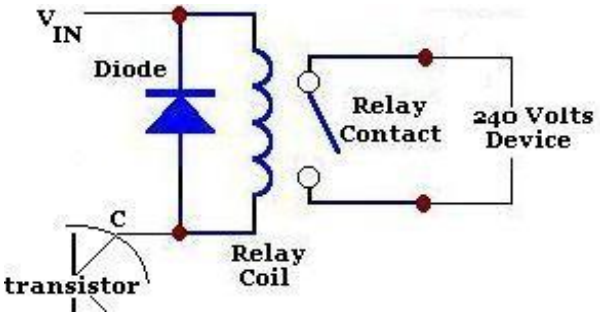
In the circuit diagram above, the LED lights up whenever the LDR is in darkness. The 10K variable resistor is used to fine-tune the level of darkness required before the LED lights up. The 10K standard resistor can be changed as required to achieve the desired effect, although any replacement must be at least 1K to protect the transistor from being damaged by excessive current.



By swapping the LDR over with the 10K and 10K variable resistors (as shown above), the circuit will be activated instead by light. Whenever sufficient light falls on the LDR (manually fine-tuned using the 10K variable resistor), the LED will light up.

Using an LDR in the Real World

The circuits shown above are not practically useful. In a real world circuit, the LED (and resistor) between the positive voltage input (Vin) and the collector (C) of the transistor would be replaced with the device to be powered.



Typically a relay is used - particularly when the low voltage light detecting circuit is used to switch on (or off) a 240V mains powered device. A diagram of that part of the circuit is shown above. When darkness falls (if the LDR circuit is configured that way around), the relay is triggered and the 240V device - for example a security light - switches on.

LM35 TEMPERATURE SENSOR

LM35 is a precision IC temperature sensor with its output proportional to the temperature (in oC). The sensor circuitry is sealed and therefore it is not subjected to oxidation and other processes. With LM35, temperature can be measured more accurately than with a thermistor. It also possess low self heating and does not cause more than 0.1 oC temperature rise in still air.

The operating temperature range is from -55°C to 150°C. The output voltage varies by 10mV in response to every oC rise/fall in ambient temperature, i.e., its scale factor is 0.01V/ oC.

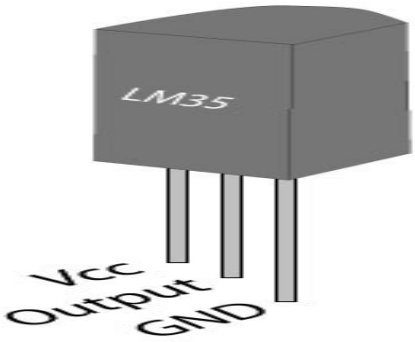


Fig 8: Temperature Sensor Lm35

TEMPERATURE SENSOR

This project uses IC LM35 as a sensor for detecting accurate centigrade temperature. Linearity defines how well over a range of temperature a sensor's output consistently changes. Unlike thermistor, Linearity of a precision IC Sensors are very good of 0.5°C accuracy and has wide temperature range. its output voltage is linearly proportional to the Celsius (Centigrade) temperature.

The LM35 is rated to operate over a -55° to +150°C temperature range.It draws only 60 µA from its supply, it has very low self-heating, less than 0.1°C in still air. LM35 Operates from 4 to 30 volts.

Output of IC is 10mv/degree centigrade for eg if the output of sensor is 280 mV then temperature is 28 degree C. so by using a Digital multimeter we can easily calculate the degree temperature. For trigger point you should set the voltage of pin 2 of IC 741 by using preset or potentiometer.

Our aim of this project is not to construct a thermometer but to activate or deactivate a device at a particular margin temperature. For simplicity we have used 2 LED for indication of both low (Green) and high (Red) temperature.

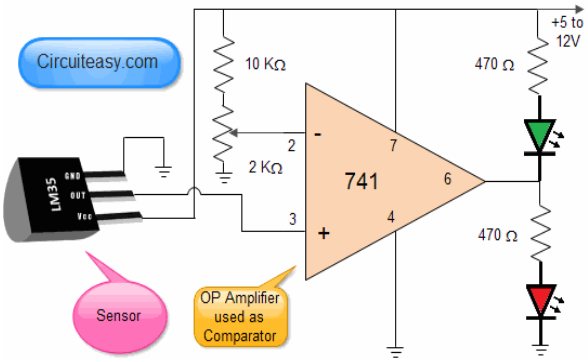


Fig 9:- Circuit Diagram of temperature sensor

Working: The output of IC2 increases in proportion to the temperature by 10 mV per degree. This varying voltage is feed to a comparator IC 741 (OP Amplifier). OP Amplifier are among the most widely used electronic devices today. The op-amp is one type of differential amplifier. It has two input inverting (-) and non-inverting (+) and one output pin. We have used IC741 as non-inverting amplifier which means pin 3 is the input and the output is not reversed. This circuit amplifies the difference between its input terminals.

As a comparator, Bistable output of an op amplifier is as follows :-

$$V_{\text{out}} = \begin{cases} V_{S+} & \text{if } V_1 > V_2, \\ V_{S-} & \text{if } V_1 < V_2, \\ 0 & \text{if } V_1 = V_2, \end{cases}$$

Part list:

IC LM35, IC LM741

Resistance: 10K Ohms, 470 Ohms X 2Pcs

Preset or P.O.T of 2K Ohms

LED 2pcs (Red and Green)

9V Battery with Snap

Switch, wire

*By making this Temperature Sensor Project, student will be capable of making many similar project i.e Automatic room heater controller, determine hotness of Tea or Coffee to avoid burning your tongue, Automatic Fan Controller etc.

V. LCD

Introduction

LCD (Liquid Crystal Display) is such a level board show which uses liquid significant stones in its fundamental kind of movement. LEDs have an enormous and moving approach of utilization cases for customers and relationships, as they can be ordinarily found in phones, TVs, PC screens, and instrument sheets.

LCDs were an imperative ricochet the degree that the movement they removed, which breaker light-passing on the diode (LED) and gas-plasma shows. LCDs allowed colleagues to be inside and out more thin than the cathode bar tube (CRT) movement. LCDs eat up generously less power than LED and gas-show shows since they seek after the norm of obstructing light as opposed to releasing it. Where a LED radiates light, the liquid huge stones in an LCD pass on an image using establishment enlightenment.

As LCDs have replaced progressively organized hotshot drives, LCDs have begun being removed by new introduction enhancements, for instance, OLEDs.

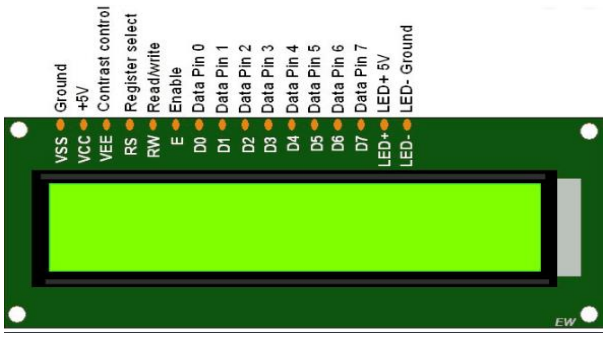


Fig 10:- LCD Display

VI. SOFTWARE TOOLS

Arduino IDE compiler:

Arduino is an open-give contraptions stage subordinate by and large upon smooth to utilize stuff and programming utility. Arduino sheets can see inputs - slight on a sensor, a finger on a button, or a Twitter message - and flip it into a result - inducing an engine, turning on a LED, dissipating a few locales on the web. You could put together your board by sending a firm of mentioning to the microcontroller at the board. To do such a ton of that you utilize the Arduino programming language (set up all around concerning Wiring), and the Arduino programming (IDE), pondering Processing.

All through the long Arduino has been the mind of loads of liabilities, from standard devices to complex clinical contraptions. Overall neighborhood creators - understudies, informed subject matter experts, arranged specialists, originators, and coordinated prepared experts - have amassed unusual this open-convey stage, their responsibilities have brought whatever amount of a dazzling level of open limit that can be of astonishing help to understudies and specialists the same.

Arduino has become brought into the world on the Ivrea correspondence setup Institute as an ideal contraption for second prototyping, prepared towards school understudies without an obvious past in stuff and programming. As fast as it displayed at a miles more broad district, the Arduino board began changing back to adjust to new dreams and unwanted conditions, segregating its give from smooth eight-cycle sheets to stock for IoT Programs, wearable, three-d printing, and installed conditions. All Arduino sheets are without a doubt open-convey, attracting clients to total them excitedly and in the end change them to their extraordinary dreams. The thing program, additionally, is open-supply, and its miles making through the responsibilities of clients from one side of the world to the next.

VII. CONCLUSION

These days, we are in desperate need of all things electronic. Ahead of time, with the assistance of cameras, we are able to essentially screen the situations. We have implanted the Internet of Things (IoT) in the firm to limit from an overall perspective in an analogous way as to set up the competent individual to go to appropriate lengths, but this will acceptably complete our requirement. In daring to minimize manual vertical. On occasion, it will be too late in the meantime, and the damage it does to the property will be comparable to the harm it causes to life. Taking everything into consideration, we are encouraging the development of mechanical robotization via the Internet of Things (IoT) with the assistance of artificial intelligence (AI) in order to automate the game plan so that it can make significant judgments.

Future Scope

In the future, effort will be done to construct more complicated assault scenarios by expanding upon these fundamental attack scenarios that are now being developed. Additionally, more complex defense measures would be taken into account. One example of this would be the adoption of ML algorithms in order to detect patterns of agent interactions and assaults.

VII. REFERENCES

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Portable ECG Kit

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***Abstract*— Measuring the Electrocardiogram (ECG) signal is an important method for the identification of heart diseases. Heart diseases are one of the leading causes of deaths globally. The ECG signal contains information regarding the degree of how much heart perform its function. Thus, there is need of an portable and efficient machine which will allow an person to take their own ECG anytime and anywhere. For a person to own machine that will measure the ECG is very costly. By using Internet-of-things (IoT) we propose a methodology for ECG recording and monitoring. A wearable monitoring node gathers the ECG information and using Wi-Fi technology is transmitted directly to IoT cloud and user can see the pulses on Ubidots cloud server. By having an cloud server the doctor will be able to view the electrocardiogram anywhere and anytime. The proposed work will drastically reduce the costly of a portable ECG kit. The article is of great help to the health industry and help those who don't have the capital to buy expensive devices.**

Keywords*— *ECG, IOT, Cloud, ThingSpeak, Health monitoring, Wearable Sensors.

I. Introduction

Since previous decade, IOT has been the technology that is most frequently utilized to develop interactive circuits. One of the main causes of unplanned fatalities is heart disease. Several variables, including age, level of physical activity, and cholesterol body size, diabetes, cardiovascular disease, and level position and other factors might affect a person's heart rate. In the proposed work, how to identify the heart rate of the individual has been attempted in this project. The heart diseases are one of the foremost reasons for unexpected deaths. Many factors such as Age, fitness activity, cholesterol level, diabetes, cardio vascular diseases, body size, body position etc. may influence the heart rate of an individual.

ECG is helpful for prediction of one's heart's health. It can be used at the comforts of their homes. Heart rate can be measured easily. The cost of taking an ECG is very high and portable ECG kits in the market come at a very high cost

II. Literature Review

The rural population lacks adequate medical care. In this perspective, modern technology can be facilitated to alleviate your health problems. The ECG meters are connected to the human chest and the necessary cardiovascular data is collected through an IoT device. This data is stored in the cloud, which is integrated with the MQTT and HTTP servers[1]. This study proposed an innovative IoT-based method for ECG monitoring systems[2]in cardiovascular or cardiac patients.

ECG signal parameters P, Q, R, S, T are collected, pre-processed and predicted in order to monitor cardiovascular conditions for further health management. The machine learning algorithm is used to determine the importance of the ECG signal parameters and the error rate. The logistic regression model corresponded to the best agreement between the train and the test data.[2]

Electrocardiogram monitoring is widely studied and used to diagnose heart disease. However, almost all existing portable ECG monitoring systems cannot function without a mobile app that is responsible for data acquisition and visualization. This article proposed a new ECG monitoring method based on Internet of Things (IoT) techniques.[3] ECG data is recorded with a portable monitoring node and transferred directly to the IoT cloud via WLAN. The HTTP and MQTT protocols are used in the IoT cloud to provide timely and visual ECG data to users. Almost all smart terminals with a web browser can conveniently record ECG data, greatly alleviating the cross-platform problem.[4] Experiments are carried out on healthy volunteers to check the reliability of the overall system. The experimental results show that the proposed system is reliable in collecting and displaying ECG data in real time, which can aid in the primary diagnosis of certain

heart conditions.[2]The prediction was made to determine the variation in the quality of the PQRST and its suitability in the ECG monitoring system. Satisfactory results are obtained when the values of the quality parameters are considered.[6]The proposed ECG system based on IoT will reduce healthcare costs and the complexity of the process.

The collected information is displayed in a graphical user interface (GUI), encoded with C, and displayed on a web page. Rapid Application Technology (RAD) was used in the methodology that began with rapid system design.[7] Hardware and software systems went through a prototyping cycle for development. Once the system integration is complete, a complete IoT-based ECG monitoring system will be configured. A sample size of 18 and a = 0.05 is used to test with test. [3] The tests returned test values that are in the non-critical range for all ECG parameters, which means that there is no significant difference between the collected data. The percent reliability of the device for detecting ECG conditions such as normal sinus rhythm, sinus tachycardia, sinus bradycardia, and flat line is 83.33 percentage. The percentage difference in heart rate is 0.35 percentage, which is within the acceptable medical standard of 99 precision. The device was classified as functional and fully running.[2]

III. Methodology

The methodology that the project will follow is that the main sensor AD8232 will record the ECG signal via its nodes.
The information from the nodes will be passed to the Microcontroller unit that is the Arduino Uno. The Arduino Uno will help us in view the ECG signal by converting the electrical signals from the nodes to digital signal.

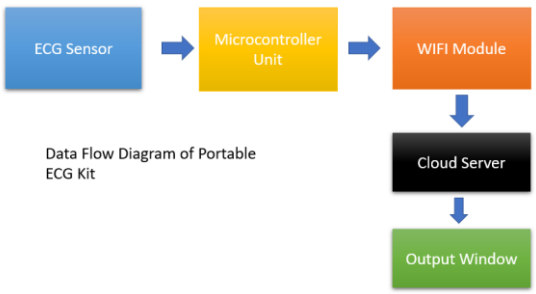

Fig 1. Flowchart

A. Hardware

The various hardware components are:

i. ECG Sensor
The ECG tracking node is responsible for collecting information from the human skin ECG and then sending that information through an unguided medium. The sensor module is the basic component of the system that collects ECG information from the human body.

ii. Arduino Uno
The Arduino UNO is a standard board of Arduino. Here UNO means 'one' in Italian. It was named as UNO to label the first release of Arduino Software. It was also the first USB board released by Arduino. It is considered as the powerful board used in various projects. Arduino.cc developed the Arduino UNO board.

iii. ESP8266 Module
The Wi-Fi device can get the ECG medical information through the web server. The WIFI device provides quick and efficient web access that can send and receive consistent, electrocardiogram information to the IoT cloud.

B. Connections of Hardware

The AD8232 ECG sensor must be connected with the Arduino to get the readings. The connections are shown below:

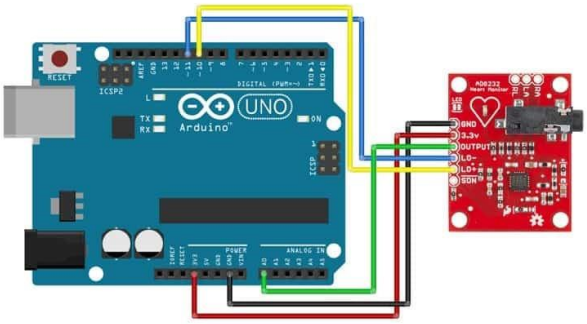

Fig 2. AD8232 with Arduino

Five of the board's nine pins will be connected to Arduino. The required five pins are GND, 3.3v, OUTPUT, LO-, and LO+.

Table 1. Connections

Board Label	Pin Function	Arduino Connection
GND	Ground	GND
3.3v	3.3v Power Supply	3.3v
OUTPUT	Output Signal	A0
LO-	Leads-off Detect	11
LO+	Leads-off Detect	10
SDN	Shutdown	Not used

After the connections are done for ECG sensor with Arduino, we can get the Signal on Arduino IDE. The ECG can be seen by going to Serial Plotter in the tools present in the Arduino IDE.

C. Cloud Server

The cloud server that this project focuses on is the Things Speak server which is an open platform. There are two types of windows on the Thing speak platform one is the private window and the public window; the public window gives access to all user to view the data.

Ubidots is a provider of data analytics and visualization for Internet of Things (IoT) applications. We transform sensor data into knowledge that is relevant for corporate decisions, machine-to-machine communication, academic research, and a greater efficiency of the world's resources.

It is not efficient to view the ECG on the Arduino IDE it is just an temporary solution, the better solution is to view the ECG on cloud server/platform called as Ubidots. Here the data is much clear and the ECG can even be viewed within a certain time period, through this even the doctors will be able to view the ECG anywhere and anytime.

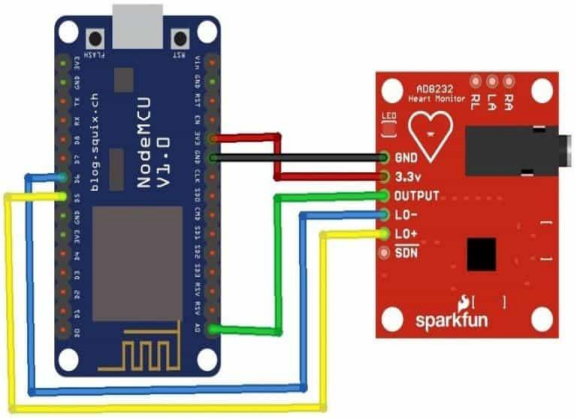

Fig 3. Connection of AD8232 with ESP8266

The AD8232 Breakout Board has 6 pins. SDN isn't linked. Connect the OUTPUT to Nodemcu's analogue A0. Connect the Nodemcu's's D5 and D6 to the LO+ and LO-, respectively. Connect the AD8232 kit's GND to GND and supply it with 3.3V VCC.

D. Implementation

The circuit is constructed by referring the proper circuit diagram and the all the connections are made. After the connections are made with the AD8232 the small circuit is connected with the Arduino Uno.

The Arduino Uno is then turned on by plugging in to the USB port of the laptop. After it is plugged into the laptop, the Arduino IDE is opened where the initial code is written. The code is then tested and checked if there are not any error.

Once the code is checked, the nodes of the ECG is connected to the person. The circuit will be working by taking ECG from the nodes as input and then the signal will which is analog will be converted into digital using the Arduino Uno. The Arduino Uno will act as intermediate device which will be connected to the laptop.

The laptop will be the output device here and on the screen the ECG will be displayed. The ECG signal that will get from the AD8232 will then be transferred to the cloud server of Ubidots where all the data will be stored.

In the Ubidots site various changes can be done to data. The data can even be viewed within a particular time interval or duration.

E. Results and Discussion

After all the connections and setup is done the ECG signal is first viewed on the Arduino IDE with the help of the serial plotter.

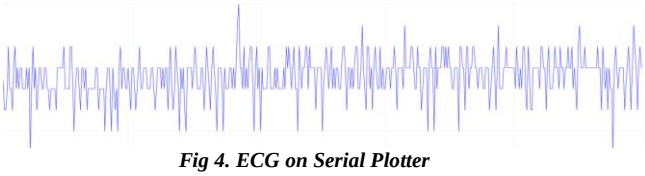

Fig 4. ECG on Serial Plotter

We can also view on the Cloud server Ubidots after making the proper connections with ESP8266 and executing its respective code. The Ubidots cloud server gives us a better platform to vew the ECG . As there are various tools which allow us to view the ECG in an particular interval of the day.
This method is efficient as compared to others as through the cloud server the doctor will be view ECG anywhere and convey the condition of the heart.

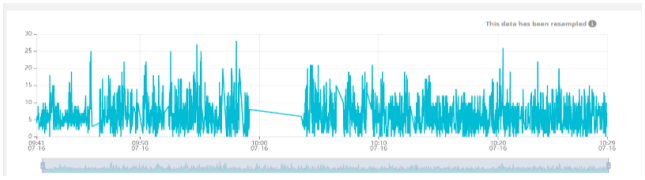

Fig 5. ECG on Ubidots Server

IV. Conclusion

The IOT sector is already changing many lives every day. As one of the main causes of unplanned fatalities is heart disease. Age, degree of physical activity, cholesterol, diabetes, cardiovascular illness, body size, body posture, etc. are all elements that might affect a person's heart rate and ultimately lead to mortality. Since these devices are typically cumbersome and awkward, the proposed work store the ECG.

Since the patient will need to visit the hospital frequently, this project will make the procedure easier and reduce the load on the medical facilities. The future scope is:

1. Future wearable equipment will pay more attention to the wearer's psychology and emotional state.

2. They will have more implantable and separated equipment.

3. The future device will also be able to collect data to be processed and send an alert of sudden illness to the patient's family via the transmission of data

Acknowledgment

We would like to thank our college, Thakur College of Engineering and Technology for giving us an opportunity to work on this project. We would also like to thank our guide, Mr. Niket Amoda, for guiding us throughout the project.

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Smart Medicine Dispenser

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***Abstract*– There are several challenges that old people face, and one of them is taking their medicines on time. Old people usually forget to take their medication on time and also have a hard time recollecting whether they had their medication or not, which sometimes could lead to overdose and severe medical complications.The smart medicine dispenser could solve such problems by informing and alerting the patients to take the appropriate dose at the right time. There are several expensive medicine dispensers available in the market now. But most of them are just simple devices with reminders but lack other aspects of health monitoring systems. The product in the proposition consists of two major parts which are hardware and software. The hardware part involves a microcontroller and many other sensors for monitoring the health of an individual whereas the role of the software part is to control the device remotely. Also, as the product is mostly focused on the old people the aim is to make it more user friendly and portable. The proposed product is designed to make sure that the quantity and timing of the pills to be dispensed can be controlled and monitored using an application, which makes things easier for users of all age groups.**

Keywords– Medicine dispenser, smart, patients, medication & application.

I. INTRODUCTION

The life of a person has become so hectic that it is not possible for him to vacate even a single minute to look after himself , thus negligence towards taking medicines has become conventional.Studies show that many people irrespective of age become forgetful when it comes to consuming medicines. This, seen mostly in the elderly, leads to many life risks. This is where medicine dispensers come into play.

There are different types of dispensers all of which are just implemented using solid medicines. Most of them are just simple devices with reminders but lack other aspects of health monitoring systems. The available dispensers are extremely costly and do not allow multi user functionality.

This paper proposes a dispenser that can dispense solid medicines and has an application integrated with it and helps to set alarms and provide care and take live information.To build an economically viable medicine dispenser and to make it more efficient. The system should allow efficient communication between user and caretaker. The product is designed to make sure that the quantity and timing of the pills to be dispensed can be controlled and monitored using an app, which makes things easier for everyone, it is also embedded with a health monitoring system.

The system that is proposed is mainly divided into two parts consisting of hardware and software. The hardware would include ESP32S for managing the sensors and connectivity with the Blynk Application or Website as it has wifi and bluetooth compatibility. The software includes the Blynk Application or MediBox webpage and the information database regarding the medication and the time of the dispensing. Both combined together will produce an all rounder product for a cheaper rate and same efficiency.

II. LITERATURE REVIEW

Most commonly microcontrollers are used to keep track of when the patient should take medications. It displays the time for the next medicine on a LCD screen and when the time arrives, it generates messages repeatedly, along with LED blinking indicating which compartment to open. When the patient opens a compartment, a sensor detects this and resets the light, and the alarm is snoozed. A tradition yet the most important part of the medicine dispenser as reflected in Automatic Pill Dispensing Apparatus by Shaw & ThomasJ.[1] [2] reviews concludes that work is still required to enhance technology-based systems that can overcome these challenges, especially the accuracy, user comfort, and battery consumption. In addition, assuring the whole workflow with minimal burden for the patients and health practitioners is still to be met.

The economical side of medication adherence includes whether patients have insurance or other financial resources to pay for the medication and deep understanding of patient's relationship with their physician as well as the physician's communication style can affect adherence as observed in [3]. [4] explains the hardware architecture brings forward a wearable self-care device capable of delivering effective but tactful reminders, achieving

ergonomic and functionality requirements of patients' and care-givers' ease of use.

In the study, NodeMCU ESP8266, an Android; microcontroller with an inbuilt Wi-Fi component, is utilized for development. The Xcluma 28Ybj-48 stepper motor is used to rotate the medicine container. The stored history is also displayed to the user, which has the list of alarms successfully given the alarm, and the rotation of the container completed successfully. A medical alert is sent to the caretaker via a notification using the Android Application if the medicine is not taken within a specified time and specified dosage [10]. Some more examples of the same methodologies for reminding or giving alter notification are UniMeds [11], Wedjat [12], and MyMediHealth [13].These applications can be installed on various mobile devices such as smartphones, PDAs, etc. They offer sound and user-friendly user interfaces for configuring medication timetables and alert users to the specific period and class of medication conferring to the configured prescription timetable. They can prevent underdosing and miss dosing and are relatively low cost [14]. However, an IoT-based programmable innovative medicine kit guides users/nurses to manage the precise medication at the correct time schedules through a unique alarm system that includes buzzers, mobile notifications, and LED signals on the equipment sections. The parts containing suitable tablets are unlocked at the prearranged time [15].

In [16] It can be observed that the Node MCU is the main controller where it receives information from the magnetic switch and LDR (at pill compartment). The information is processed and the suitable status is displayed at the notification block. A Blynk IOT front end is used to show the mediation timings and health systems.ECE 4760 (Smart Medicine Box),This ECE 4760 is a project of a microcontroller-based smart medicine box using Atmel 1284p MCU. Its targeted users who routinely take drugs or vitamin supplements and nurses who take responsibility for the patients. The project is programmable that acknowledges nurses or users to specify the tablet amount to consume and the serving time for each day. It contains seven separate sections. This project would significantly loosen nurses or users' responsibility for regularly preloading tablets for patients [17]

[20] The system includes the interfacing of peripheral devices with Arduino UNO such as Alarm, IR sensor, Servo motor, and ESP 8266 in which the dispenser is controlled by specific programming. The locking system is based on a servo motor, by using an IR sensor which overcomes the problem that arises whether the subject has taken the pills or not. The concept of the local cloud has been used to address the usage of IOT to monitor the subject by the caretaker. The product consists of a chamber designed with a servo motor and it will be controlled by the Arduino. The subject will be notified by the LCD display at the time of dispense and also audibly indicated by an alarm with a buzzer, The chamber will be locked by the servo motor.

All the references mentioned have the basic Node MCU connected to the main working system. Mainly an Arduino or ESP32/ 8266 are used as the main microcontroller, they are utilized for mobilization of the opening valve for the medication to be received, for setting timers and in few cases connecting the device to an online platform. Most of these devices lack mental monitoring systems which can be a great addition to an all round system that could be helpful and can be commercialized to a greater market. All of these devices have a LCD screen for display and a Buzzer to send out alarms in addition to mobile notification. Unfortunately they lack inclusivity, as someone with hearing disability will not be able to get the sound signals. In MediBox, there is a provision for a visual alarming system that will indicate medication time and will act as an alarm for the needy.

III. PROPOSED METHODOLOGY

Work shall be done on each individual part at a time and then rectified, if found to be incorrect, it might start from scratch. This is able to go on till the project is completed in parts and needs to be assembled together. It is very crucial to work on things one at a time for them to be correct and avoid damaging the hardware components. The hardware components include devices which might need extra delicacy and need to be adjusted properly. For the software end of the project, even if there are multiple ways to connect the project online, it is important to keep in mind the needs and requirements of the users and the system itself. Therefore, more focus is put on creating the hardware and creating the basic structure of the system before deploying it online.

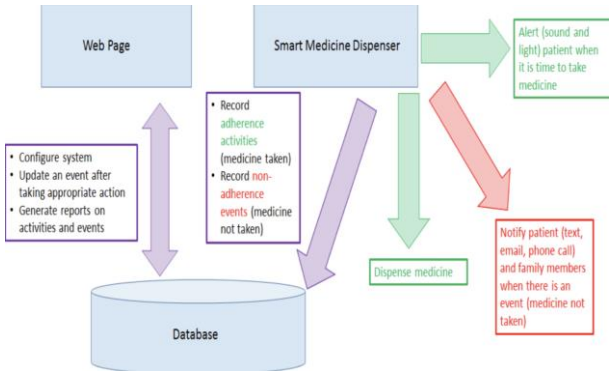

Figure1: System Working

The proposed product involves two major components:

A. *Hardware (Smart Medicine Dispenser):*
Hardware includes microprocessors and various types of

sensors. This stage of the project is the first stage and it allows us to work on the main medicine dispensers. If the components are soldered without prior testing they can be damaged and cannot be used further.

Table1: Components

Components	Application In the Product
ESP32S	Will act as the heart of the system by monitoring and controlling sensors & connecting it to the application
DS323	It is a real time clock that allows the ESP32 to manage real time applications.
LM393 chip	This chip allows the exact count of the medicines .
SIM800L	SIM800L is designed to connect to the caretaker via message.
ISD1820	This device is used to give output voice indication at the time of dispensing.
MicroMotor	Micro Motor acts like a valve that would allow the flow of the medication.
Heart Beat Sensor	Heart Beat Sensor is a part of the health monitoring system which will allow the caretaker to monitor the patient's heart rate.
LM35	Temperature sensor is a part of the health monitoring system which will allow the caretaker to monitor the patient's body temperature.

B. *Software (Webpage & Database):*

This involves user application and data viewing with communication between the devices. To connect ESP32S with any cloud platform and to perform coding Arduino IDE compatibility is required. And to do so the following steps are crucial:

Install the current upstream Arduino IDE's latest version. The current version is at the arduino.cc website. [7] Start Arduino and open the Preferences window. [7]

Enter one of the release links into the Additional Board Manager URLs field. You can add multiple URLs, separating them with commas. (https://raw.githubusercontent.com/espressif/arduino-esp32/gh-pages/package_esp32_index.json) [7]

Plug your ESP32 board and wait for the drivers to install (or install manually any that might be required) [7]

For this particular project ESP32 library is required.

To have error free coding install CH34x_Install_V1.5.pkg

Before coding, select the appropriate Board and Serial Port. To connect it to Blynk or Web application for Arduino Cloud, an authentication code is provided by both the websites which will allow connectivity.[8][9]

The database of the system will only include the login, password , the medications and the timer settings of those medications. The database should be able to change according to the changes in the website. The shown website is made using HTML, CSS, Java Script & Bootstrap. The website is intended to be very fluid and user friendly. The website is still under work and needs more features and charts need to be added that will allow the viewers to monitor health.

IV. RESULTS

The results would give the product maximum efficiency and allow effortless usage. The device will allow the user to set alarms for medicine dispensaries, notify when the medications are low and additionally monitor health. It would also provide a log time and remote access because of ESP32s and reduces the requirement of Arduino which leads to cheaper production cost. [21]

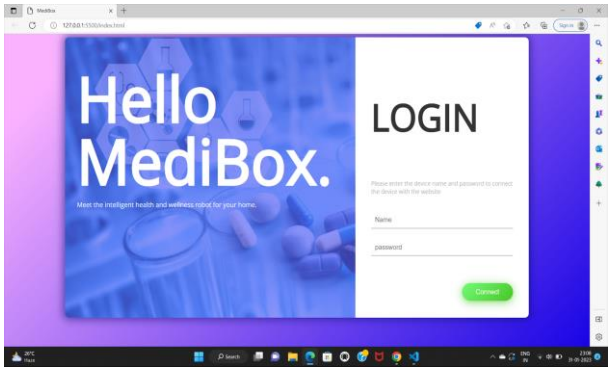

Figure2: Login Page

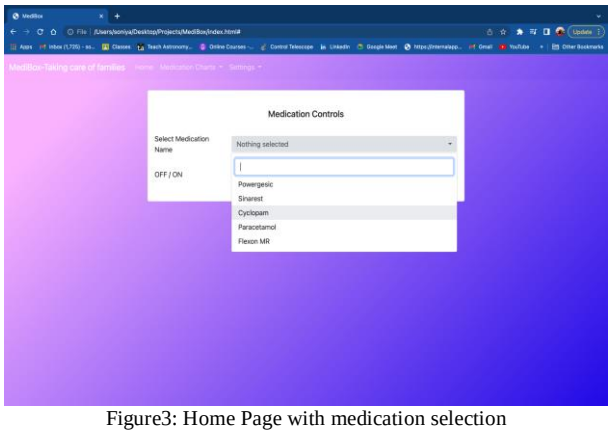

Figure3: Home Page with medication selection

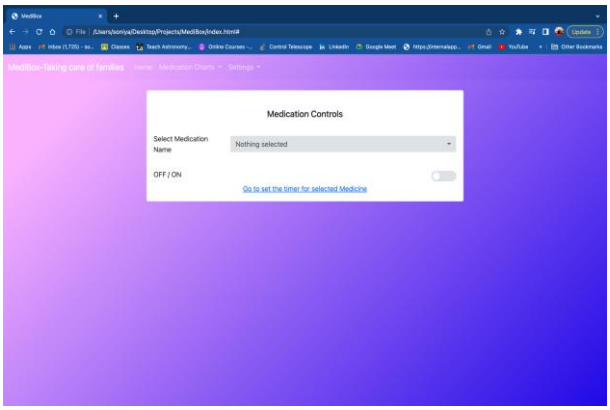

Figure4: Going Towards Timer Setting

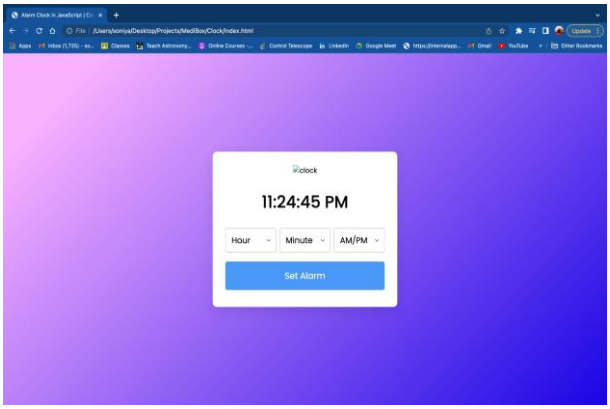

Figure5: Setting Timer

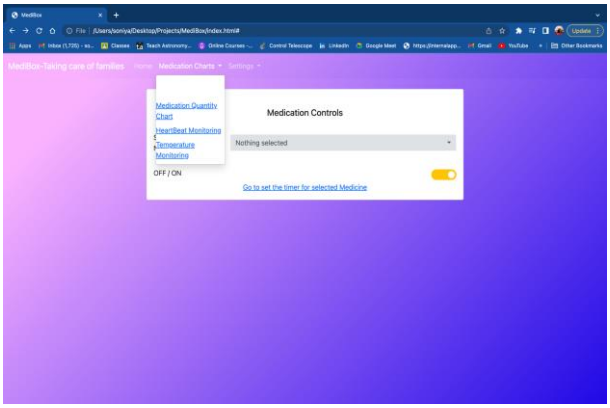

Figure6: Monitoring Charts

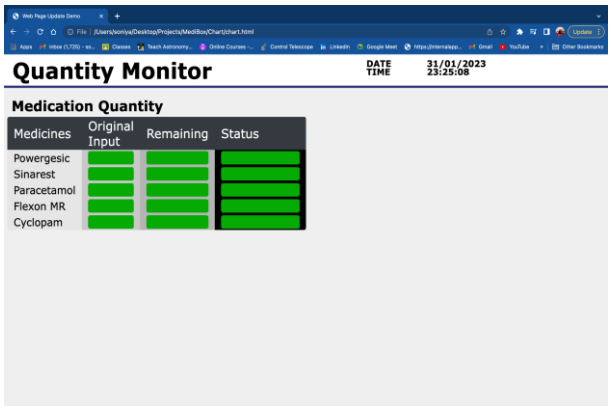

Figure7: Medicine Quantity Monitoring Chart Sample

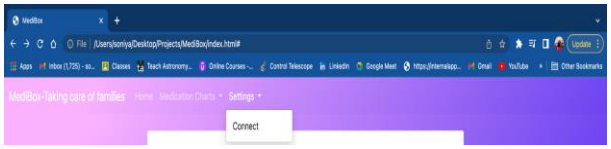

Figure8: Connecting to ESP32 via IP address

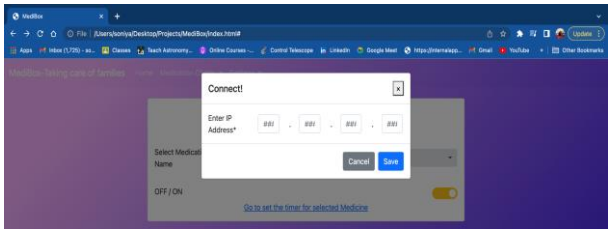

Figure 9 : Entering IP Address

V. CONCLUSION

In this paper, various comparisons and methods of building a smart medicine dispenser are discussed. Based on the proposed Smart medicine dispenser which will make it easier for people who require medical attention to take proper intake of medication. The proposed medical dispenser will have the property to communicate with caretakers at any time of the day, provide information if there is a recruitment of refill of medicines, they will provide information if the patient has taken the medicine or not, will blink to alert people who have hearing impaired, will send a voice message or a voice alarm for those who are blind. At the same time our main focus will be to make this medicine dispenser cost effective and cheap so that it can be affordable for the common man.

VI. FUTURE SCOPE

Some functions can be added to the dispenser to improve its user friendliness and effectiveness. An example is that the proposed product can be made for more than one user but the current prototype does not support this function even though it can be added easily. Also, provisions for

liquid doses can be added to make the device more effective. The current prototype does not have any location tracking system of the user so it can also be added to improve the effectiveness of the product. Adding communication with pharmacies to refill the dispenser will also make the proposed product more flexible and reduce patient efforts.

ACKNOWLEDGEMENT

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[20]International Research Journal of Modernization in Engineering Technology and Science (Peer-Reviewed, Open Access, Fully Refereed International Journal)Volume:03/Issue:08/August-2021 AUTOMATED LOW-COST PILL DISPENSER USING ARDUINO AND IOT WITH 24 HOURS MONITORING Kamal Raj *1, Javatini*2, Jainab Nisha*3, Mr. N. Prabhakaran*4

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Integrated Automatic Flood Warning System IoT Based

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***Abstract*—Floods are considered to be one of the most dangerous calamities in the world. In India places like Orissa, Bihar, Assam, West Bengal are prone to floods every year. Thisresults in massive loss to life and property. The main reason for these losses is the inadequate information regarding the disaster among the people. This paper is based on flood warning system using IOT. It would help to warn people about the floods in advance. The system consists of different sensors. These would measure the rising water level of the water bodies, record the intensity of rainfall for flood prediction and create alarm for the emergency situation. With the help of IOT the sensed data will be displayed on web server, that would be accessed by the concerned authorities. This paper talks about the early warning system, that would be a great help to people living in the flood prone areas. The early warnings would help them to take preventive measures. They can move to safer location and minimize their damage.**

Keywords—IOT, Flood management, Thingspeak, Arduino, ESP8226

I. INTRODUCTION

Climate change is one of the most important causes of flooding worldwide. In many places it has lasted for decades longer and has had a devastating impact on lives and livelihoods. Consequences include failure of water treatment systems and water utilities leading to water pollution and failure of wastewater treatment facilities. The addition of dirty sewage and overflow water increases the risk of spreading water-borne diseases such as typhoid and cholera. [1] When floods hit the land, it renders farms useless and disrupts planting and harvesting. This leads to a lack of food for living beings. The property, homes, and lives of people who live closer to flood-prone areas will eventually be affected. Damage to roads and other transportation infrastructure makes it difficult to provide emergency assistance. [2] Several flood warning systems have been developed and installed in developed countries, but production costs are too high for use in developing countries. Therefore, creating an effective flood warning system while maintaining a reasonable cost has motivated several

researchers and manufacturers. This study explores the use of wireless sensor networks (WSNs) for river and flood monitoring. Arduino data, ultrasonic sensor, and rain sensor data are transmitted through the Internet of Things. This can be done anytime, anywhere. [3] The paper written by P.Manikandan , V.Aravind , G.Gowtham Sankar ,P.Karthik named Integrated Automatic. Flood Warning and Alert System using IOT investigates about the use of wireless sensor network (WSN) for monitoring of river and flood conditions, stored in the web server which would send flood alerts to corresponding authority for proper action and the same can be viewed through the web. The wireless sensor network system can also be used for real-time monitoring conditions of water likewater flow level and precipitation levels. The paper highlights the main computer vision techniques and IoT sensor approaches utilized in the literature for real-time floodmonitoring, flood modelling, indicating early flood warning systems with the estimation of water level. The paper does not explain about how wireless communication can be used and the techniques of IOT. [4]In the paper IOT Based Early Flood Monitoring, Detection and Alarming System, written by Soubhagya P, Sreyasukumaran, Vishnu G M, Prof. Rashida Hameed; the author explains the development of flood monitoring systemusing IOT to keep track of the conditions nearby the reservoir. The proposed model is excessively utilized for monitoring the water level, flow variations, humidity and temperature variation occurring in the river and the same canbe used at dam or reservoirs. Hardware components used were: Arduino Uno R3, Wi-Fi MODULE – ESP8266, Temperature Humidity Sensor, Ultrasonic sensor, Water flow sensor, Water level senor, LCD display. Software components used were: Internet of things (IOT), Thingspeakweb server, Arduino IDE. The Future scope of the project is,flood can also be related to the intensity of rainfall, which is the height of the water layer covering the ground in a period of time. Hence the development of a rainfall forecasting sensor eventually turns up to the early flood monitoring and detection. [5]

The research done by Jagadeesh Babu Mallisetty and Chandrasekhar V in paper named Internet of Things Based Real Time Flood Monitoring and Alert Management system;they investigate the use of wireless sensor network (WSN) for monitoring of river and flood conditions. The WSN system can be used for real-time monitoring of water conditions like water flow level and precipitation levels. The model was developed and utilized in monitoring flood. Further studies on wireless

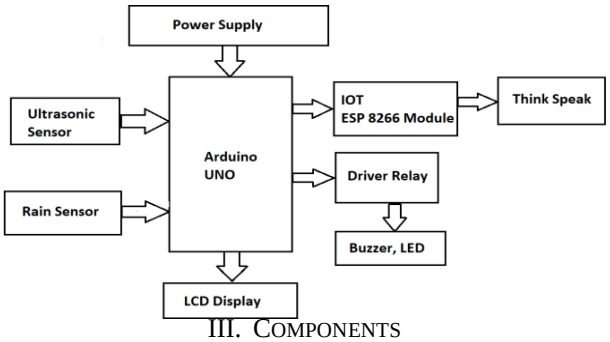
sensor technology could replace the current sensors and add new and more efficient sensors. The flood alert information can be displayed on LED display boards for road users and for safety reasons could be placed at strategic locations. [6]

The research paper named The Implementation of an IoT-Based Flood Alert System by Wahidah Md. Shah, F. Arif, A.A. Shahrin and Aslinda Hassan; develops a real-time flood monitoring and early warning system using wireless sensor node at a high prone area of flood. The system consists of a sensor that helps in detecting the water level and rain using an Ultrasonic Distance Sensor (HCSR04) and rain sensor respectively This system is based on Node MCU based technology integrated using Blynk application. The wireless sensor node can help the victims by detecting the water levels and rain intensity while giving an early warning when a flood or heavy rain occurs. [7].

II. METHEDOLOGY

In this system Arduino Uno is connected to all the components like LCD screen, LED, buzzer, ultrasonic sensor, rain sensor and the Wi-Fi module. The ultrasonic sensor is used to sense the water level, therefore rising water level of the water bodies will be sensed by it. The rain sensor is used to record the intensity of the rainfall occurring. This information will also give an idea about the upcoming floods. The real time analysis of the water level will be displayed on the LCD screen for nearby residents. Once the water level reaches the threshold alarm will be created with the help of buzzer and LED, along with it the warning message displayed on the LCD screen. For the IOT ThinkSpeak webserver used. This is a web browser that will show all the updates of the water level in the water body. The Wi-Fi module which is ESP8266 acts as the transmitting unit. It will send data of the different sensors stored in Arduino to the Think speak webserver. During the emergency all the updates can be seen on this website. Therefore, by this people could be warned and can move to a safer place and hence save their lives.

The Ultrasonic Sensor is connected to arduino board at pin 10 and pin 11. The Ultrasonic sensor senses the data i.e. any obstacle in a given range and gives that information to the arduino. Here if the distance of the obstacle in this project water level increases above certain level the arduino board sends signal to the buzzer that is connected to the pin13.



III. COMPONENTS

A. Hardware

1. Arduino Uno R3

The Arduino UNO is an affordable, flexible, and easy-to-use open-source programmable microcontroller board that can be integrated into a variety of electronic projects. The board can interface with other Arduino boards, Arduino shields, Raspberry Pi boards, and can drive relays, LEDs, servos, and motors as outputs.

fig. III.1

2. Wi-Fi Module

The Wi-Fi module, also known as serial ESP8226, belongs to the IoT transport layer. Its function is to convert the serial port or TTL level into an embedded module that can meet the Wi-Fi wireless network communication standard with embedded IEEE802 wireless network protocol.

fig. III.2

3. Ultrasonic Sensors

An ultrasonic sensor is a device that measures the distance to an object using ultrasonic waves. Ultrasonic sensors use transducers to send and receive ultrasonic pulses that convey information about an object's proximity.

fig. III.3

4. LED

LED which is known as Light emitting diode is a semiconductor light source that emits light whenever an electric current passes through it. It consists of a negative terminal and a positive terminal.

fig. III.4

5. LCD Display

A liquid crystal display (LCD) is a liquid crystal material sandwiched between two sheets of glass. When no voltage is applied between the transparent electrodes, the liquid crystal molecules are parallel to the glass surface.

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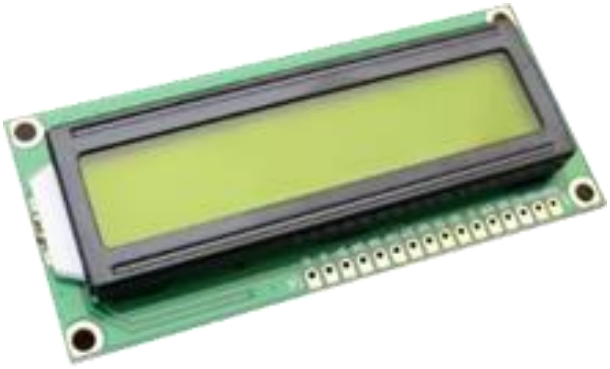

fig. III.5

6. Buzzer

A buzzer or beeper is an audible signaling device that can be mechanical, electromechanical, or piezoelectric (piezoelectric for short). Common uses for buzzers and horns include alarm devices, timers, and validation of user input such as mouse clicks or key presses.

fig. III.6

7. IOT

The Internet of Things (IoT) describes physical objects (or groups of such objects) embedded with sensors, processing functions, software, and other technologies that connect and communicate with other devices and systems via the Internet or other means of communication. network.

fig. III.7

B. Software

1. Arduino IDE

An integrated development environment for Arduino IDE controller programming written in Embedded C and an open platform for ESP modules. Sensors connected to the controller are programmed to monitor and detect flood conditions and alert others.

Fig.IIIb.1

2. ThingSpeak

ThingSpeak Server is an open data platform and API for the Internet of Things that can collect, store, analyze, visualize and act on sensor data.

Fig. III.b.2

IV. RESULT

The system is designed using all the different hardware and software components. The proper connections are made. The output of the Flood Warning System is being obtain in the below diagrams.

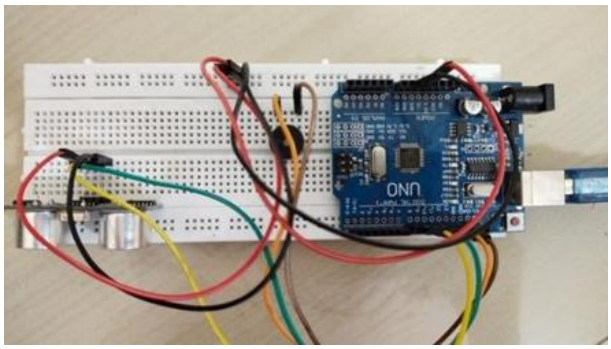

fig. IV.1

The image shows the all the connections of the flood warning system. The connection between to the Arduino, ultrasonic sensor and buzzer is made.

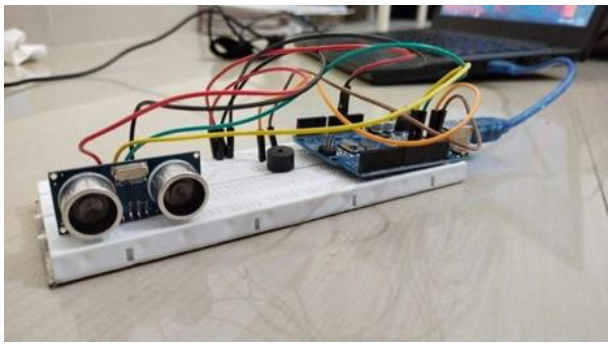

fig. IV.2

The Arduino board is connected is then connected to laptop for inputting data. The code is written in Arduino IDE software.

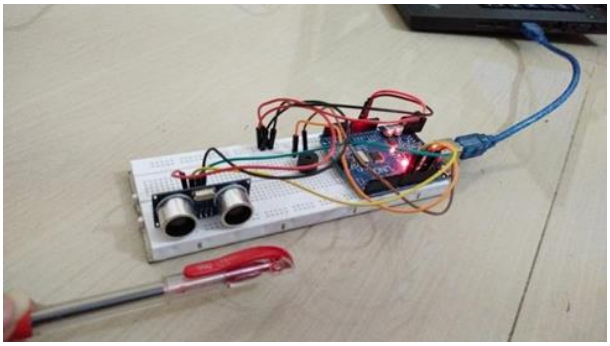

fig. IV.3

This is the situation where the disturbance is made in frontof ultrasonic sensor and the sensor sends signal to Arduinoand the buzzer starts buzzing on the command of Arduino. Once the LCD is connected to the system it will display themessages regarding the water level, whether the water is atnormal level, if level is increasing or there is flood situation.The ESP8266 will use to send the real time data to the webserver. The rain sensor will be used to detect the intensity of the rainfall to make flood prediction.

V. CONCLUSION

This project highlights the possibility of creating a warning system to overcome the risk of flooding. Since the project is implemented using IOT technology, sensor data can be monitored from anywhere in the world. More sensors can be incorporated into the system to create a more accurate and efficient flood detection system. It can also help various government agencies or government agencies that will ultimately help society and humanity deal with floods such as dangerous natural disasters. They will control every aspect that can lead to a Flood. Instant warning can be send when the water level rises with speed. It can also increase availability in resolving and recovering from this catastrophic event. In this way, it will help the community to make quick decisions and plan for the human catastrophe of a dangerous natural disaster: flooding.

The future scope of the project is that flood messages can be sent directly to residents' mobile phones. LEDs can be used to alert people in advance by displaying real-time sensor readings in flood prone areas and on roads. Solar panels can be connected to sensors. Easier to install and easier to maintain.

ACKNOWLEDGMENT

This paper and the research behind it would not have been possible without the exceptional support of my supervisor, Dr, Sukruti Kaulgud. Her enthusiasm, knowledge and exacting attention to detail have been an inspiration and kept our work on track.

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IOT Based Health Care Panic Alarm

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***Abstract*—In a world with an accelerated population aging, there is an increasingly interest in developing solutions for the elderly living assistance and small kids. The Internet of Things is a new reality that is completely changing our everyday life, and promises to revolutionize modern healthcare by enabling a more personalized, preventive and collaborative form of care. Aiming to combine these two important topics, this work presents an IoT-ready solution for the elderly living assistance which is able to provide mechanisms to trigger alarms in emergency situations. Its effective low-power/low-cost and wireless characteristics turns this solution suitable to be used anywhere and by anyone, in a discrete and comfortable wristband. With elderly people as the main target, these conservative users pose a serious challenge to the Successful implementation of smart home healthcare services. The objective of this research was to develop and test a theoretical framework empirically for determining the core factors that can affect the elderly users acceptance of smart home services for healthcare.**

Keywords: accelerated, developing solutions, wireless characteristics, emergency situations, low cost.

I. INTRODUCTION

A smart home system is defined as a collection of Sensors, actuators, communication devices, and Computing devices that are connected to each other to Provide homeowners with services and applications (e.g.,Safety and security, automation, entertainment, and Energy management) with minimum or no intervention. As reported by the World Health Organization (WHO), the population of elderly people Aged 60 or over will increase to about 20 billion by 2050 From 900 million in 2015, which accounts for 22% of the World's population . However, ageing is always Associated with decreasing functionalities, such as Physical, sensory and cognitive disabilities, which Increase the risk of falling. It is reported that Approximately 28-35% of the elderly aged 65 or over fall Each year. The risk of falling will rise as the age Increases. It is reported that elderly adults aged 70 or over Who fall each year will increase to 32-42%, while they Suffer moderate or severe health injuries, such as bruises, Hip fractures or head trauma, etc. Falls also bring out psychological burden, economic pressures and even impact the caregiver's quality of life

The key Challenge is to understand the behavior of the elderly People towards using a service that currently is not Available on a commercial scale. Hence, there is a serious Lack of a theoretical/conceptual approach in acceptance Modelling as the current focus is on the underlying Technologies and services rather than an end-user Perspective. In this study, we concentrate on the factors Affecting the elderly acceptance of the smart homes for Healthcare from a conceptual view point rather than a Specific product or service. Thus, the takeaway of this Research is a framework that suitably explains the Acceptance behavior of smart homes for healthcare Among the elderly on a conceptual level that will provide The initial groundwork for potential future research

II. PROBLEM DEFINITION

In our day-to-day life elderly people need more help in their Daily Activities They can get Injured easily, or they need any help so we need to create a solution for them Our Project will help them to inform to their closed ones if they are in Problematic condition. Our Health Care Alarm is efficient and easy to use in emergency situations.

III. LITERATURE SURVEY

Developments in IOT technology have resulted in the Evolution of traditional homes to smart homes which According to Rosslyn etal is defined as '' an Amalgamation of technology and services through home Networking that ensures a better quality of life for its Inhabitants' 'The sensors and actuators along with the Backbone communication network (wired or wireless) Form the core part of such smart homes. Artificial Intelligent (AI) techniques are often used to gather and Analyze the information of the occupants' health status And report any kind of abnormalities; thereby enabling to Take certain decisions and provides recommendation. Most of the studies provide specific solutions to address The needs of the patients/elderly people, such as chronic Disease management, assistance in independent living, Preventive care, etc. All these systems include a Combination of sensors, software and networking Technology to collect, process, analyze, and transfer the Data either to the smart home service providers or to a

Remote healthcare center. All these systems include a Combination of sensors, software and networking Technology to collect, process, analyze, and transfer the Data either to the smart home service providers or to a Remote healthcare center. The main cause for such a low Adoption rate is the lack of a holistic approach towards Smart home systems for healthcare in general. The main cause for such a low Adoption rate is the lack of a holistic approach towards Smart home systems for healthcare in general. Most of the Ongoing research focus on the underlying technologies And services without talking into account the dependence of human characteristics on technology and the social Background.

IV. PROPOSED METHODOLGY

An online survey instrument has been developed to measure the perception of the elderly people in using smart homes for healthcare purpose. The target population is from India, Thailand, Indonesia, and Malaysia. Before distributing the questionnaire to the participants, opinion has been sought from two independent experts for ensuring the questionnaire validity and relevance. The survey instrument has been structured in two parts. Part 1 contains certain sociodemographic questions (respondent age, gender, household size, and household income) and a basic question on smart home awareness that has been used as a screening question. The screening question has been used in order to minimize the hypothetical response biases from those people who absolutely have no idea or prior knowledge about smart homes. The screening question used was ‘‘Do you know what smart home technologies are?’’ Response options ranged from ‘‘no idea’’, ‘‘vague idea’’, ‘‘general idea’’, ‘‘and good idea’’ to ‘‘already using some form of smart home technology/service. ’Respondents answering ‘‘no idea’’ were filtered out from the remaining survey. For all other respondents they moved on to part 2. In order to get sufficient number of subjects to generalize our model, the age group that we have considered for the elderly is 55 years and above instead of the 60 years and up criterion. In addition, in order to ensure that the questionnaire reaches out to as many elderly people as possible our contacted subjects were requested to further contact their friends or relatives matching the age criterion. No internet access or a custodial provider that uses the same local network all the systems currently accessible operate on this board and transform the We-Care program into a single Internet self-governing portal. This table transforms into a readily accessible framework when connecting to the Web via an integrated portal, where all resources and functionality are reached and by the built apps online, from anywhere and at all times.

V. CONCLUSION

This survey of ambient assisted living works has been carried Out with the aim of supporting the elderly in living independent Lives, mostly based on ambient sensors. It could also be helpful in Supporting caregivers, friends, and family and in avoiding Unexpected harm to the elderly. By far, the sensor-based surveys Have majorly focused on wearable sensors alone or wearable Sensors in combination with ambient sensors for the elderly. One Major disadvantage of using wearable sensors is that they can Generate uncomfortable feelings during extended wearing on the Body, which results in the high risk of rejection by the elderly, especially at home. In Contrast ambient sensors are free from this drawback, which results in high acceptance by the elderly if they can provide reliable data. Hence, this survey has been performed by focusing on research works that are based on using ambient sensors for monitoring the health or behaviors of the users, The IOT is a revolutionary concept that enriches our daily existence and aims to bring about dramatic improvements and a huge impact on American healthcare while making for a more customized, efficient and integrated medical network. Especially the elderly individuals and send messages or notifications. Utilizing an IOT (Internet of Things) module is yet another effective strategy.

VI. FUTURE DETECTION AND VISION

It has been observed during the review that none of the Reported works provide solutions to all the areas of Ambient assisted living systems that are discussed. In Many works, it is assumed that the approach is designed Based on the belief that the inhabitants’ behavior is Consistent every day, with the possibility of following a Broad pattern. Most of the behavior models are produced Based on deterministic models. The entertainment needs of elderly people have been mostly ignored. Entertainment in their daily lives should boost their lifestyles and help them enjoy their lives more. Multimedia enabled entertainment techniques can contribute to effective treatment policy for elderly persons with memory problems. However, more rigorous study is necessary to obtain a scientific conclusion with proof. Considering the perspectives of elderly persons And caregivers, studies of this kind can help identify requirements for elderly entertainment support systems, which is challenging. Among the many challenges that are encountered in implementing elderly assistance technology in the home, one key challenge is related to the continuous observation of the vital signs and behaviors of elderly subjects through non-wearable ambient sensors. The challenge is related to important factors such as durability, acceptability, communication, and power requirements of the sensors that are installed in the smart homes. Elderly people are generally aware

of privacy risks and possible intrusion. Acceptance of sensors such as video cameras may be challenging, as cameras can easily be perceived as intrusive by the elderly

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IOT Enabled Health Monitoring System

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***Abstract*— This paper aims to reduce the spread of pandemic and epidemic diseases through a health monitoring system that utilizes IoT devices to continuously monitor key health parameters such as heart rate, oxygen level, blood pressure, and temperature. The system will provide real-time health data to caretakers, and the integration of robotics technology will enhance its effectiveness. The paper's objective is to improve overall health outcomes and prevent the spread of diseases. The literature review found that IoT-based health monitoring systems have potential benefits such as real-time monitoring and early detection of health problems, but also face challenges such as privacy and security issues. The study will focus on the current state of the technology, its potential benefits, and the challenges to fully realize it's potential.**

Keywords— healthcare, applications, technology, diseases.

I. INTRODUCTION

The world's population is continuously changing in size and composition, and these trends are expected to continue in the future. This has a major impact on various aspects of society, particularly in the fields of health and healthcare. With an increase in life expectancy, especially in more developed countries, people are living longer and facing new challenges in terms of health and wellness. As a result, the incidence of life-threatening diseases such as Spanish flu, the COVID-19 pandemic, and the plague has increased. To combat these diseases, governments are investing substantial amounts of money into healthcare, which can put a financial strain on the general population.

For instance, China's healthcare expenditure rose from 50 million Yuan in 2001, accounting for 4.58% of its total GDP, to over 400 million Yuan in 2015, accounting for 6.05% of its total GDP. To ensure that people can live longer, healthier lives without incurring financial burden, it is critical to develop flexible and cost-effective healthcare systems.

Health monitoring systems have the potential to address these challenges and provide a solution to the growing demands of the healthcare system. By using IoT enabled devices, these systems can collect and analyze health-related data in real-time, providing individuals and healthcare providers with valuable insights into health conditions. Additionally, the integration of robotic systems can further enhance the capabilities of health monitoring systems, providing advanced support for healthcare providers and improving the overall healthcare experience for patients.

This research aims to explore the potential of health monitoring systems using IoT enabled devices and the role of robotic systems in improving the efficiency and effectiveness of these systems. The study will focus on the current state of the technology, its potential benefits, and the challenges that need to be addressed to fully realize its potential. The results of this research will contribute to the development of a more flexible, efficient, and cost-effective healthcare system, benefiting individuals and societies alike.

Health monitoring systems that use IoT enabled devices have the potential to revolutionize healthcare, especially in countries like India where the population is large and the healthcare infrastructure is limited. The following are the key technologies and devices used in health monitoring systems [8]:

1. Wearable devices: Wearable devices such as smart watches, fitness trackers, and wearable sensors are commonly used to collect health-related data, such as heart rate, blood pressure, and physical activity levels.

2. Smart home devices: Smart home devices, such as smart beds and smart toilets, can also be used to collect health-related data, such as sleep patterns and bathroom habits.

3. Cloud platform: A cloud platform is used to store and analyze health-related data collected by IoT enabled devices

4. Mobile applications: A mobile application is used to display health-related data to patients and healthcare providers, and to provide remote health monitoring. [9]

The use of IoT enabled devices in health monitoring systems has the potential to improve patient care and reduce healthcare costs. For example, by using wearable devices and smart home devices to collect health-related data, patients can receive real-time health monitoring and personalized health advice.[6] Additionally, by using a cloud platform to store and analyze health-related data, healthcare providers can better understand patients' health conditions and provide more effective treatment. Robotic systems can also play a role in solving the healthcare problems faced by large populations like India. [7]For example, robots can be used to assist

healthcare providers in performing surgeries, diagnosing diseases, and delivering medication. Robots can also be used to provide remote health monitoring, reducing the need for patients to travel to healthcare facilities.

II. PROBLEM DEFINITION

This paper aims to reduce the spread of pandemic and epidemic diseases by monitoring the health of individuals. The goal is to design and develop a reliable and energy-efficient health monitoring system that utilizes IoT enabled devices to continuously monitor key health parameters such as heart rate, oxygen level, blood pressure, and temperature. The system will provide real-time health data to caretakers, allowing for prompt identification and management of any potential health concerns. The integration of robotics technology will further enhance the effectiveness and efficiency of the system. The objective is to create a solution that helps prevent the spread of diseases and improve overall health outcomes.

III. LITERATURE SURVEY

After looking into many research papers and websites related to this we found out

A Review on IoT-Based Health Monitoring System by Hussain et al. [1] provides a comprehensive overview of the potential benefits and challenges of using IoT-based health monitoring systems. The authors conclude that IoT-based health monitoring systems have the potential to provide real-time monitoring of a person's health status and prevent serious health problems by detecting them early. Additionally, the use of IoT devices can increase patient engagement and improve the efficiency of healthcare delivery. However, the authors also identify several challenges facing the implementation of IoT-based health monitoring systems, such as data privacy and security concerns, and the need for efficient data processing and analysis methods. Overall, the paper concludes that while IoT-based health monitoring systems have the potential to provide significant benefits to patients and healthcare providers, there are also several challenges that need to be addressed to ensure the effective implementation of these systems.

The paper "IoT-based Health Monitoring: A Comprehensive Review" by Alharbi et al. [2] provides a comprehensive overview of the benefits and challenges of using IoT-based health monitoring systems. The authors conclude that IoT-based health monitoring has the potential to improve patient engagement and increase the efficiency of healthcare delivery. Additionally, IoT devices can provide real-time monitoring of a person's health status and help prevent serious health problems by detecting them early. However, the authors also identify several challenges facing the implementation of IoT-based health monitoring systems, such as data privacy and security concerns, and the need for efficient data processing and analysis methods. Overall, the paper concludes that while IoT-based health monitoring has the potential to provide significant benefits to patients and healthcare providers, there are also several challenges that need to be addressed to ensure the effective implementation of these systems.

The paper "Wearable IoT enabled real-time health monitoring system" by Wan et al. [3] presents a wearable IoT-based health monitoring system that provides real-time health monitoring for patients.

The authors used a combination of hardware and software components to design and implement the system, which includes wearable sensors, a microcontroller, and a cloud platform for data storage and analysis. The wearable sensors are used to collect data on a patient's vital signs, including heart rate, blood pressure, and body temperature, which is then transmitted to the microcontroller for processing and analysis. The processed data is then sent to the cloud platform for storage and further analysis. The authors conducted experiments to evaluate the performance of the system and found that it provides accurate and reliable health monitoring information in real-time. The system was also found to have low power consumption and be cost-effective. In conclusion, the authors provide a wearable IoT-based health monitoring system that provides real-time health monitoring for patients. The system is accurate, reliable, and cost-effective, making it a promising solution for improving healthcare delivery and reducing healthcare costs.

The paper titled "IoT-Based Smart Health Monitoring System for COVID-19" by Vaneeta Bhardwaj, Rajat Joshi and Anshu Mli Gaur [4] focuses on the development of an IoT-based system for monitoring the health of individuals during the COVID-19 pandemic. The authors have used a variety of methods to develop this system, including data analysis, design, and implementation. The system consists of a mobile application that is installed on the user's smartphone and connected to wearable devices such as smart watches and fitness trackers. The application collects data from these devices and sends it to a central server for analysis. The server then sends this data to healthcare providers for monitoring and decision-making purposes. The authors used data analysis to determine the most relevant data points to collect from wearable devices and to develop the algorithm used to process the data. The design process involved developing the user interface for the mobile application and determining the architecture of the central server. Finally, the authors used implementation methods to test the system and evaluate its effectiveness.

In conclusion, the authors have successfully developed an IoT-based system for monitoring the health of individuals during the COVID-19 pandemic. This system provides real-time data to healthcare providers and can assist in early detection and response to the disease. The authors have used a combination of data analysis, design, and implementation methods to develop this system and have shown that it is effective in providing real-time health monitoring.

The methodology used by the authors in this paper includes data analysis, design, and implementation. The authors have used data analysis to determine the most relevant data points to collect and to develop the algorithm used to process the data. The design process involved developing the user interface and determining the architecture of the central server. Finally, the authors used implementation methods to test the system and evaluate its effectiveness.

The paper "Smart Health Monitoring System using IoT"[5] by M. Jain et al. discusses the design and implementation of a smart health monitoring system that utilizes the Internet of Things (IoT) technology. The aim of the system is to monitor the health status of patients remotely, and to provide real-time data to healthcare providers for effective treatment. The authors used a multi-disciplinary approach to design and implement the system, which includes hardware and software components. The hardware components consist of wearable devices, such as a smart watch and a health monitoring band, which are equipped with sensors to measure the patients' vital signs, such as heart rate, blood pressure, and body temperature. The wearable devices are connected to a gateway device, which acts as a bridge between the wearable devices and the cloud platform.
The cloud platform is responsible for storing, analyzing, and processing the data collected by the wearable devices. The platform provides a user interface for healthcare providers to access and view the patients' data. Additionally, the platform implements an alert mechanism to notify the healthcare providers in case of any emergency.

"A Survey of IoT enabled Health Monitoring Systems" [6] by S. Chen et al. provides an overview of the various health monitoring systems that use IoT enabled devices. The paper also mentions the advantages and disadvantages of these systems, as well as the challenges in integrating these systems with existing healthcare infrastructure.

"IoT based Telehealth Monitoring System" [7] by K. S. Lee et al. discusses the design and implementation of an IoT based telehealth monitoring system that uses wearable devices to collect health-related data. The system also includes a cloud platform for data storage and analysis, and a mobile application for remote health monitoring.

The two papers, "A Review of Health Monitoring Systems using IoT enabled devices" and "IoT based Health Monitoring System for Elderly Care", both focus on the use of Internet of Things (IoT) enabled devices for health monitoring systems. In the first paper, the authors conduct a review of various health monitoring systems and IoT enabled devices that can be used to monitor the health of individuals. The second paper focuses specifically on the use of IoT for elderly care. The authors propose an IoT-based health monitoring system that can be used to monitor the health of elderly individuals and provide them with necessary care. In both the papers, the authors emphasize the importance of using IoT for health monitoring and the potential benefits it can provide in terms of improved health outcomes, increased efficiency, and reduced healthcare costs. The methodology used in both papers is a combination of literature review, analysis, and simulation.
In conclusion, the use of IoT enabled devices for health monitoring systems has great potential to improve the health and well-being of individuals, particularly the elderly. The two papers provide a comprehensive overview of the current state of IoT in health monitoring and the potential benefits it can bring. However, further research is needed to fully realize the potential of IoT in health monitoring and to address the challenges that still need to be overcome.

IV. PROPOSED DESIGN

In this project at first we will take parameter like temperature, pulse using sensor then record the date and send to server using networking. After that data will process and analysis it and then the data as output get displayed using web or mobile application.

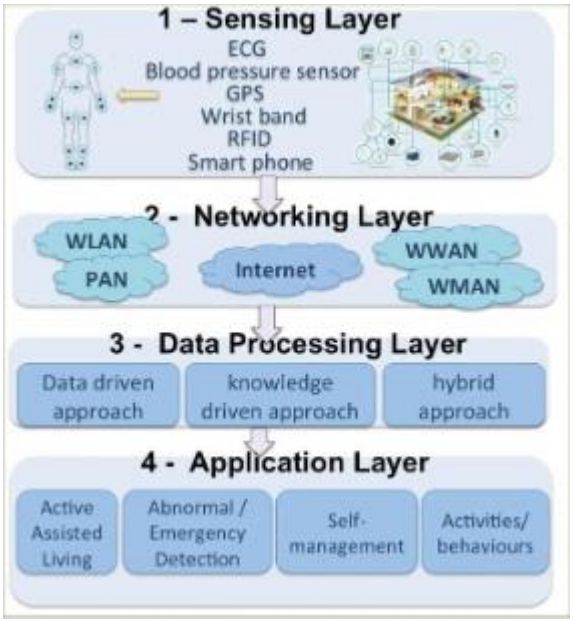

Figure 1: Data Flow Diagram

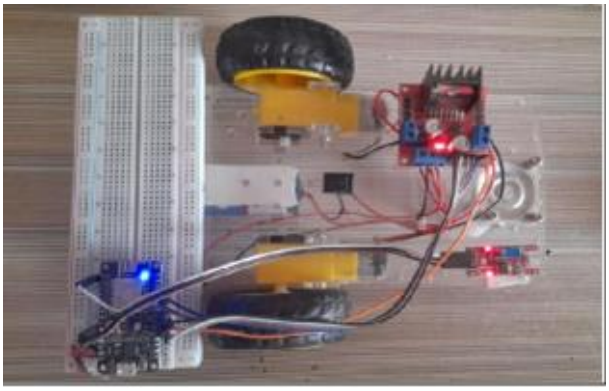

Figure 2. Prototype of project

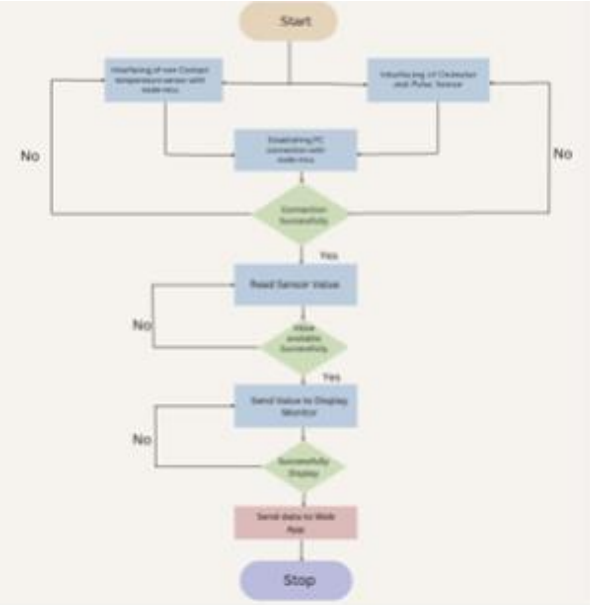

Figure 3. Flowchart of project

IOT technology is expanding day by day to include different sectors and applications. One of them is the smart health sector and this sector offers incredible opportunities for us with new applications. The monitoring of the patients, who should be kept under constant surveillance, in the hospital environment is very difficult with the existing infrastructure and methods. In this study, a wireless patient monitoring system is developed that allows patients to be mobile in their social areas. The developed system continuously measures the heart rate and body temperature of the patient and provides monitoring and tracking through an android based interface. We assembled the sensor ice and Micro-controller and built a prototype Robotic System Which will be controlled by the Remote controller or using the Patient's Hand Gesture So that any patient can handle our device by keeping the understanding of isolation so that no outsider can come in contact. In this by measuring health parameter of the patient and displaying the result on IOT application and giving access to controlled the Robotic System. So, Patient can monitor their Health parameter and analyze the result without any problem. Even Doctor can use such system to monitor the patient remotely and can give a treatment to the Patient Remotely without having any Contact. Such Robotic enabled system with integrated sensor really help patient and doctor to solve or prevent the spreading of pandemic and epidemic Diseases.

V. APPLICATION

Remote Patient Monitoring: With the help of an IoT-enabled health monitoring system, patients can be monitored remotely. The system can collect data such as heart rate, blood pressure, glucose levels, and send it to a central server. The robotic system can then provide feedback on the patient's condition and alert the healthcare provider in case of any abnormalities.

Personalized Medication Management: The IoT-enabled health monitoring system can provide real-time information about a patient's medication schedule. The robotic system can dispense the medication and provide reminders to the patient to take the medication on time.

Fall Detection: The IoT-enabled health monitoring system can detect if a patient falls and alert the healthcare provider. The robotic system can be programmed to respond to such emergencies, such as calling for help or providing assistance to the patient.

Health and Fitness Tracking: The IoT-enabled health monitoring system can track a patient's physical activity, sleep patterns, and other vital signs. The robotic system can provide feedback on the patient's progress and suggest changes to their lifestyle to improve their health.

Rehabilitation Support: The IoT-enabled health monitoring system can be used to monitor a patient's progress during rehabilitation. The robotic system can provide assistance and feedback to the patient during the rehabilitation process.

Telemedicine: The IoT-enabled health monitoring system can be used to connect patients with healthcare providers through video conferencing. The robotic system can assist the healthcare provider in examining the patient remotely.

VI. FUTURE SCOPE

Predictive Analysis: IoT-enabled health monitoring systems can collect real-time data on patients' health conditions, which can be analyzed to provide predictive insights into their health. Robotic systems can be programmed to identify changes in patient's health patterns and trigger appropriate actions like alerts, reminders, or prompt diagnosis also in the future accuracy of data collection can be improved, and added more features.

Personalized Healthcare: IoT-enabled health monitoring systems can provide personalized healthcare to patients. Based on the collected data, the robotic system can be programmed to provide personalized treatment plans and reminders for patients.

Improved Patient Care: IoT-enabled health monitoring systems can lead to improved patient care, as doctors and healthcare professionals can get real-time updates on patients' health conditions. This can help to prevent medical emergencies and provide timely treatment.

Enhanced Efficiency: IoT-enabled health monitoring systems with robotic systems can enhance healthcare efficiency by automating routine healthcare tasks, reducing the need for human intervention, and freeing up healthcare professionals to focus on complex medical cases.

VII. RESULT & DISCUSSIONS

In this study, a real-time heart monitoring system is developed for chronic disease management. Various cardiac parameters such as heart rate, blood pressure, and temperature are being acquired using wearable sensors. Input System created to receive and store medical information of the patient which is then transmitted to the web interface using wireless communication. Web interface has been designed to be on the doctors' side so as to inform them of the medical status along with location of the patient in real-time. The accumulated data is stored in data server which pushes the information to doctor's web interface and ultimately, data of the patient located in remote area is made visible to the doctor sitting in super specialty hospital.

VIII. CONCLUSION

The paper focuses on the potential of health monitoring systems using IoT enabled devices and the role of robotic systems in improving the efficiency and effectiveness of these systems. The use of wearable devices, smart home devices, cloud platform, and mobile applications in health monitoring systems has the potential to improve patient care and reduce healthcare costs. The aim of this paper is to reduce the spread of pandemic and epidemic diseases by monitoring the health of individuals through a reliable and energy-efficient health monitoring system. The literature survey shows that IoT-based health monitoring systems have the potential to provide real-time monitoring of a person's health status and prevent serious health problems. However, there are challenges such as accuracy, data privacy and security concerns and the need for efficient data processing and analysis methods that need to be addressed.

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Smart Homes Using Smart Mirror

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***Abstract* – The Paper indicates the layout of a Smart device-Smart Mirror. The Smart Mirror right here is specifically for domestic surroundings. These Smart mirrors aren't extensively used because of fee or excessive necessities of hardware. The proposed Smart Mirror can be operated with the aid of using Raspberry Pi and can be related with the aid of using actual international via net. The Smart Mirror will consist Raspberry-Pi, LED display, speakers, microphone with two-manner Mirror and acrylic glass. With the assist of voice reputation API the Mirror will speak with the consumer via voice instructions and responds them accordingly. The Mirror will spotlight a few primary facilities like time, neighborhood information, climate, etc. The Mirror may also carry out a few increase feature consisting of Home Automation the use of Smart Mirror. This Mirror with synthetic intelligence will offer an outstanding revel in to the consumer**.

I. INTRODUCTION

Heterogeneous computing gadgets with wi-fi connectivity which embeds normal gadgets are being utilized in one-of-a-kind sports are presenting an entire new revel in. The interactive computing, voice technology, synthetic intelligence are presenting ease in lifestyles in very steady and handy manner. In each residence there's a Mirror and we examine the Mirror normal and discover how we look. The Smart Mirror is a change over a ordinary Mirror with interconnected Smart gadgets and technology with embedded intelligence which gives superior capability consisting of time, information, climate, showing maps. This Mirror will assist in growing Smart houses and offer a completely unique surroundings to the customers.

II. LITERATURE REVIEW

In this project, a smart mirror for home use as part of the Internet of Things is developed using a Raspberry Pi. The Raspberry Pi serves as the central controller for the smart mirror and can display information such as the weather, time, date, and more, retrieved through the API network interface. The user can interact with the mirror by asking for information, and the mirror will automatically retrieve and display the relevant data. The designed smart mirror has numerous potential applications and benefits, including its compact size, ease of use, and cost-effectiveness.

A smart mirror system has been proposed by Ishwarya P, Lakshami N M, and Chandana M S that provides an attractive interface for viewing information and also serves as a thief detector in a home setting. However, this mirror system lacks support for gesture control, which would enhance its interactivity. [11].

The authors of the paper focused on creating a smart mirror that doubles as an attractive display for date, time, weather information, and online news, utilizing IoT technology. Additionally, they aimed to incorporate a thief detection feature that would work when no one is present in the home. [11].

The proposed smart mirror system utilizes microprocessor technology and internet connectivity to display a range of information, such as weather, time and location, current events, and user and camera images, obtained from web services. The system, which is powered by a Raspberry Pi 4b card, also includes a microphone for voice control of certain functions..

In the study by B. Thomas al., a smart mirror was developed that allows users to control the lights in their homes and access information such as the time and date, weather, warnings, traffic, and location map. The system interacts with users through Sonus technology, which converts speech into text, enabling users to give voice commands. Nair Dhruv, Pannu Preeti, Khanna Vaibhav, and Vardhan Vash also proposed a smart mirror with improved features such as weather, news updates, and local time, making it easier for users to manage their daily activities and household chores. [3]

The Smart Mirror has applications not just in homes but also in various industries, making use of Ambient Artificial Intelligence (AmI). Matthew Lee and Victoria White designed a multi-user smart mirror system that aims to promote healthy lifestyles in the workplace by incorporating persuasive strategies. The mirror can recognize users based on their personal corporate ID cards, allowing each user to access their own custom interface. The mirror displays the indoor environment data such as temperature, humidity and light, personal exercise information from wearable devices, and general information like weather and news. The project also includes a website that provides information about the features of the smart mirror and gives motivational

advice on physical performance through speech recognition requests. [4].

The limitations imposed by web browsers as the primary method of scriptable display are eased by these enhancements. In this paper, they compare and contrast the design and implementation of smart homes with other platforms of a similar nature.

Chidambaram Sethukkarasi et al. 2016) developed an smart mirror that uses facial recognition to identify the user and offers services like emotion recognition, progress representation of measured health parameters, height identification, garment identification, garment color suggestions, and reminders of important events. Their paper does not go into great detail about any of its topics; rather, it tries to bring the ideas together into the idea of an intelligent mirror[8].

In 2016, Microsoft shared details about their creation of a smart mirror. They made the instructions and all of the necessary code publicly accessible through a GitHub repository, indicating that their intention was not to sell a finished product, but rather to provide a do-it-yourself project for individuals to create their own smart mirror. The information they provided covered the basic features of a smart mirror, making it interactive and user-friendly. [8].

Toshiba showcased its smart mirror idea at the 2014 International Consumer Electronics Show (CES). They displayed the smart mirror in various home settings and the concept was to create a unique smart mirror for each room. The smart bathroom mirror would show the weather forecast and personal fitness tracking. The input method used was gesture control.[10]

III. PROPOSED SYSTEM

A. Proposed System

The smart mirror is a cutting-edge device that has been designed to provide users with a new and exciting way of accessing relevant information. It makes use of a low-powered mini-computer known as the Raspberry Pi 4B, which comes with an 8 GB SDRAM and runs on the Linux platform. This computer is energy efficient, using only 15W of power to run. The mirror itself is made up of a one-sided glass that acts as a regular mirror when there is no light behind it. However, when the user stands in front of it, the mirror displays relevant information that is retrieved from the internet. This information can be updated and personalized, depending on the user's preferences.One of the key features of the smart mirror is its ability to retrieve updated information from various data feeds, including RSS feeds. This ensures that the information displayed on the mirror is always up-to-date and relevant to the user. Overall, the smart mirror represents a significant advancement in the field of smart devices. With its ability to display personalized and up-to-date information, it promises to be a valuable addition to any home or office setting.

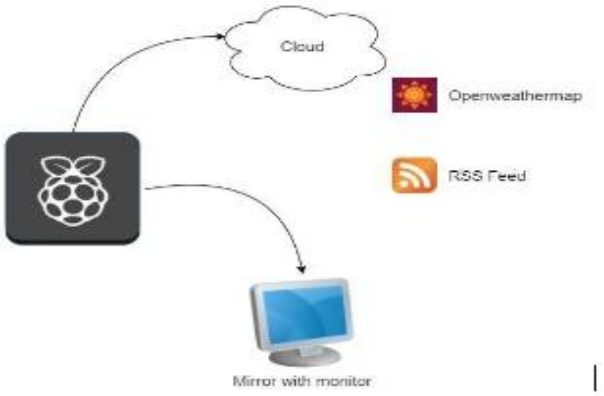

Fig -1: Architecture of a Smart Mirror

The private time table of occasions and the up to date climate reviews may be acquired with the aid of using the use of Google Calendar API and Weather API. For showing those beneficial statistics Tkinter, a preferred library GUI python module [9]

B.Implementation

We are currently in the process of developing an exciting new Smart Mirror that promises to revolutionize the way users interact with mirrors. By incorporating advanced Ai&ml technology, our Smart Mirror is designed to provide an immersive and intuitive user experience. The mirror itself is a two-way mirror made from high-quality acrylic glass, which is both durable and provides excellent visibility. The mirror is set within a beautifully crafted wooden frame, and behind it, we have installed a series of LED lights that provide a range of customizable lighting options. The Smart Mirror is powered by a Raspberry Pi, which is connected to a series of Raspberry Modules and sensors. The Raspberry Pi acts as the brain of the mirror, processing all the information and data that the sensors collect. To power the LED display and sensors, we have connected a power supply directly to the Raspberry Pi. When a user activates the Smart Mirror, it will connect to a Docker container that contains all the necessary APIs and software to run the mirror. The Docker container requires internet access, which can be provided through the Wi-Fi module or LAN connection on the Raspberry Pi. Overall, our Smart Mirror promises to be an exciting and innovative addition to the world of smart devices. With its advanced features and customizable design, it will provide users with an experience unlike any other.

The Smart Mirror is designed to provide a unique user experience with the incorporation of Ambient Artificial Intelligence. The system consists of a two-way mirror, an

acrylic glass display, Raspberry Pi, various Raspberry modules, and sensors. The LED display is placed behind the glass, along with the sensors and the Raspberry Pi, all housed in a wooden frame. The mirror will be powered by the Raspberry Pi, which will connect to the docker containing the necessary APIs and software to run the system when it is turned on. The mirror requires internet access, which will be provided by the Raspberry Pi's Wi-Fi module. The virtual interface, created using HTML and CSS, will display news headlines, the calendar, and weather updates. The mirror will also utilize Google Assistant's API as a virtual voice assistant and perform facial recognition using OpenCV and Java programming to allow real-time zooming in and out of an image.

The software program can be programmed on java and python and Node.js can be used as a server-aspect language. The proposed Smart Mirror will carry out a few superior functions which can be mentioned withinside the IV segment of this report. The proposed Smart Mirror will carry out those responsibilities:

•1. A ordinary two-manner Mirror and acrylic glass will show actual time picture.

•2. After activation the Mirror will show climate, time and information.

•3. The Mirror will routinely sleep if no one appears in front with the assist of sensors.

C.Project Inputs and Outputs

The input in our Smart Mirror is specifically via the voice instructions that it listens and offers consequences consistent with it. The responsibilities consist of putting a reminder, appointment, assembly or even makes use of its assistant to view photographs via the Mirror, the photographs which can be synced with the consumer's cellphone.

The output is generated from the Smart Mirror withinside the shape of voice in addition to textual content function. Mainly the output includes the primary functions of a Smart Mirror like climate, time, calendar, vacations etc. The output is likewise generated via the assistant that we use via voice instructions as enter. The output and enter generated via the Smart Mirror also can be visible in graph aleven though the analytics function furnished with the aid of using the assistant.

Fig -3: Output

IV. CONCLUSION AND FUTURE SCOPE

A. Conclusion

Our gadget included the idea and methodologies which have been carried out in lots of current structures a Smart Mirror gadget. It is a singular utility of making a Smart interacting gadget. The gadget is dependable and smooth to use, on this interactive gadget; we had been targeting an interactive gadget for domestic. There exist many advantages from the Smart Mirror. A providerorientated structure has been tailored for the improvement and deployment of the numerous offerings, in which the Mirror interface, the information feeds all use Web provider verbal exchange mechanisms. By using sensor, we will lessen the electricity intake for the reason that Mirror will show statistics best withinside the presence of a human.

The destiny prototype is ripe with ability and in all likelihood strong in phrases of capability. It makes use of voice instructions to replace among every perspectives and gestures to have interaction with content. Rather than restrained to a domestic we will put in force the capability to a pitcher material. So that it is able to have a huge variety of programs like you'll setup this capability to a pitcher table, which he utilized in office. This will assist him to recognize approximately notifications from many webweb sites on the equal time in a unmarried display screen. Another utility is this capability may be setup in public locations.

B. Future Scope

The scope of this product to take a observe in increase an green and cost-effective answer for the improvement of a Smart Mirror to lessen and probable put off the want for the consumer to make time of their day by day morning or nightly recurring to test their PC, tablet, or cellphone for the statistics they want. The Mirror will offer the statistics with little to no attempt from the consumer with the purpose of now no longer being a burden that she or he ought to maintain. The Mirror

wouldn’t be any other activity, alternatively an enhancement to the already not unusual place use of mirrors in maximum present day bathrooms.

Mirror will do the questioning for the consumer. First, it's going to switch on and stale with the aid of using itself. Then, it's going to replace with the consumer’s calendar time table, todo lists, Twitter, information, and climate. The statistics wouldn’t be thrown withinside the consumer’s face, however unobtrusively displayed on the rims of the Mirror to nevertheless permit use of the real Mirror. The Mirror presents not unusual place statistics maximum humans take a look at their smartphones or drugs for, consisting of climate, information, Twitter and schedules. This lets in the customers to read, think, and plan their day whilst getting prepared withinside the morning or night.

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IoT And ML Based Agriculture System

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***Abstract*—In order to optimize plant growth and assist the farmer in his work, smart farming enables real-time parameter manipulation and plant growth analysis. The gaps between the digital and physical worlds are being filled by Internet of Things (IoT) arrangements, which are based on the application specific sensors, data measurements, and cognitive processing. In this study, we suggest an agriculture system based on AI and IoT to improve crop productivity and quality. The system comprises of a number of sensors that gather information about the surrounding area, the weather, and the soil. A machine learning algorithm uses this data to compute the ideal circumstances for planting and harvesting. Using artificial intelligence (AI) approaches, we propose the design and experiment of a smart agricultural system built on an intelligent platform. This system is based on wireless sensor network technology, and its implementation entails four primary phases: the first is data collecting using sensors placed in an agricultural field, the second is data cleaning and storage, the third is data analysis, and the final stage is making prediction of the environment for increasing crop yield using Machine Learning Algorithm**

Keywords— AI, ML, IoT, Agriculture, DHT11, BMP180, BH1750.

I. INTRODUCTION

The way technology has affected nearly every aspect of our lives is not unique to us. Things like fans, air conditioners, refrigerators, plants, doors, and many others can talk with one another and make decisions on actual situations with hardly any human input. The Internet of Things (IoT), artificial intelligence (AI), Machine learning (ML) and cloud-based technologies all made significant contributions to the development of smart homes, wearables, smart cities, smart grids, linked cars, the industrial internet, supply chain management, health care, and other fields. IoT is a large group of varied linked devices that use multiple protocols and architectural designs to communicate with one another and carry out predetermined actions on sensor data acquired. Things get smarter when AI, ML and IoT are integrated. Things become smarter and judgments are made with no human interference when AI and IoT are joined.

We examined the data coming from the various devices that surround us as we join the modern world. When this data is evaluated by IoT devices, AI plays a very important role. Agriculture is no longer an exception in this decade of unprecedented technological advancement. Agriculture-related operations were also significantly impacted by AI and IoT. According to research, India's contribution to global GDP in 2020–21 was almost 20.2%, and in 2021–22, it was roughly 18.8%.

Shrewd Cultivating could be a cultivating administration concept using modern innovation to extend the amount and quality of agricultural items. Agriculturists within the 21st century have access to GPS, soil filtering, information administration, and Web of Things advances. By absolutely measuring varieties within a field and adjusting the technique appropriately, agriculturists can greatly increment the viability of pesticides and fertilizers and utilize them more selectively. Smart cultivating (SF), based on the joining of data and communication innovations into apparatus, gear, and sensors in agrarian generation frameworks, allows a large volume of information and data to be produced with progressive inclusion of robotization into the method. Smart farming depends on information transmission and the concentration of data in farther capacity frameworks to empower the combination and analysis of different cultivate information for choice making.to

The agricultural industry plays a significant role in the economy by supplying food and other goods to consumers around the globe. With 10% of world emissions coming from the agricultural sector, it is also a significant source of greenhouse gas emissions. Therefore, there is pressure on the agricultural sector to cut emissions in order to contribute to the achievement of global climate targets.

Using AI and IoT-based agriculture systems is one method the agricultural industry is attempting to lower its emissions. With the aid of these tools, farmers can forecast crop yields, predict weather patterns, and use fertilizer and irrigation more effectively. These technologies allow farmers to use less water, fertilizer, and other inputs in their operations, which can result in decreased costs.

AI and IoT-based agriculture technologies can help farmers increase their yields and profitability in addition to lowering emissions. These technologies can assist growers in more precisely directing their planting, irrigation, and fertilization efforts, resulting in healthier crops and greater yields. Because these systems can automate many processes that are presently done by hand, AI and IoT-based agriculture technologies can also assist farmers in lowering their labor expenses.The use of AI and IoT-based agriculture technologies is presently in its early phases in the agricultural industry. But it is anticipated that these systems will develop into one of the greatest revenue makers.

II. PROBLEM DEFINATION

In modern agriculture, there's a developing got to increment yields while decreasing inputs such as water, fertilizer, and pesticides. Farmers are seeking out for ways to optimize their generation utilizing data and innovation. The Problem definition for this extend is to create a machine learning and IoT based agriculture framework that can aid farmers to extend their crop yield and make strides there in general productivity. The framework will ought to be able to gather information from different sensors put around the cultivate, and after that utilize machine learning calculations to prepare this information and give suggestions to the farmers on how to optimize their cultivating practices. As a result, Light, Humidity and Pressure sensors are some of the sensors which have been used in this product.

III. SCOPE OF PROJECT

Use of IoT in agriculture can bring numerous benefits to farmers such as expanded yields, less water and pesticide utilization, and lower costs. IoT can moreover help farmers to screen their crops and soil wellbeing in real-time, permitting them to form changes to their developing practices as required. In expansion, IoT can be utilized to naturally control water system frameworks, nurseries, and other agricultural equipment. ML can be utilized in conjunction with IoT to encourage progress rural effectiveness. For illustration, ML can be utilized to foresee crop yields, optimize water system frameworks, and anticipate bug and infection episodes. ML can moreover be utilized to create unused edit assortments that are safer to bothers and infections. In expansion, ML can be utilized to analyze information from sensors and other information sources to recognize patterns and designs that can be utilized to move forward agricultural practices. IoT use in agriculture offers the potential to boost productivity, save costs, and lower hazards. In order to optimize irrigation, planting, and crop care, farmers can utilize IoT-enabled devices and sensors to monitor soil moisture, temperature, and other factors. Farmers may make better choices about when to plant, how to fertilize, and when to harvest by gathering data in real timeout can also assist farmers in tracking their cattle and keeping tabs on their health and welfare. Farmers can keep tabs on the location, activity, and health of their livestock by implanting sensors in them. By using this knowledge, animal husbandry procedures can be improved, and disease outbreaks can be stopped. IoT can also be utilized to raise food quality and safety standards. For instance, it is possible to spot and address any potential issues by tracking the location and state of food goods along the supply chain, from farm to table. The methods for food tracing and recall can also be improved with the help of this information.

IV. MOTIVATION

In agriculture, one of the most important factors is efficient and accurate crop monitoring. The current monitoring methods are often inaccurate and time-consuming, which can lead to significant losses. ML and IoT can provide a more accurate and efficient way to monitor crops. By using sensors and cameras, the system can automatically detect and track crops, and then use machine learning algorithms to predict the growth of the crops. This information can be used to optimize irrigation, fertilization, and other agricultural practices. The benefits of this system are clear. First, it can help farmers reduce losses due to inaccurate monitoring. Second, it can help optimize agricultural practices, leading to increased yields and profits. Finally, it can help reduce the need for manual labor, which can save time and money. We were propelled to create an ML and IoT based agriculture system project since We need to assist farmers progress their yields and increment their effectiveness. We accept that this venture has the potential to do that by computerizing a few of the assignments that farmers ought to do physically, and by helping them with real-time information around their crops. We also think it would be a great way to learn more about machine learning and IoT, and how to apply them to real-world problems.

V. OBJECTIVE

The targets of a Machine Learning (ML) and Internet of Things (IoT) empowered agriculture system are to supply farmers with a way to extend yields and diminish costs by utilizing information collected from different sensors to optimize water system, supplement administration, and other agricultural practices. In expansion, an ML and IoT empowered farming framework can be utilized to screen natural conditions and foresee climate patterns in arrange to way better secure crops from extraordinary climate occasions. By expanding yields, farmers can create more nourishment with less assets, which decreases costs and progresses maintainability. In expansion, IoT-enabled agriculture can move forward the quality of nourishment by giving superior information and data approximately crops, soils, and climate.

VI. LITRATURE SURVEY

In making the project we went through a lot of research papers to find the common patterns of implementations and hence to find the things in common and the direction in which we should go to solve the problem. Reading the papers gave us a wealth of information following is the paper that we read and the inferences that we got from the papers.

A. Internet-of-Things (IoT) -Based Smart Agriculture:

The application of IoT in agriculture has been considered as a key technology to achieve sustainable development in precision agriculture. The IoT-based smart agriculture can be used to manage the farmland more efficiently by integrating the field information with the decision-making process. In addition, the IoT-based smart agriculture can also provide timely and accurate information for farmers to make better decisions. IoT-based smart farming applications could be new ways to support other burgeoning or typical trends in agriculture, such as organic farming, family farming, and enhancing extremely transparent farming. They also target conventional and huge farming operations.

B. The Study and Application of the IoT Technology in Agriculture:

The paper discusses the potential for the internet of things technology in agriculture. The paper starts with a discussion of the internet of things and its potential applications in agriculture. The paper then discusses the current state of agriculture and the challenges it faces. The paper discusses about the growth conditions provided by the system. It is easy to operate, the interface Is friendly, offering the real time environmental factors in the greenhouse. The paper then looks at how the internet of things technology can be used to help address some of these challenges. The paper concludes with a discussion of the future of the internet of things in agriculture.

C. An IOT based Agriculture Monitoring System.

This paper presents an IOT based agribusiness checking framework that can be utilized to screen different perspectives of farming such as soil dampness, temperature, humidity, etc. The framework can be utilized to screen the conditions of the crops and send cautions to the farmers in case of any anomaly. The framework can moreover be utilized to screen the water level within the water system frameworks and send cautions to the agriculturists in case of any deficiency. The framework can too be utilized to screen the climate conditions and send alarms to the ranchers in case of any unfavorable climate conditions. The framework can be utilized to screen the control utilization of the rural apparatus and send cautions to the farmers in case of any over the top control utilization. This mainly focuses on sustainable irrigation approaches and improving the efficiency of the existing irrigation systems.

D. Iot based monitoring system in smart agriculture

The means of monitoring the behavior of the crop according to conditions applied and then working according to it. The IOT based monitoring system in smart agriculture is a great way to keep track of your crops and soil health. The system is able to monitor various aspects of the growth of your plants and soil, including temperature, humidity, and moisture levels. The system can also provide you with information on the health of your plants, including pests and diseases. This system is a great way to ensure that your crops are healthy and producing the best possible yield.

After Alluding to all these papers, we constructed a roadmap for our product. Deducing from these papers, we made utilize of distinctive sensors such as humidity sensor, light sensor and pressure sensor for getting the information of the environment and soil and afterward sparing the procured information on csv which is encourage utilized by machine learning algorithm i.e. Random forest classifier for forecast of the environment which would offer assistance the farmers to form utilize of crops which is backed by environment. IoT Based Smart Agriculture Automation in Artificial Intelligence.

E. The literature review of IoT based smart agriculture

Automation in artificial intelligence discusses the potential of using IoT technology in the agricultural sector to improve efficiency and productivity. It reviews the current state of IoT in agriculture and the major challenges faced by the industry. The review also highlights the potential of artificial intelligence in agriculture and the various applications of AI that are being developed for the agricultural sector. The status of agriculture today makes it difficult for the sector to meet the demands of a growing population while simultaneously attempting to have as little negative environmental impact as possible. There has never been a more pressing need for techniques of food production that are more effective and sustainable. The application of IoT in agriculture has the potential to significantly increase food production efficiency while simultaneously lowering its environmental impact.

Numerous ways can be aided by IoT-based smart farm automation. IoT sensors, for instance, can be used to track soil moisture levels, which enables farmers to plan irrigation more effectively. The amount of fertilizer and other inputs needed can be reduced, which can result in significant water savings.

F. IoT can also be used to track crop health and yield

Which enables farmers to see issues early and take appropriate action. IoT adoption in agriculture offers the ability to improve yields while also lessening its negative environmental effects. The full potential of IoT in agriculture must be realized in order to overcome a number of obstacles. The absence of standards is among the main difficulties. It is challenging for devices from many manufacturers to cooperate due to the variety of IoT platforms and protocols. Additionally, the information produced by IoT devices can.

G. AI and IoT Based Monitoring System for Increasing the Yield in Crop Production:

Artificial intelligence (AI) in agriculture has the potential to improve food security and raise agricultural yields has been discussed in the paper. The means of collecting the data and applying ML algorithm to the data were seen. Real-time data on the weather, soil, and crop conditions may be collected by IoT-based monitoring devices, giving farmers the knowledge they need to use irrigation, fertilizer, and pesticides as efficiently as possible. AI-based systems can also be used to forecast weather patterns, diagnose pests and illnesses, and forecast crop yields. An effective tool for boosting crop yields and enhancing food security is provided by the integration of AI and IoT.

VII. EASE OF USE

The product was designed with ease of use in mind, the main user of the devices are farmers or people who are in the farming industries. The product to collect data either needs internet connection or the data can be stored on device in use cases where the access to internet is difficult. Once the device is initialized there is minimal user input required. If in the case that a problem arises in the hardware the solutions to these problems are given the code. So, if a problem so arises in the hardware the

precise wire to check is displayed to user. Post data collection if there is problem in the hardware with causes erroneous values to be recorded, by detecting the number of outliers in a given data entry the user can be prompted to change the given hardware component.

VIII. METHODOLOGY

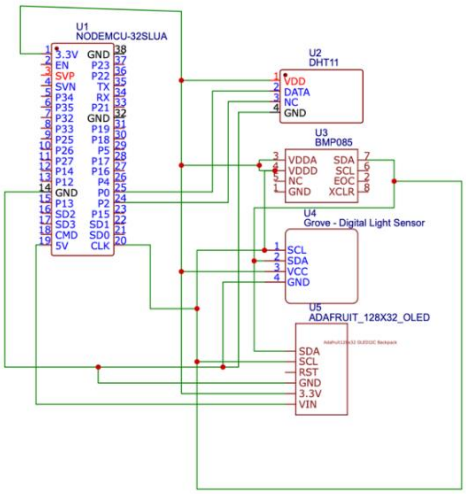

Fig. 1. Circuit Diagram

To combat the plight of the farmers the product collects the data from the environment, the data collected of interest temperature, humidity, light intensity, and pressure. All these data are related closely to crop yield hence they need to be collected. The process followed to implement the project, For the basic implementation of the project an ESP8266 is used, and the circuit is arranged as shown in Fig.1

The heart of the system was a ESP8266 which is a low-cost Wi-Fi microchip with an integrated TCP/IP network interface and a powerful microcontroller. NodeMCU is an open-source firmware for open-source prototyping board designs such as the ESP8266. NodeMCU provides access to 11 GPIOs (General Purpose Inputs/Outputs). These pins are used by the sensor to interface with the ESP8266. Due to the limited number of pins in the NodeMCU and for the project to have vertical scalability. I2C was chosen as the common communication protocol. The Inter-Integrated Circuit (I2C) protocol isa protocol that allows multiple peripheral digital integrated circuits to communicate with one or more sensors. It is a serial communication protocol which greatly reduces the input/output pins needed to implement the project.

The sensors used are:

A. DHT11:

A basic, extremely affordable digital temperature and humidity sensor is the DHT11. It measures the humidity in the air using a thermistor and a capacitive humidity sensor, and it outputs a digital signal on the data pin (no analogue input pins needed). Although reasonably easy to operate, data collection requires precise timing. The sensor's only significant drawback is that it can only provide fresh data once every two seconds, which means that when utilizing our library, sensor values could be as much as two seconds outdated, but this does not pose a problem to our project as if the data entries are delayed the effect of the error is negated.

B. BMP180:

It is a barometric pressure sensor with an I2C interface. Barometric pressure sensors gauge the surrounding atmosphere's absolute pressure. The weather and altitude both affect this pressure. The pressure has correlation with growth in some plants hence this a metric that can be used to get useful insights.

C. BH1750:

The BH1750 provides 16-bit light measurements in lux, the SI unit for measuring light, and can be easily compared to other values such as references and measurements from other sensors. The BH1750 can measure from 0 to 65K+ lux. With calibration and advanced measurement time adjustment, it can also measure up to 100,000 lux.

D. OLED display

0.96-inch I2C OLED display was used to show the data collected, this removed the need to connect the ESP8266 to computer to see the serial monitor output, instead showed all the necessary information on the screen itself. Thereby increasing the ease of use.

Following is the Flow Diagram which shows the outline of the entire project and all the processes associated with the project.

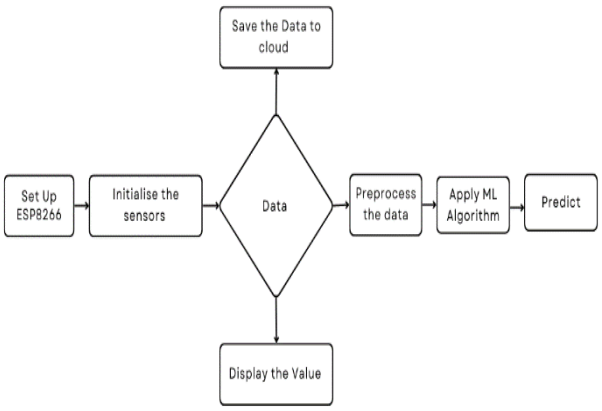

Fig. 2. Flow diagram of outline of proposed system

The brief summary of the steps and process involved in the project.

- Setting of the ESP8266: Initially all the sensors which used the I2C protocol were connected to the serial

data and the serial clock pin of the ESP8266, and the sensors which did not use this protocol were connected to GPIO pins.

- Once connected the sensors were initialized. The pins were defined, for the components using the I2C protocol their physical address was defined and for other components the pin number was defined.
- The data once collected by the sensors is fed into google sheets using the google app script API, the data collected is to be used to train a machine learning algorithm. Several Different algorithms will be tested to find the insights from the plethora of algorithms the algorithm with highest accuracy will be displayed to the user.

IX. Result And Discussion

The project used a plethora of sensors in the very early stages of the project development it was understood that the project needs to a user friendly. Hence with the complex wiring of the prototype that we had a feature was added so that if at any instance any wiring disconnects the user will be notified about which pin is to be checked this information is conveyed by the OLED display and the serial monitor.

The project used a plethora of sensors the main hurdles starting on was the collection of the data, and after the collection of the data storing of the collected data. The data collected is stored in google sheets using Google Apps Script API. In the ESP8266 code there was a provision to select the frequency of data, for initial testing of the project the frequency of the data logging was set at 1 minutes. The effect of the frequency of logging at the machine learning algorithm was left to be investigated later.

id	date	time	temp	humidity	pressure	light_intensity
1	06/08/2022	17:06:11	30.6	71	698.29	35.83
2	06/08/2022	17:07:16	30.6	71	698.11	35
3	06/08/2022	17:08:21	30.2	72	697.85	35
4	06/08/2022	17:09:02	29.6	72	697.5	35
5	06/08/2022	17:10:06	30	72	697.5	35
6	06/08/2022	17:11:11	30	72	697.37	35.83
7	06/08/2022	17:12:14	30	72	697.24	36.67
8	06/08/2022	17:13:19	29.9	72	697.06	36.67
9	06/08/2022	17:14:24	29.9	73	697.06	36.67
10	06/08/2022	17:15:28	29.9	73	697.24	36.67
11	06/08/2022	17:16:32	30	73	697.24	37.5
12	06/08/2022	17:17:36	30	74	697.32	36.67
13	06/08/2022	17:18:41	30	74	697.41	36.67
14	06/08/2022	17:19:45	30	74	697.37	37.5
15	06/08/2022	17:20:49	30	74	697.24	39.17

Fig. 3. Data Collected

The data is stored up to date and safe in the google sheets. For machine learning this data was accessed by again by using the Google App Scripts. Due to the volatile nature of the data, the model was to be trained every day. From the data collected as a baseline the testing was first done on the basic linear regression algorithm, this algorithm was used a baseline due to its ease in implementation and speed. As expected the accuracy which was yielded from the linear regression was low.

```
from sklearn.metrics import r2_score
accuracy = r2_score(temp,lr.predict(pressure))
print('THE ACCURACY IS',accuracy*100)
```

```
THE ACCURACY IS 78.62598158515932
```

Fig. 4. Expected Result

Fig. 4 is expected because the non linear nature of the data. This served a basis for the accuracy to be increased but also gave the basis that the data can be used for accuracy. The same training and testing data was then tested on Machine learning algorithm.

Random Forest Algorithm: This is the second algorithm that was used, It operates by building a large number of decision trees during the training phase, making it an ensemble learning technique that may be applied to regression. The mean or average prediction of each individual tree is returned for regression tasks. 1000 trees were utilized as the number of trees in this data collection.

```
from sklearn.ensemble import RandomForestRegressor
rf = RandomForestRegressor(n_estimators = 1000)
# Train the model on training data
rf.fit(train_features, train_labels)
```

```
RandomForestRegressor
RandomForestRegressor(n_estimators=1000)
```

```
THE TOTAL ACCURACY IS 91.82589352407884
```

As the model had sufficient enough accuracy, it was used to determining future values of the environmental paraments

```
a = np.array([2023,2,9,10,50,00])
clf.predict(a.reshape(1,6))
```

```
[20] ✓ 0.3s
array([[ 30.1387 ,  71.891  , 700.89102, 114.05645]])
```

X. Future Scope

Long run of ML and IoT-based farming frameworks looks shinning. Farmers are progressively utilizing these advances to improve yields, decrease inputs costs, and make their operations more effective and maintainable. Within the future, these frameworks will end up more advanced, able to identify and react to a more extensive run of environmental and plant conditions. They will too be coordinates with other frameworks, such as climate determining and irrigation, to supply farmers with real-time data and suggestions. As these frameworks ended up more far reaching, they will aid make a more productive and maintainable nourishment framework.

In future, the utilization of this item can be made strides by association of taking after things:

1. Mechanized irrigation frameworks that utilize ML to optimize watering plans based on real-time

information almost soil dampness levels, climate conditions, etc.

2. Crop monitoring frameworks that utilize IoT sensors to gather information approximately plant wellbeing and development, which is at that point analyzed by ML algorithms to identify early signs of illness or stress.
3. Livestock administration frameworks that utilize IoT-enabled labels and collars to track the area and wellbeing of creatures, as well as consequently apportion pharmaceutical or give other care as needed.
4. Accuracy cultivating frameworks that utilize ML to anticipate abdicate, optimize pesticide utilize, and more.
5. Stockroom administration frameworks for nourishment capacity and dissemination that utilize IoT sensors to track stock levels and close dates, and ML calculations to anticipate request and optimize stock levels. The conceivable outcomes are really unending. With the control of ML and IoT, long term of agribusiness looks exceptionally shinning in fact.

XI. CONCLUSION

IoT in agriculture has already begun to play a big role in precision farming, and the trend is expected to continue. Farmers are using sensors and other devices to track soil moisture, crop yield, and weather patterns. This data is then used to make more informed decisions about irrigation, planting, and crop care. In the future, AI-enabled IoT devices could be used to automate these decisions, making agriculture even more efficient and effective.IoT can help in automating the agricultural process by providing real-time data which can be used to make informed decisions. AI can be used to improve the yield and quality of crops by using the data collected by IoT sensors.

Internet of Things has the potential to revolutionize agriculture by increasing efficiency, reducing costs, and improving yields. However, the technology is still in its infancy and there are many challenges that need to be addressed before it can be widely adopted. One of the key challenges is the development of AI-enabled agricultural robots that can autonomously carry out tasks such as planting, watering, and harvesting. Another challenge is the need to develop standards for the interoperability of IoT devices and data.

Farming is a very difficult domain which has tight profit ratios and many factors for the loss of the yield. This project was designed to help the farmers by collecting the data and predict the environment factor. This project was not only designed to predict the values but also find any pitfalls due to which a particular crop failed. With the data collected a loss in yield can be attributed to any one particular factor. Then using this system efforts can be made to avoid particular the given conditions. The project was designed with usability in mind hence can be used by a variety of people. This project should be able to help a plethora of people and hence could work towards the betterment of society.

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Smart Dustbin for Smart Cities, Railways Using IoT

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***Abstract*— This paper presents a model of a smart IOT-based trash garbage can using Raspberry Pi for handling hygiene issues related to trash management system. The increase in population also brings unsanitary conditions to the lives of citizens in terms of the spread of contagious diseases and illnesses. To avoid the many problems, an IOT-based smart bin is proposed. As the government has taken many initiatives to develop smart cities in India, any smart city project is not complete without a smart garbage management system. A smart system is required which is capable of providing real time information about the status of the garbage can. This system should be able to notify the city government to clean or pick up the garbage can in time, protecting the environment and the health of citizens. To implement the system, a message can be sent to the authorized person to pick up the garbage at the current and accurate location.**

Keywords— Internet of Things (IOT), Raspberry Pi, Image classification, HC-SR04 Ultrasonic Sensor

I. INTRODUCTION

Waste segregation refers to the process of separating different types of waste materials into distinct categories based on their characteristics, such as biodegradability and non-biodegradability. Biodegradable waste refers to materials that can be broken down by natural processes into organic matter, such as food scraps and yard waste. Non-biodegradable waste refers to materials that cannot be broken down by natural processes and persist in the environment, such as plastic and metal. Segregating waste in this manner helps to reduce the amount of waste that goes to landfills, and enables more efficient recycling and composting.

Moreover, waste segregation at source, meaning separating waste in the households or the source of generation, is the first and most important step in proper waste management. This ensures that the waste is separated properly before it is collected and disposed of, making it easier for the waste management facilities to process the waste efficiently. When waste is not separated at source, it becomes mixed and it becomes much more difficult to recycle or compost the waste, leading to increased waste in landfills and higher environmental impact. Encouraging people to participate in waste segregation at source can also raise awareness about the importance of waste management and inspire individuals to adopt more environmentally friendly practices.

In conclusion, waste segregation is an important and effective way to improve the waste management process and reduce its impact on the environment. By separating biodegradable waste from non-biodegradable waste, we can increase the amount of waste that can be recycled or composted, reduce the amount of waste in landfills, and promote a more sustainable waste management system. So, let's all do our part to support waste segregation and help preserve our planet for future generations.

Therefor we developed a smart trash can using a Raspberry Pi 4 and an ultrasonic sensor to detect the object to be thrown into the trash can and open the lid with the help of a motor. It is an IOT-based project that enables a new and smart way of cleanliness. It is used for two types of waste. The trash can opens its lid when someone/object is nearby, and then waits for a certain time until it closes automatically. Here the lid is closed when you do not want to use it and it opens only when it is needed

II. PROBLEM DEFINATION

The problem of waste segregation in biodegradable and non-biodegradable materials can be defined as the challenge of effectively separating these waste materials in order to promote more sustainable and efficient waste management practices. One solution to this problem is the use of smart dustbins. Smart dustbins are equipped with sensors and automated systems that can distinguish between different types of waste and separate them accordingly, and there is one more problem of dustbin overfilled which leads to increased waste in landfills to overcome this problem we can use IoT Technology for real-time monitoring and we get the notification before the dustbin is full.

III. MOTIVATION

The motivation for a technical paper on smart dustbins is driven by the need to address the challenges faced by traditional waste collection systems and the negative impacts of improper waste management. With the growing population and increasing waste generation, traditional methods are becoming less effective and efficient, leading to overflowing bins, littering, and negative impacts on the environment and public health. The rise of technology and the increasing demand for smart solutions to everyday problems further adds to the need for research and development in this area. A smart dustbin, equipped with sensors, wireless connectivity, and real-time monitoring, offers a promising solution to these

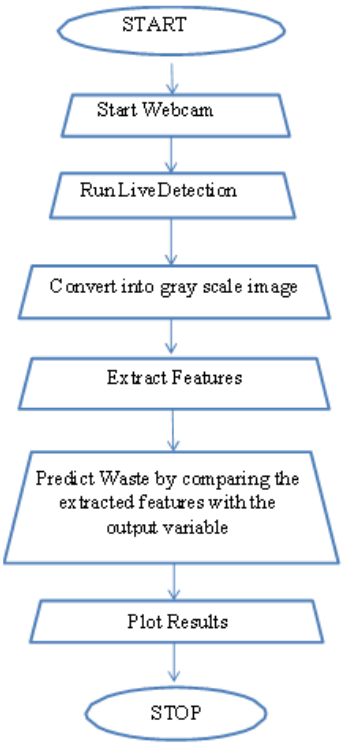
challenges and the motivation for this technical paper. Here we implement the Raspberry Pi with pi camera using machine learning classification algorithm.

IV. Literature Review

Smart trash bin for smart waste management proposed by [1]. In this white paper, the system consists of sensors that measure the weight of the waste and the level of waste in the bin. Bluetooth is connected for short-range communication. Researchers [2] propose the following garbage disposal methods: In this article, the Arduino UNO will check the level of the trash can and send an alarm to his web server in the city when the trash can is full. After cleaning the trash can, the driver confirms that the trash can has been emptied using an RFID tag. RFID is a computer technology used in the verification process by automatically identifying trash that has been placed in the trash and sending the emptying status to a server to confirm that the job has been completed. , enhance the intelligent garbage warning system. A researcher [3] proposes the following garbage management method to replace his Arduino with his Raspberry Pi to improve performance.

V. Proposed Methodology

Implementing a smart trash can with a Raspberry Pi and a Pi Camera involves several steps, from assembling the hardware components to deploying the system in a public area. The first step is to connect the Raspberry Pi to the Pi Camera, the power source, and the trash can. The Raspberry Pi runs the Raspbian operating system, and the Pi Camera is configured to work with it. The images captured by the camera are processed using computer vision algorithms to determine the level of the trash can. The data flow is shown in Fig.1.



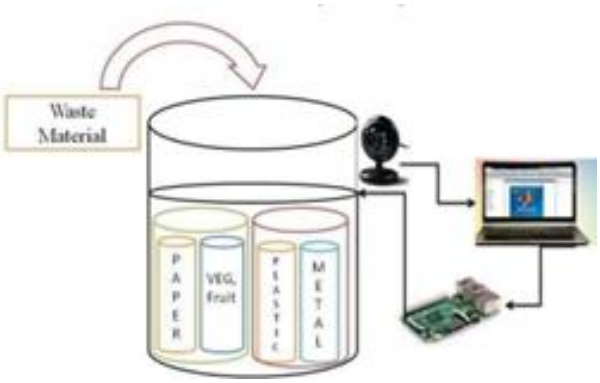


Fig. 1. Data flow diagram

Waste data is wirelessly transmitted to a central server for analysis and storage. The data is analyzed to identify trends and patterns in waste accumulation over time, and an automatic collection process can be triggered based on the waste data. A user interface has also been developed to display the waste data and allow users to monitor the status of the smart garbage can. Finally, the system is deployed in a public area, smart cities and railroads, and its performance is monitored to detect problems and make improvements.

To complete our project, we require some software as well as some hardware.

1.1. Required Software:

1. Raspberry PI

1.2 Required Hardware:

1. Raspberry Pi 4
2. ULTRASONIC SENSOR
3. SERVO MOTOR
4. POWER SUPPLAY
5. DUSTBIN
6. JUMPER WIRES

Procedure:

- Gathering the components: The first step is to gather all the necessary components, including the Raspberry Pi, Pi Camera, power supply, sensors, wireless module, microcontroller, LEDs or display, and relay.
- Assembling the circuit: the next step is to assemble the circuit by connecting all the components according to the schematic. This can be done by soldering or using jumper wires.
- Installing the software: The required software must be loaded onto the Raspberry Pi, including an operating system, a computer vision library, and a communication protocol.
- Configuring the wireless module: The wireless module must be configured to connect to the central server so that the Raspberry Pi can transmit waste data.

- Programming the microcontroller: The microcontroller must be programmed to control the operation of the sensors and the wireless module.
- Testing the system: the assembled circuit must be tested to ensure that all components work as expected and that the waste data is transmitted correctly.
- Deployment: Finally, the smart trash can must be placed in a public area and its performance continuously monitored to detect any problems and make necessary improvements

Circuit Diagram:

The schematic of the smart trash can is shown in Fig.2.The Raspberry Pi board consists of a microcontroller, which is an important component of the board. There are other components such as a power supply, an ultrasonic module, and a servo motor, etc.

VI. Expected Output And Conclusion

In summary, the smart trash can with Raspberry Pi and Pi Camera is an extremely innovative and effective solution for waste management in public areas. This system harnesses the power of computer vision and wireless communication to provide real-time data on waste inventory for efficient and sustainable waste management. The use of Raspberry Pi and Pi Camera in the development of the smart garbage can enables the implementation of advanced features such as image processing, data analysis and remote monitoring, making it an innovative solution for waste management. The system can be customized to meet specific requirements and can be integrated with other waste management systems to create a comprehensive solution.

The Smart Bin with Raspberry Pi and Pi Camera is an excellent example of how technology can be used to solve real-world problems and improve quality of life. It has the potential to revolutionize the way we dispose of waste and promote sustainable lifestyles.

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Real Time Accident Detection And Alerting System For Medical Emergency And Rescue

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***Abstract*—Our aim through this paper is to give a brief detail on the ways by which we can avoid the accident and detect the location of that accident which is based on previous parameters, and we can provide medicals as soon as possible. In this there are two possibilities as in the first one a pre accident detection system is there in which various techniques like alcohol sensor, eye blinking sensor etc. are applied to find out the accident prior to its occurrence so that we can avoid this. Secondly about the post alert system we use vibration sensor, accelerometer sensor etc. to detect the accident. When vibration threshold frequency exceeds the programmed maximum limit, then GPS data from the GPS module is extracted and later alerts the police and the rescue team about the tragedy to provide the medicals and other favorable help to that person. GPS & GSM systems track a vehicle and send the exact location of the vehicle as a text message.**

Keywords—Vehicle, Accidents, Tragedy, Medical, Detection, Alert, Techniques, Location, Track, System, etc.

I. INTRODUCTION

As the economy is increasing day by day, we can see the number of vehicles is also increasing at a faster rate. So, it is very obvious that road accidents will also increase, and the death rate will also increase. In this automobile sector especially, two-wheelers are increasing at the fastest rate. And according to the survey reports most of the deaths happen just because of the lack of immediate medical help on the expressway or a national highway.[2] So, in this idea our main aim is to target those victims to provide medical help as soon as possible. Thus comes the idea of an alerting system that captures the road accidents and its seriousness and alerts the nearest police station, rescue team and the nearest hospital so that they can provide the ambulance and all other stuff at the accident area.[5]

As the system sends the exact location of the accident area so there will be no delay by the help team, This system will also send messages to the friends and relatives to inform them about the incident.[2]

This system has been studied over the last many years. Many of the research teams are trying to execute this model which has basically three different modules. The very first one is to capture the person's location by GPS receiver and send all necessary details to the vehicle owner's phone number. Second one is proposed system offers automated detection and in the assistance of all passengers where they are involved in accidents with the help of v2v communication.[4] And the third one is sending the location of the victim to medical helpers which are nearby to that place. And this also senses the heartbeat of the victim to check the seriousness of the accident and it sends the same detail to the medical centre [3].

II. PROBLEM DEFINITION

A good number of reports were studied on road accident and road accident deaths. These unfortunate deaths are a cause of just a single reason, that is to provide the required facility to the victim at the right place and at the right time. The measuring system which is based mostly on installation projected would inform the accident victim's relations or police room concerning the accident instantly, in order that facilitation to the slashed in road accident may be delivered as presently as attainable. The medical emergency care unit would dispatch to the accident location without any delay, thereby we are able to increase the victim's survival possibilities.[5]

III. LITERATURE SURVEY

The system contains GPS, GSM module and Vibration sensor which will be activated by sudden or heavy vibration or triggered by the airbag system. We will use Bluetooth technology to activate GPS by the sensors. When an accident happens, the system operated in the vehicle will be activated by the sensors and information with the fixed location of the accident area. Messages will be sent to the number entered in the system and to the nearest police station, hospital, and rescue team.[1] The installed system will work when the vehicle is registered and uploaded in the database of PSO Headquarter. We have proposed a new system after studying various precious papers on the system. In this system work in two-part (a) Pre-Accident part (b) post-accident part. In the pre-accident phase we use two sensors, alcohol detection sensor and eye blinking detection sensor. Alcohol sensor detects if the person who is driving the car is drunk or not

and an eye blinking sensor which will count the at what rate your eye is blinking if the sensor will find something abnormal is going so it will be going to stop the vehicle for the safety purpose.[6] In the post-accident phase we use four sensors, accelerometer sensor, vibration sensor, ultrasonic sensor and fire sensor. Accelerometer sensors respond where there is change in the speed and tilt in the vehicle. The accelerometer sensor is based on the finding of the gravitational forces in the system. The sensor senses the change in the gravitation-forces in the object. The value of the gravitation forces talks about the type of the collision. Vibration sensor detects the vibration of the vehicle and degree of vibration occurred on the vehicle. This sensor will activate when it crosses the threshold force defined in the system. Ultrasonic sensor detects the obstacles in the path before collision and alerts the driver. This will work with the vibration sensor to avoid false alarms.[7] Fire alarm will detect the fire in the vehicle after the accident. After checking all parameters, the system will activate and send the information to the family members, police station, ambulance, hospital with exact location with the help of two modules which are GPS and GSM installed in the system.[9].

IV. SYSTEM IMPLEMENTATION

Overall implementation will be done in 2 phases, the software and the hardware implementation. All the software will be initially tested and hence the implementation architecture will be taken care of. Overall purpose is to meet the proposed objective.[8]

A. Software Implementation

This constitutes the fundamental aspect of the project. It has to be done very carefully. It determines the efficiency of the equipment, helps in selection criteria of the components and the requirement of each component. In addition, the coding was done using Arduino software.[8].

B. Hardware Implementation

In the hardware implementation the following components briefly explained below were used to actualize the aim of our project.[8].

a) ARDUINO NANO

Arduino NANO is dependent on the Atmega328 microcontroller, and this is very small in size and it is a very friendly board. The main function of this Arduino is exactly like other boards but in different ways. And the drawback of the board is the port which is installed in this mini and which is replaced by a DC power jack.[7]

Fig. 1. Arduino NANO

b) GPS Module

The GPS module used here is a perfect module having a ceramic antenna and is basically a complete GPS receiver. It captures the location data of the affected vehicle and sends it to the microcontroller. Hence the location of the vehicle can be easily determined.[6]

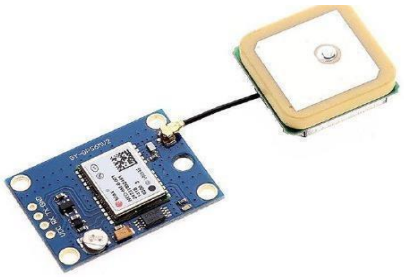

Fig. 2. GPS Module

c) GSM Module

In this module there is a SIM 900 GSM used which is connected with a microcontroller which helps to work many mobile functions examples are to conduct a call and messages. There is a shield which is designed to protect the SIM900 chip to connect with any microcontroller for working. There are so many varieties of AT commands and the protection or shield will be free to send or receive any type of text or call. So there are some benefits of SIM 900 which makes it the perfect device to complete the aim of the project.[5]

Fig. 3. GSM Module

d) Accelerometer Sensor

An accelerometer sensor is used to detect the tilt angle. This sensor is a 3-axis sensor (MMA7660FC) which helps in finding different physical changes like tap, tilt and shake etc. It senses the activity in all the three directions, this property is its most dominating one. [1]

Fig. 4. Accelerometer Sensor

Fig. 5. When vehicle position in x- axis

Fig. 6. When vehicle position in y- axis

Fig. 7. When vehicle position in z- axis

e) Vibration Sensor

The model's name of this sensor is SW18010p which is a vibration sensor having a spring mechanism and in which a small piece of metal is connected in the center of the dark part. So generally, when any outside force is applied then the spring touches the metal part and when force is removed the both sides of the sensor get open. The number which comes after SW18 signifies the amount of force which is essential to come into the contact. So generally, when the high the number it means the greater the vibration is required to reach saturation point. In short, in this component this can be used to find out the vibration occurs and the seriousness of vibration that hits the automobile.[3].

Fig. 8. Vibration Sensor

f) Ultrasonic Sensor

So the model name is HC-SRO4P Ultrasonic ranging which is a very low or moderate proximity sensor and the main role of this sensor is that it uses its sonar to measure the gap between the obstacles. In this there is an ultrasonic transmitter and the second one is fitted with receiver modules. So, the basic function is to send a signal or message which is just reflected whenever the signal module finds an obstacle. There is an echo pin which accepts the signal coming and in this the time gap between the transmission and receiver is used to find out its distance to the obstacle because its sound speed in the vacuum is known. An on-board 2.54mm pitch pin fronter granted it to be front face to any obstacle during its testing phase. So, with the use of this sensor in our project it will mainly verify that there is any obstacle in front, back or side of the automobile and after finding it will alert with the help of an alarm to ignore any type of tragedy and generally it is connected with the vibration sensor.[2]

Fig. 9. Ultrasonic Sensor

g) Alcohol Sensor

One of the main functions of this sensor is to find out whether the driver had consumed any type of alcohol or not and this will occur with the help of the breathing system of our body or we can say with the help of Breathalyzer. It is very accurate and shows every minute behavior towards the benzene. This shows the analog resistive output supported to the concentration of alcohol. Whenever the conductivity of the sensor will increase then the gas concentration will also increase. We can use this sensor to find out the alcohol with different levels of concentration. The good points of this sensor is it is available at a very low cost and it is used in many applications.[5]

Fig. 10. Alcohol Sensor

h) Eye Blinking Sensor

This is an IR based sensor. The Variation Across the eye will vary as per eye blink. Closed eye result in a high output, whereas other states denote lower ones. This helps to know the eye is closing or opening position. This output is given to the logic circuit to indicate the alarm. It can be used for detecting the accidents that take place because of one being unconscious.[8]

Fig. 11. Eye Blinking Sensor

V. BLOCK DIAGRAM

A. *Pre-Accident Phase*

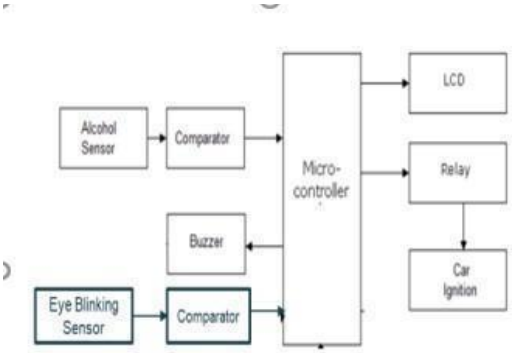

Fig. 12. . Block Diagram of Pre-Accident Phase

B. *Post-Accident Phase*

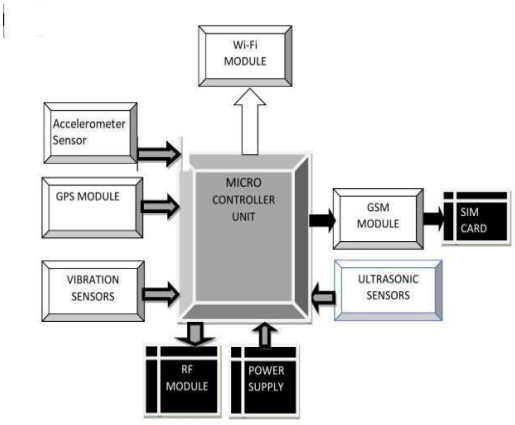

Fig. 13. Block Diagram of Pre-Accident Phase

VI. WORKING

When the system operates firstly the GPS system starts getting connected and giving updates at every fixed interval of time and after some time alcohol sensor which is fixed in car if it reaches its threshold limit then automatically it sends the message that ALCOHOL IS DETECTED on the given saved number and all the fire and ignition related thing will be off. And then the ultrasonic sensor will start working and will check the seriousness of the collision and if it finds the distance less than 20 cm then it will start sounding the buzzer so that we can avoid an accident. If in the worst-case accidents occur then our vibration sensor will start working and if it will reach our threshold limit then with the help of GPS we send the particular location to the police and medications services and registered mobile number. It also sends the alert message if a vehicle catches any kind of fire with the help of a GSM system.[9].

VII. RESULT AND DISCUSSION

TABLE I. THRESHOLD G-FORCES FOR ACCELEROMETER SENSOR

Accident Severity	Actual Maximum G Range Represented [13]
No Accident	0-4g
Mild Accident	4-20g
Medium Accident	20-40g
Severe Accident	40+ g

TABLE II. TABLE OF RESULT OF CAR CRASH TEST

S No	g-Forces	Accident Severity	LCD Display	Message Send
1	0	No Accident	Safe	NO
2	5	Mild Accident	Accident	NO
3	10	Mild Accident	Accident	NO
4	20	Mild Accident	Accident	NO
5	30	Medium Accident	Accident	YES
6	40	Medium Accident	Accident	YES
7	50	Severe Accident	Accident	YES

TABLE III. WHEN ALCOHOL AND EYE BLINKING SENSOR IS ABOVE THRESHOLD

Sr No	Status	Component	Input	Output
1	ON	GPS Module	As System started it takes co-ordinates	LAT (Latitude):28.630152 LON(Longitude):77.370041
2		Alcohol sensor	1025 (above threshold)	Sends "Alcohol detected" and ignition OFF
3		Eye Blinking Sensor	Above threshold	Sends Rapid eye blinking detected and ignition OFF

TABLE IV. WHEN ACCIDENT DETECTED

S.NO	STATUS	COMPONENTS	INPUT	OUTPUT
1		GPS MODULE	As system started it takes coordinates	LAT(Latitude): 28.630152 LON(Longitude): 77.370041
2	ON	Alcohol SENSOR	1000(below threshold)	No Action
3		Ultrasonic Sensor	Distance<20cm	Buzzer will blow
4		Vibration Sensor	Above Threshold	Accident Detected
5		Fire Sensor	Above Threshold	Fire Detected

The particular system works in many different situations. Whenever it finds that the rider had consumed alcohol above the saturation point then according to the above table 1 the alert sms will be sent and the main power will be automatically turned off. And in the second table whenever the automobile approaches any object and the gap between them is less than 20 cm then immediately it will alert the driver and if any tragedy happens then alert message will be sent to different units and if it catches fire it will send sms to fire authority.[2].

VIII. CONCLUSION

The Accident Detection and Alerting system was designed or made in such an amazing way that it primarily detected any mishap that was to happen and prevented it. It also has an alcohol sensor and eye blinking sensor in the pre accident phase which detects the person who is going to ride the vehicle. If a person is drunk and has a rapid eye blinking, then it stops the ignition of the vehicle and informs the person by buzzer and prevents the accident. It is attached with a vibration sensor and accelerometer sensor for detecting the usual possibility of an accident by detecting the impact and speed of the vehicle and it is attached with an ultrasonic sensor that is used for the prevention of the accident in the post-accident phase. The system will also inform the family members about the condition of the victim, nearby police - station, hospital, and the nearby fire station through messages containing the location of the accident by using a GSM and GPS module in the case when the threshold value of the sensor is surpassed.[7].

IX. FUTURE SCOPE

A webcam can be used with respect to a future scope in order to have visual records of the accident. Automatic Brake locks can be applied in case of an accident, in generalized cases , accidents occur as a result of the driver losing control over the vehicle , of any sort. Once the accident occurs , heavy vibrations act as a stimulus for the vibration sensors in order to energize the processor. At the end , these processors must have a direct control over the locking brakes of the vehicle in order to apply them and avoid an accident and hence we fulfill the preset objectives. Our systems can widely be used in food service vehicles , logistics verticals of companies , rented vehicles & etc.[9].

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Cross Platform Operating System Solution

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***Abstract*—This paper discusses porting of Arch Linux kernel on ARM architecture as ARM development boards are optimal to use considering their speed, cost, flexibility, and accuracy. ARM boards are ideal for development since ARM Processors are widely available (Qualcomm's SnapDragon, Samsung's Exynos, and MediaTek's Helio). Agni OS which is an open-source project has to be cross-compiled and burned into the SBC. The detailed procedure of porting the OS (Arch Linux) is described in this paper along with the necessary tools. All software that we use is free and open source. All the code is available in some version control system-dependent websites (Github/Gitlab). Cost optimization of the device is the main motive of the project providing B2B solutions while developing the hardware which can be viable by the usage of ARM-based processors.**

Keywords—Linux kernel, ARM processor, bootloader, system architecture, cross-compile.

I. INTRODUCTION

The main objective of this project is to provide a business- to-business (B2B) solution for companies developing people in India own a laptop because of the surging prices. Even after spending such a hefty amount user gets a device with low configuration and can only perform minimal tasks on such a system. Hence, they are compelled to buy a mobile phone which gives them access to better tools and can work better than any such laptop. Processors of x86 architecture are relatively expensive, which leads to an increase in the price of laptops/desktops. Software and Hardware components are mostly imported, which in turn increases the total price of the device.

ARM is a simpler alternative to x86 for mobile devices also it is cost efficient to make devices on ARM based chips with little to no loss in performance. This project discusses porting of Arch Linux based Operating system on ARM instruction set architecture. ARM is a simpler alternative to x86 for mobile devices. ARM development boards are also optimal to use considering their speed, cost, flexibility, and accuracy integration as ARM processors are very flexible and we have seen how well some large laptop/desktop manufacturing companies use these processors. For seamless integration of these functional modules, an x86 inspired OS has to be ported on these ARM-based CPUs. Our goal is to provide such projects with an operating system built for such processors. Our OS can be customized according to the hardware specifications mentioned by the company. As an example, Apple ships Mac OS with both of their MacBook models, one with an Intel processor and one with an M1 processor.

II. LITERATURE REVIEW

Most of the laptops and desktops have a starting price of Rs. 25,000*, which is expensive for an individual who aims to use it for basic usage. A survey states that only 11% of people use laptops.

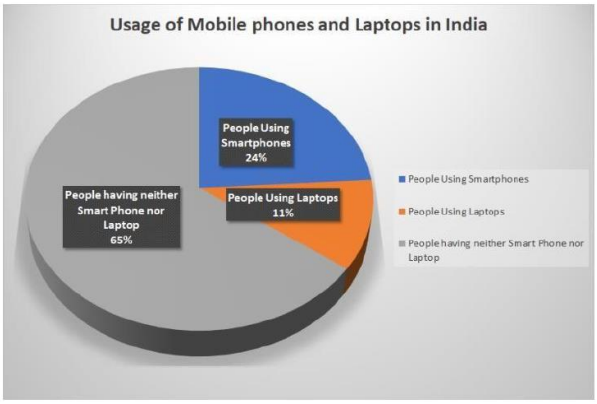

Fig. 1. Usage of Smartphone versus Laptop in India [2]

III. IMPLEMENTATION

The basic aim of the project is to Port Arch Linux on an ARM SBC. The different types of ARM ISAs that can be used are Raspberry Pi 4B+, Banana Pi, Orange Pi, Beagle Bone xM, with Cortex A7. In our case, we'd be using Raspberry Pi, and port Linux to the same. Processors of x86 are highly expensive and unnecessary for carrying out simple tasks of using light software. The idea behind the implementation is to create an accessible product that can be used by those people who need a laptop, but only for low-end tasks. For people implementing low-end tasks, a mainstream laptop/desktop can prove to be way too expensive. The idea behind the project is to come to a middle ground and come up with a niche product that isn't too miniature-sized like a mobile phone, and at the same time isn't as complex as a laptop/desktop.

A. *Recompiling Kernel*

Step one of the projects is to recompile:

- Kernel (Linux): Most important system software in an operating system. Acts as a sandwich between hardware and software. Loads initial RAM filesystem into memory.
- Init (systemd): Initialises hardware on each bootup. This is the first software that the kernel loads. It has the process ID of 1. (PID 1)
- Bootloader (GRUB): Bootloader loads in the entire operating system with the desired kernel.
- File System (ext4): Hierarchical data structure & method to control storage & retrieval of data.
- Shell (Bash): Program that allows users to safely interact with the kernel, filesystem, and various other operating system utilities.
- Display Server (XORG): Manages input and output coordination between the user and operating system.
- GUI Framework (Qt): Qt framework aids in building GUI tools.
- Display Manager (SDDM): Display Manager helps in starting desktop environment, and also takes care of login
- Window Manager (kwin): Window manager manages windows Desktop Environment (plasma): DE is GUI slammed on top of the core OS
- Network Manager: Network Manager manages networks!
- Open SSH: SSH is a protocol that allows two computers in a network to communicate remotely.

and their dependencies in a way that's convenient for porting Linux to an ARM SBC. Arch Linux would be used for that purpose. We will be cross-compiling all of the above on an x86 computer. All the compiled packages will be stored in a local database and linked to the package manager (pacman) in /etc/pacman.conf.

B. *To Boot OS*

Step two of the project is to connect all the Peripherals to the ARM processor-based SBC. Peripherals like Keyboard, mouse, etc would be connected to the RISC. The subsequent step would be to boot the OS on our target ARM SBC. The term "booting" is short for "bootstrapping", which refers to the process by which a computer prepares itself to load an operating system.[7] The communication between the peripherals and the ARM SBC would be done with the help of the booted OS, which contains the Kernel that has interacted with the modified Bash script. We'd also be using Bash scripting to communicate with the Kernel, which in turn would help in starting the init system. The reason it is crucial to use Bash for the Kernel is that the init system would help us in the execution of further steps of our project. Considering the business model, Steps one and two can be modified depending on the type of ARM SBCs we are using and then can be sold for commercial or industrial purposes.

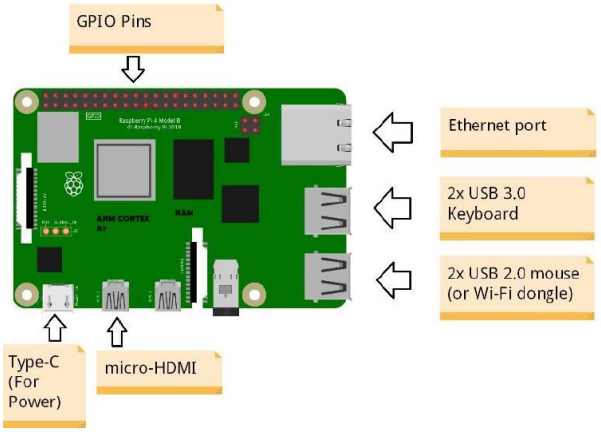

Fig. 2. Raspberry Pi 4 setup for the project

C. *Test and debug for problems*

The final step of the project would be to test the working model of the OS and its interfacing with ARM processor and to test whether the OS is compatible with other devices by which if any bugs and errors exist, they can be found. Those errors can be fixed and debugged for a better product.

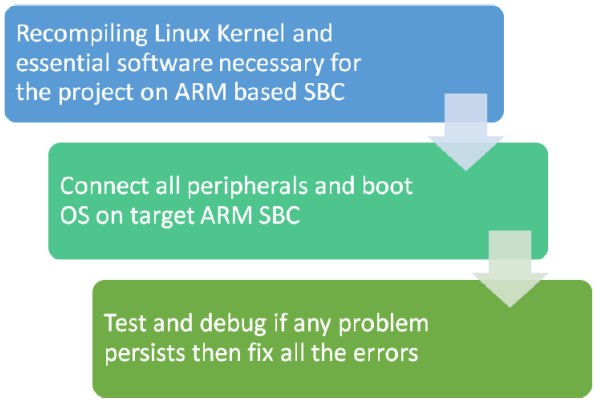

Fig. 3. The flow of Implementation of the project

D. *Hardware and software Tools used*

- Arch Linux OS installed on x86 computer (for cross compiling packages, build, dump)
- Tools on Arch Linux OS for example compilers, Linux shell, interpreters, and other tools like squashfs creator, etc.

Fig. 4. Logo of Agni OS Used to boot in ARM SBC

- ARM SBCs which may include Raspberry Pi 4B+, Banana Pi, Orange Pi, BeagleBone xM, with Cortex A7 or better processor.
- Wire: HDMI to micro-HDMI, type C
- Peripheral devices for interfacing. Keyboard, mouse, monitor, Wi-Fi dongle(optional).

Fig. 5. Agni OS installation

- The above image shows the User Interface of Arch Linux on the ARM SBC.

E. Working methodology of our Project

- Step 1: Flash an SD Card

Fig. 6. SD Card inserted in the laptop to set up Arch Linux

- Step 2: Insert the SD Card into a Pi with the OS flashed in it.

Fig. 7. SD card inserted in RPi 4

- Step 3: Connect all Peripherals. Here we have connected the keyboard mouse (USB) & monitor (HDMI):

Fig. 8. Peripherals connected to the ARM SBC (RPi 4)

- Step 4: Add power with the help of Type C

Fig. 9. Connecting power supply to the ARM SBC (RPi 4)

- Step 5: OS will boot Automatically

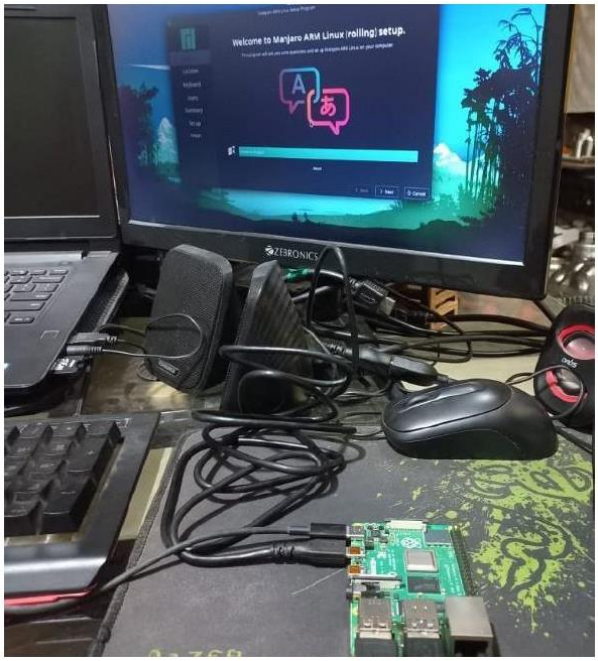

Fig. 10. View of Desktop after the ARM SBC (RPi 4) is connected

- Step 6: Post Install System Installation.

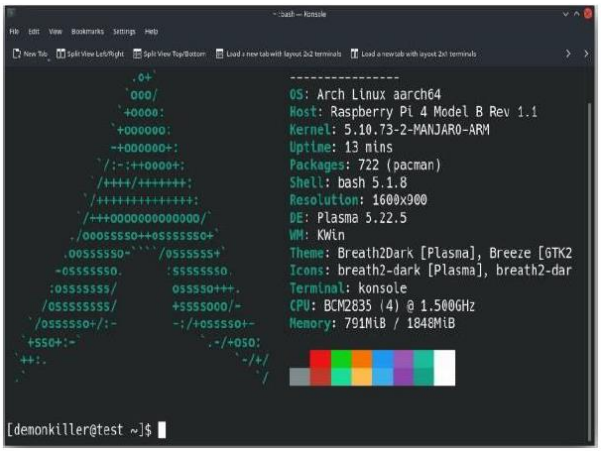

Fig. 11. View of Desktop after installation of the OS

IV. Result and Discussion

The result would include the creation of a model with an ARM SBC that works on Linux. This ARM SBC (Raspberry Pi in our case) is connected to peripherals like a monitor, keyboard, mouse, etc. This helps in the ultimate functioning of an SBC as a computer and hence, helps in the functioning of low-end tasks. This model can be successfully implemented as a B2B model as well as a B2C model. The product can be used by individual consumers for their personal use, like carrying out simple tasks and running simple software. At the same time, the model can be implemented for the industries and can be used for operating their system, or machine, that is used for industrial purposes and doesn't require an x86 processor computer. The business model can be further upgraded by taking orders and creating personalized ARM SBCs based on the client's requirements. In all the cases mentioned above, the final result comes down to running a desktop/laptop with an ARM processor and making it convenient for low-end tasks.

V. Conclusion

Arch Linux was booted on an ARM-based processor (in this case Raspberry Pi) which is interfaced properly. Hence, Arch Linux was ported on ARM ISA which is essential for creating a new laptop using the same processor. It will help in reducing the cost of laptops/desktops drastically. The approximate reduction in costs can be up to 40% of the current cost. The devices that can be developed using these processors can be both affordable as well as easy to operate for daily tasks for most people. Any company can have a customized design for its particular specifications. Since this is an open-source project, many more developers can also contribute to a better build of the proposed prototype.

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Designing Battery Management System for Li-ion battery using IoT

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***Abstract*—As we know Future is Electric & the most promising electrical energy storage is Li-ion Batteries. But they can be used only in stipulated conditions, and therefore a battery management system (BMS) is necessary in order to monitor battery state and ensure safety of operation. In this paper we are going to design a BMS which is IoT enabled. We will see why & what is BMS? how it estimates the battery parameters as SoC, SoH, power, etc. In this study, we discussed BMS cell balancing, safety like over/under voltage, current & temperature and IoT feature tech that was designed to receive & transfer data over clouds where software can control BMS.**

Keywords—Li-ION, IoT, MCU, Cloud Platform, BMS, SoC and SoH estimation.

I. INTRODUCTION

A battery management system is a system allows individual to monitor individual battery within a battery pack. The stability of the battery pack is maintained by the energy released by the cells in each battery. This is one of the reasons because of which a battery management system (BMS) is used. A Battery Management System does the work of constant monitoring, gathering, and forwarding information to an external medium where users can observe the status of each battery and the health of the overall battery pack. The Battery Management System has the responsibility of management and monitoring a battery pack in order to protect it from damage, extend its life, and keep the battery operating system within its safety limits. The above characteristics are important for efficiency, reliability, and safety.

II. PROBLEM DEFINITION

The main task of the battery management system is to make optimal use of the energy remaining in the battery. To prevent battery overcharging, the BMS system protects the battery from over-discharge and over-voltage resulting in very fast charging and very high discharge current. For multi-cell batteries, the BMS also provides cell balancing to ensure that different battery cells have the same charge and discharge requirements.

III. LITERATURE SURVEY

A. Basic framework of BMS

BMS can be measured by hardware and software. Hardware contains sensors, circuits for safety, charge control and thermal management. Software contains battery parameters like current, voltage, etcetera, battery states i.e., SoC (Sate of Charge) and SoH (State of Health), cell balancing, fault detection and user interface. As we were researching about this project, we came across several papers.

B. Need for BMS

a) Cell Protection - Cell protection is about protecting cells from unacceptable environmental or operating conditions and providing the necessary monitoring and control to protect users from the effects of battery failure.

b) Current and Voltage protection – Overcurrent protection is usually provided by a current sensor that detects when the battery's high current limit is reached and opens a circuit. Multiple protection schemes can be implemented to provide comprehensive protection schemes, including those built into chargers and batteries.

c) Thermal Management - Excessive temperature will eventually lead to failure of all elements. Therefore, most protection circuits contain a fuse that permanently disables the battery if the temperature exceeds a predetermined limit. A thermistor is a circuit device whose resistance changes with temperature. There are two types of PTC thermistors: positive temperature coefficient and negative temperature coefficient. Likewise, the temperature of an NTC thermistor is negative. The coefficient when the resistance increases as the temperature decreases or vice versa.

d) Intelligent cell balancing - Battery balancing and battery redistribution refers to methods of

improving the capacity of a battery pack consisting mostly of multiple cells connected in series and extending the life of each cell. A battery balancer or battery regulator is an electrical device on a battery that balances the battery. Balancing can be active or passive.

e) State of health monitoring - State of Health (SoH) is a measure of the quality of health of a battery (or cell or battery pack) compared to ideal conditions. These SoH units are percentage points (100% = battery health meets battery specifications).

f) State of Charge - State of charge (SoC) is the level of charge of an electric battery relative to its capacity. SoC units are percentage points (0% = empty, 100% = full).

g) paper proposes a model involving multiple sensors such as GPS, GSM, vibration sensor, and IMU sensors which is used to sense motion-induced events like acceleration, braking, skidding etc. An algorithm is created to analyse this data on an embedded microcontroller unit that triggers an alarm if it detects conditions indicative of a crash or high speed impact from various sources. This can reduce response time for rescuing injured riders with timely medical assistance.

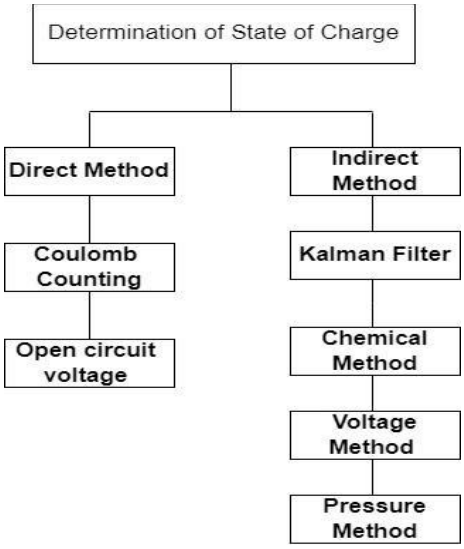

Fig. 1. Determination of State of Change

C. Why Lithium Ion?

Lithium-Ion or Li-Ion batteries are those type of batteries that are rechargeable and are used in many applications, but most commonly in the electronics industries.

D. Advatages of Lithium Ion

Lithium-Ion batteries provides portable electricity, it helps in powering electronic gadgets such as smart mobile phones, laptops, etc. It also has highest energy density, operate on low maintenance, Lightest metal and greatest electrochemical potential, minimum self –discharge.

E. Disadvantages of Lithum Ion

Lithium ion are brittle. They need protection circuits from being over charged or discharge quickly. Life of a lithium battery depends on its surrounding temperature as well as charge discharge cycle and its cost are high.

IV. Flow Chart of Battery Management System

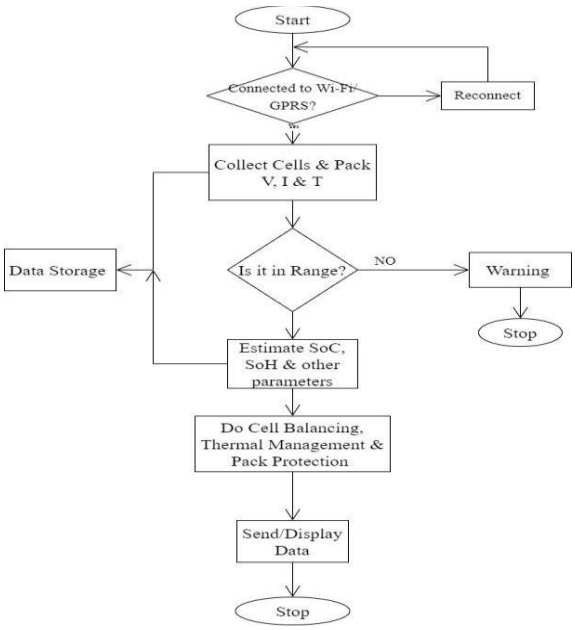

Fig. 2. Flow Chart of BMS

V. Design of Battery Management System

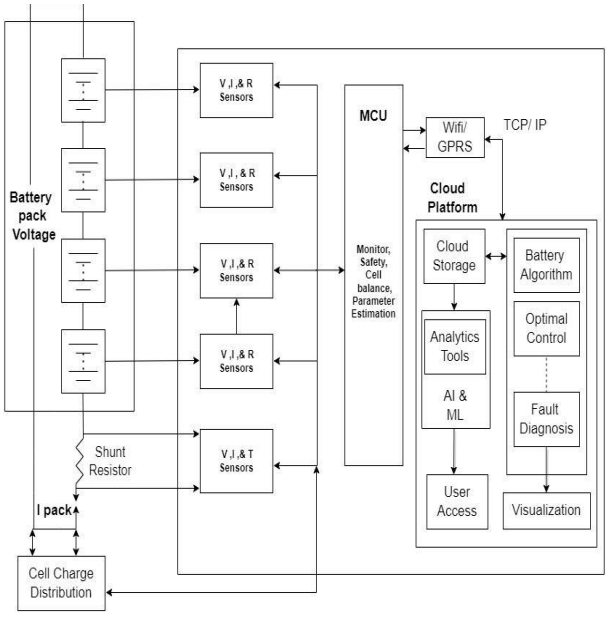

Fig. 3. Design of BMS

There are four main functional blocks

A. V, I, & T Sensors Device

B. MCU

C. IOT Gateway

D. CLOUD Platform

A. V, I, & T SENSORS DEVICE

Voltage and current monitoring are arguably standard features of battery management systems. This is useful for checking the health and charge of the battery. Thermal sensors can be used to measure temperature. All cells in a battery must operate at standard voltage levels during charging and discharging for safety and longevity.

B. MCU

MCU stands for Microcontroller unit. MCU is a tiny computer along with memory and programmable input and output peripherals. Its main function is to Monitor, Safety of cells, Cell balancing and Parameter Estimation.

C. IoT Gateway

An internet of things (IoT) gateway is a software program or physical device that serves as the medium between the cloud and controllers, sensors and AI devices. Wi-Fi and GPRS are used as an IOT Gateway. They receive and transmit the data to cloud platform.

D. Cloud Plateform

Cloud Storage store the data This stored Data is received from IoT gateway. After that data is further processed through Analytical tools i.e., Artificial Intelligence and machine learning. There is battery Algorithm, optimal Control and fault Diagnosis for finding fault. After analysing all the parameters, we will get the visual in form of graph. This data will be access by the users anytime anywhere.

VI. RESULT AND DISCUSSION

A battery is postured as a nonlinear system, with the SOC defined as a system state. The Extended Kalman filter (EKF) or Adaptive Extended Kalman filter (AEKF) is applied to estimate SOC directly for a lithium battery pack in the presence of noises. We can use BMS in various places like Electric vehicles, hybrid vehicle. It can also be used in Solar as well as Wind energy storage system. It can be used as protection circuit in battery backup systems.

VII. CONCLUSION

The paper stated the design and development of an IoT-based Battery Monitoring System that can be monitored online. We have presented the overview of IoT BMS implementation approaches has been given. Here we have tried to explain every aspect of relevance resulting from different systems. Yet, it has to be said that, due to the large variety of applications and systems, it is not possible to consider every single existing facet. This system can be used in a mobile application where it can help user to monitor battery. For the future, we expect a continuous improvement of available BMS components and new software algorithm approaches.

VIII. ACKNOWLEDGEMENT

We would like to thank the faculty of Thakur College of Engineering and Technology for giving us the opportunity to write and expand our views and knowledge on this topic. We would also like to thank our mentor, Mr. Varun Mishra for her guidance and support on our topic.

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IoT Based Smart Greenhouse with Electrochromic Windows and Remote Monitoring

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***Abstract*— In the age of digital technology, almost everything is being automated to eliminate the need for hand operated devices. Agriculture has also recently made extensive use of automated intelligent systems and techniques such as smart farming and precision agriculture in order to increase production efficiency and quality of agricultural goods. This also leads to an improvement in the quality of life of farm workers by reducing arduous labor and tedious tasks. This study deals with the design and implementation of a greenhouse prototype that is connected to the Internet of Things (IoT) to allow remote parameter monitoring and adjustment from anywhere in the world. The system is divided mainly into two parts hardware and software. The hardware part deals with the designing and implementing of the control circuits comprising of the sensors and actuators in order to sense data and automate the processes taking care of the plant. The software part deals with the code to be sketched into the microcontroller board to ensure automatic activating and deactivating of the actuators. An inbuilt WIFI module allows for remote monitoring of the same while also giving manual control of the actuators to the user. The addition of a real time clock enables system to check different levels of parameters to ensure optimum growth. An android application is also being developed in order to allow for checking of parameters and manual control of the various actuators.**

Keywords*— *IoT, Smart Greenhouse, Electrochromic Windows, MQTT, Real time Monitoring

I. INTRODUCTION

Trees and plants play a crucial role in the ecosystem and are extremely important for the planet. In order to meet the growing demand for vegetables and the severe lack of available land, greenhouse farming is a viable solution. An optimal greenhouse environment not only boosts output but also encourages a thriving off-season market for healthy vegetables by giving farmers and growers the highest possible profits. possible profits [1]. Affordable internet of things (IoT) solutions, such as smart home systems, smart healthcare systems, smart transportation systems, and smart agronomy, are being produced as a result of recent innovations in smart sensors paired with improvements in computer technology based on embedded systems.

The automation of greenhouses has received a lot of interest recently, particularly in the agricultural sector. In this work, some of the ways used to automate greenhouses are outlined and a new method is presented that uses electrochromic glass panes to manage the sunlight entering the greenhouse.

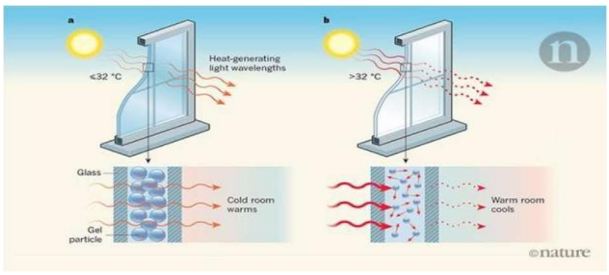

Figure 1: Electrochromic Window Working

The remaining paper is structured as follows. In Section II, a comprehensive survey is carried out on the existing state of the art techniques. In Section III, the proposed system is presented and in Section IV, the current result are highlighted. In Section V, the future scope and possibilities are discussed and in Section VI, VII and VIII the conclusion, acknowledgments and references are highlighted.

II. LITERATURE REVIEW

In [2] Marcin Brzezicki presents a thorough analysis of the most recent ideas in the field of smart windows. The review focuses on spectrally selective systems, electrochromic energy storage windows, multicolor and neutral black electrochromism, and hybrid EC/TC systems. Additionally, a brief overview of recent developments in electrochromic materials is provided.

In [3] Rajesh Megalingam, Avinash Kota, Vijaya Tejaswi and Mohammad Doriginti presented a method to detect leaks and the presence of dangerous gases inside a

closed facility, such as liquefied petroleum gas, carbon monoxide, and dioxide. Additionally, the system might be used to alert the user when certain weather factors, such rain or daylight, are greater than necessary .

In [4] Kh Nosirov, Sh, Begmatov, M. Arabboey and T. Kuchkorov Discuss the ways in which increasing levels of automation have altered every area of human life. Automation technologies are employed in many different industries, including agriculture, where they can offer effective tools for solutions under challenging climatic conditions. Designing an automated greenhouse with IoT is an interdisciplinary endeavor. Many environmental parameters need to be monitored and controlled, and sensor-based intelligent systems using cameras or infrared sensors are needed for this. Monitoring environmental factors on a regular basis helps farmers better understand how each one affects plant growth and how to boost crop yield. These factors allow for quick disease symptom diagnosis, early plant development, and plant growth monitoring. Smart greenhouse monitoring systems are being researched using automated, mobile, and remote techniques. The aforementioned sensor and vision-based system has been utilized to acquire visual data pertinent to plant growth, analyze environmental parameter information, and assess environmental parameter information.

In [5] Shreyas Bhujbal, Yash Deshpande, Arpit Gupta and Ojas Bhelsekar created and put into operation a low-cost greenhouse management system for regular customers. The system can be handled online from a distance because it was created utilizing IoT. It discusses the Internet of Things and demonstrates how a smart greenhouse parameter monitoring system may be built utilizing a Raspberry Pi 3 and a number of online sensors.

III.RESEARCH METHODOLOGY

The system that is built is derived from and adapted from the one that Deisiane Cruz first suggested [6]. Smart windows are used on the greenhouse's roof to enable remote management of the quantity of natural light that the plants get, negating the need for artificial lighting. Consequently, the plants grown in the greenhouse areguaranteed to be entirely organic and naturally cultivated. The remaining sensors in the greenhouse make sure that all of the plants' other needs, such as temperature, humidity, and moisture are also maintained in an ideal range.

A. Flowchart

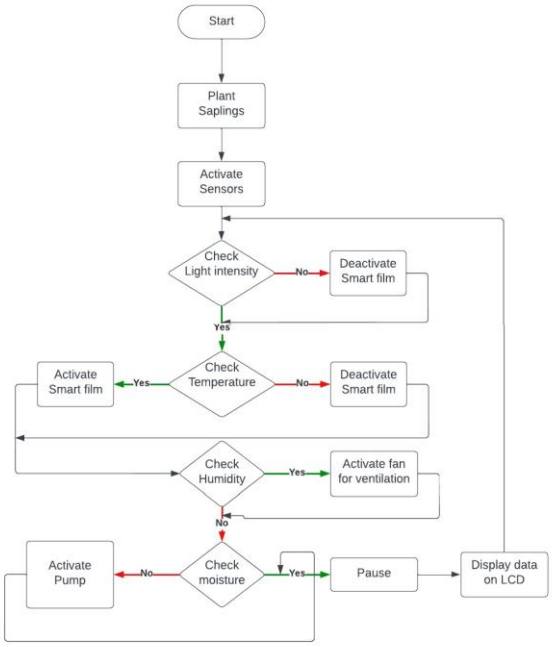

Figure 2: Flowchart of System

The operating principles of the smart greenhouse and the different operations that take place there are depicted in the flowchart in figure 2 [7].

The sensors check the various parameters of the plant such as temperature, humidity and moisture periodically and update the data in the android application. In the above flow chart, it can be seen the actions which the raspberry pi takes after each. If temperature exceeds the threshold, the smart film is activated to prevent further temperature rise, if humidity exceeds threshold, then fan is activated to ventilate and replace the air inside and if moisture falls below a threshold, the pump is activated to dispense water to the plant.

A. Components

Hardware Component	Quantity
Raspberry Pi model 3b	1
Smart Film	1
DHT11 Sensor	1
Soil Moisture Sensor	1
RTC Module	1
Mini Pump and Pipes	1
LCD Display	1
ADC Converter	1
Relays	3
Others	1

Figure 3: Hardware Components

The various sensors include:

1. Temperature Sensor (LM35): It is a precision Integrated circuit three terminal sensor used to measure temperature from -55 0C to 1500C.
2. Soil Moisture Sensor: It is a resistive sensor used to measure the water content present in the soil by

measuring the varying resistance across its conductors. The resistance is inversely proportional to soil moisture.
3. Humidity Sensor (DHT11): It is a capacitive humidity sensor along with a thermistor to measure the surrounding air and gives a digital output and has a range from 0 to 100% with 2- 5% accuracy.
4. Photoresistor: It is used to measure light intensity as its resistivity is proportional to the intensity of light incident on the sensor.
The various actuators which are responsible for moving or controlling the various mechanisms include:
1. Mini Pump: It is used to pump and supply water to the plants depending on the output of the soil moisture sensor. The water pumped is passed through a pipe to a mini sprinkler to ensure even distribution of the water. If the power requirements cannot be directly handled by a micro-controller, a relay is used and acts as a switch.
2. Smart Film: It can be activated or deactivated depending on the outputs from the temperature and light sensors. The film is used to allow or block sunlight from entering the system depending on the conditions.
3. Mini Fan: The fan acts as a ventilator to refresh the air inside the greenhouse to ensure interior humidity does not become too high. It also ensures that carbon dioxide content inside the greenhouse does not exceed the limits which may hinder plant growth.
The software side consists of using Raspbian OS as an operating system to configure the Raspberry pi. The coding of the entire system is done using Python and its various libraries which are used to interact with the sensors and actuators.

C.Working

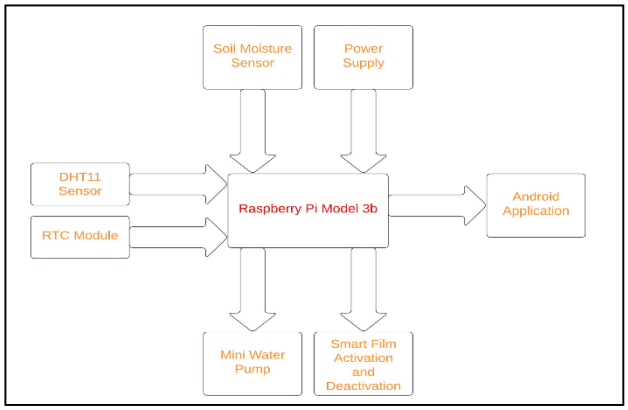

Figure 4: Block Diagram of System

Depending on the internal conditions, the smart windows serve as the greenhouse's roof and either permit or prevent sunlight from entering the structure. A temperature sensor is used to determine whether the temperature inside the greenhouse is too high to ensure that the temperature within the greenhouse is optimal for plant growth. The smart window's activation and deactivation are then controlled by this sensor. If one wants to activate or deactivate the windows remotely, the window can also be operated via a WIFI module through an android application [8].

The humidity sensor is crucial because plants can only develop at a set humidity level, and if the humidity inside the greenhouse is too high, growth may be inhibited. In case of high humidity, a ventilation system makes sure that air inside the greenhouse may be easily ventilated out to prevent development from being hindered. A moisture sensor is used to evaluate the soil's moisture content on a regular basis. If the moisture level is too low, the water pump is activated. To make sure that water is evenly distributed around the greenhouse, a sprinkler is used to spray it.

A RTC is an electronic device in the form of an Integrated Chip (IC) available in various packaging options. The purpose of an RTC or a real-time clock is to provide precise time and date which can be used for various applications. An RTC module is added to the greenhouse to ensure that plant conditions are monitored in real time and to ensure optimum moisture levels at all time of the day. The data sent to the database by the raspberry pi to be displayed via the android application can also be analysed to further predict the fertility and moisture level variance of the soil which can be a valuable tool for farmers and horticulturists. The proposed system is coded using python on the Raspbian OS on Thonny IDE. The code is written using conditional statements to activate various activators such as pumps, smart films etc. using the various sensors as input parameters. The MQTT protocol is also coded i

IV. RESULT AND DISCUSSION

A prototype of the above greenhouse with all sensors and actuators present in it was successfully constructed. The prototype would be able to monitor the plant placed inside the greenhouse, check its temperature, moisture and humidity periodically and update the data in the android application. The actuators can be also be configured to respond automatically to changes in the observed data. They can also be manually controlled through the application using MQTT protocols.

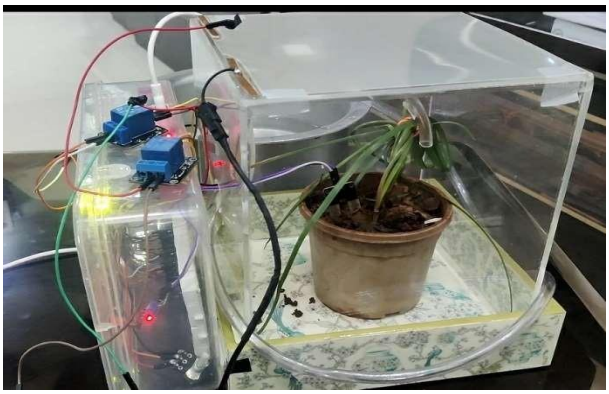

Figure 5: Prototype of System

The android application is as shown. The data for humidity, temperature and soil moisture is updated periodically using MQTT subscribe and publish standards. MQTT is a lightweight messaging protocol used for transmission between two remote devices. The protocol is event driven and connects devices using the publish /subscribe (Pub/Sub) pattern. The sender (Publisher) and the receiver (Subscriber) communicate via Topics and are decoupled from each other. To increase security of the network and for transmission over even further distances, LORAWAN can be used. Similarly, the actuators can also be controlled through the app. An example of controlling the smart film is shown in the application.

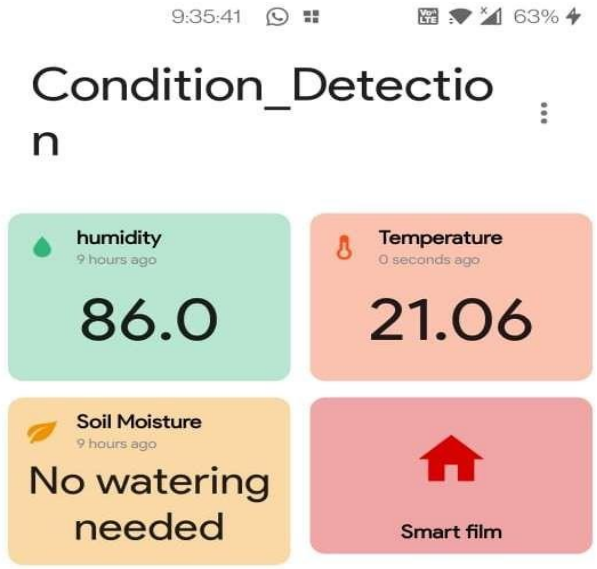

Figure 6: Android Application of System

V. FUTURE SCOPE

The project can be scaled further to cover a larger area with better efficiency by dividing plants with similar requirements together. The sensors can also be upgraded to be more weather proof to ensure better durability and accuracy. An important improvement can be the addition of a fertilizer detection system and dispenser to further reduce the amount of manual work needed in the greenhouse. As the system gets more and more advanced, the amount of manual work which needs to be done will keep reducing. A tank monitoring system can be also be added to ensure that plants have access to water at all times and that the user is warned if the tank is close to empty.

VI. CONCLUSION

The proposed solution makes use of IoT and smart windows to make sure that the greenhouse is fully automated in all respects. The system can be automated or controlled remotely over the internet by using a WIFI module. The numerous other methods for automating greenhouses have also been examined in this work to make sure the system developed is affordable and practical on both small and large scales. Because they are inexpensive and can be constructed on both small and big scales, greenhouses are growing in popularity. However, people's hectic lifestyles prevent them from using them. The suggested technique makes sure that the plants being grown are always receiving the right amount of water and sunlight, as well as being monitored to look for illnesses and other obstacles. The project can eventually be expanded into a number of different disciplines. By creating a website to track the health of the plants and other parameters, the IoT component of the same might be enhanced. Private servers could be built using cloud technologies to restrict access to the website to approved users only. It is possible to employ fuzzy controllers to broaden the control systems. Due to their reliance on trial and error, fuzzy logic controllers have stability and robustness issues. They can, however, be created to operate sequentially in a single microcontroller and have a significant impact on the stability and accuracy of the sensors. Once configured, these controllers can function as independent systems and don't need any external processing.

VII. ACKNOLWEDGEMENT

Authors are grateful to TCET and the Department of Electronics Engineering for giving them the opportunity to prepare this report and presentation during the RBL sessions. They would also like to thank the Head of Department of Electronics Department and their mentor Dr. Archana Belge who gave them pointers on how to go about researching the topic and writing a concise report.

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Implementation of Smart Class using Li-fi

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***Abstract*— As the world becomes more connected and digitized, the need for seamless internet connectivity continues to grow. Over the past few decades, the Internet has been a boon to help the world get work done as quickly as possible. In this conquest of space, Wi-Fi, or radio-wave Internet connectivity, has been at the forefront. But people's enormous demands for unimaginable speed require new technologies to meet the aspirations of new generations. Lifi makes this possibility a reality. Its speeds start at 1 Gbps as opposed to Wi-Fi terminal speeds. There are many examples where Lifi can easily reach 4-5 Gbps bandwidth. Because lifi technology is in the early stages of development, it cannot completely replace existing Internet systems. Instead, we can complement them in an efficient way. As India accelerates its mission to make all educational institutions smart, lifi could be the big driving force behind it. Less resources required to implement in the classroom. In addition, the data transfer speed of transmission is greatly increased. This is great for behind closed doors, so no worries about hacks or interruptions.**

Keywords—wi-fi, radio waves, transmission

I. INTRODUCTION

Li-Fi, or "light fidelity", refers to wireless communication systems using light from light-emitting diodes as a medium instead of traditional radio frequencies, as in technology using the trademark Wi-Fi. Li-Fi is expected to be ten times cheaper than Wi-Fi. Li-Fi has the advantage of being able to be used in electromagnetic sensitive areas such as in aircraft and nuclear power plants without causing interference. The light waves cannot penetrate walls which makes a much shorter range, though more secure from hacking, relative to Wi-Fi. While the US Federal Communications Commission has warned of a potential spectrum crisis because Wi-Fi is close to full capacity, Li-Fi has almost no limitations on capacity.

The visible light spectrum is 10,000 times larger than the entire radio frequency spectrum. Researchers have achieved data transfer rates of 3.5 Gbps and have set a goal of reaching 6 Gbps. By 2018, the Li-Fi market is expected to be worth over $6 billion per year. Potential downsides are low reliability and high installation cost.The visible light spectrum is 10,000 times larger than the entire radio frequency spectrum. Researchers have achieved data transfer rates of 3.5 Gbps and have set a goal of reaching 6 Gbps. By 2018, the Li-Fi market is expected to be worth over $6 billion per year. Potential downsides are low reliability and high installation cost.The general term visible light communication (VLC), includes any use of the visible light portion of the electromagnetic spectrum to transmit information. The term Li-Fi was coined by Harald Haas from the University of Edinburgh in the UK. The D-Light project at Edinburgh's Institute for Digital Communications was funded from January 2010 to January 2012.Haas promoted this technology in his 2011 TED Global talk and helped start a company to market it. Pure VLC is an originalintegration with existing LED lighting systems. In October 2011, business and industry groups formed the Li-Fi Consortium to promote high-speed optical wireless systems and overcome the limited amount of wireless RF spectrum by leveraging a completely different part of the electromagnetic spectrum. Many companies offer one-way VLC products. In 2012,VLC technology was introduced using Li-Fi. As of August 2013, data rates of greater than 1.6 Gbps have been demonstrated for single-color LEDs.A September 2013 press release stated that line-of-sight conditions are not generally required for Li-Fi or VLC systems. In October 2013, it was reported that a Chinese manufacturer was developing a Li-Fi development kit. TheVLC is based on the communication protocol set by the IEEE 802 working group, which defines the Physical Layer (PHY) and Media Access Control (MAC) layers. This standard can provide data rates sufficient for the transmission of audio, video and multimedia services. Consider the mobility of light transmission, compatibility with artificial lighting present in the infrastructure, and possible resistance to interference from ambient lighting. The MAC layer allows communication with other layers such as the TCP/IP protocol.

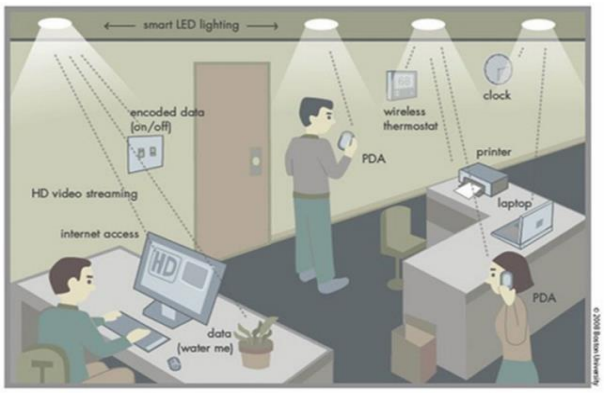

Fig no 1: Basic explanation of li-fi

II. LITERTURE SURVEY

As more and more people and their many devices access the wireless Internet, it will become increasingly difficult to receive a reliable signal due to clogged radio waves. However, radio waves are only one part of the spectrum that can carry data. What if you could surf the web using different waves? A German physicist, DR. Harald Haas came up with a solution called "Transmitting Data Through Light". In other words, it removes the fiber from the fiber by sending data through an LED bulb whose intensity changes faster than the human eye can see.

It's the same concept as an infrared remote control, but much more powerful. Haas says his invention, which he calls the D-Light, can deliver data rates of over 10 megabits per second, faster than a typical broadband connection. He envisions a future where data from laptops, smartphones and tablets is transmitted through the lighting in a room. And security would be as easy as shelling a ship. If you can't see the light, you can't access your data. The Li-Fi is now part of IEEE 802 PAN Visible Light Communications (VLC). 15.7 Standards. Li-Fi is usually implemented using white LED bulbs. These devices are commonly used for lighting by supplying direct current through LEDs. However, fast and subtle changes to the current can change the light output very quickly. Invisible to the human eye, this option is used to transmit high-speed data

III. RESEARCH GAPS

As this technology is relatively new, there are lot of applications that can be implemented and lot areas that can be covered. We aren't developing this technology to completely replace the wifi technology, instead we are doing it in harmony with the radio waves technology. There is a lot of advancement currently going on in this technology and we can look forward to more in the near future. Organizations are looking to implement to cut free from the hassles of massive setups of wired connections and to play safe from the hackers around them. In case of the educational institutes, they can also up the standard of their teaching methodologies and provide their students a seamless and lag free experience in their studies. Work is also going on to make internet hotspots all around the corridors and the premises of the schools, so that the staffs, pupils and others can get access to their files from anywhere around the building and in very short amount of time.

IV. PROBLEM DEFINITION

The world is moving forward in every aspect with a speed greater than before. There is demand for ever increasing speed in every application that is developed and every innovation that has happened. To keep it up with this, data needs to be transferred from one place to another and from one device to other. So, data transfer also needs to happen as quickly as possible. The internet connection which we are using currently using uses radio waves to do this task. But the speed gained from this thing is very limited and cannot fulfill the aspirations of the next generation. To boost this process and to take the internet speed to the next level we need a new and a promising technology. That's where LiFi comes into the picture. It can increase the speed of internet and the subsequently the data transfer would happen at a speed never imagined before. We will look to implement this technology in the educational sector and look to the various applications that can be developed in order to enhance the experience of teaching and learning altogether.

V. PROPOSED METHODOLOGY

We will be implementing this project in an educational nstitute, basically to transform regular classes into smart ones. First, we will have to look at the basic structure of the project which will get installed irrespective of where we are doing it. This flow of working is to be followed for a successful going of the project. The components are also mentioned in the block diagram which are useful and are core part of it.

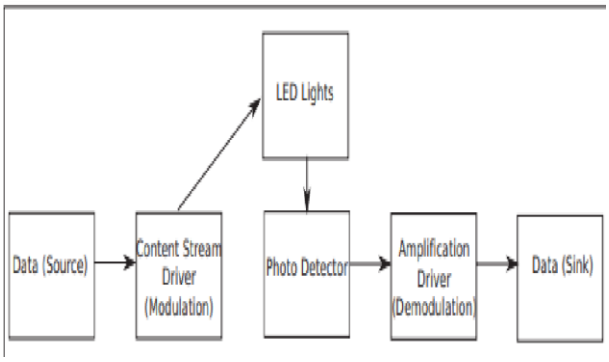

Fig no 2 : Block Diagram

Working:

Lifi uses your existing lighting system and connects it to the grid. There are two main sources for this. One is the transmitting source and the other is the receiving element. The transmit source can be a data-activated LED and the receiver source can be a photodiode that detects light and transmits the data received through the light to a computer connected via a USB cable. The math behind this process is that the receptor recognizes it as a 1 when the light is on and treats it as a 0 otherwise. Generates data for reading or processing. this.

Data to be received from the source can be passed to the board (in the case of a smart class) or viewed by a connected device. Installing multiple LED lamps on the ceiling of the computer room with transmitters to connect students' computers to the Internet will be the technical configuration of our model for the LiFi system.

Basic Implementation:

A lot of things can be developed using this technology and a lot of different stuffs can be done. Professor Harald Haas, when he was first demonstrating this project to the audience, he did so by playing a video on his laptop using the internet which was transmitting data using the visible light. We can send the data and do other works too like sending commands to certain devices which is nothing but we are sending texts to some other stuffs and getting the work done in an effective and shorter period of time. We got started with this short task and hopefully we shall get to our targets as soon as we progress with this technology. Here is the circuit diagram for the same and afterwards we will also do the explanation of the equipment's used.

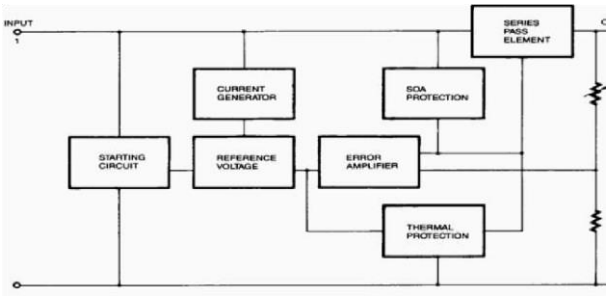

Fig no 3 : Circuit Diagram

Arduino uno: The Arduino Uno is a microcontroller board that uses the ATmega328P microcontroller (datasheet). Includes 14 digital inputs/outputs, 6 analog inputs, 16MHz ceramic resonator, USB connection, power connector, ICSP connector, and reset button. It comes with everything you need to get started with ➢ your microcontroller. Just connect it to your computer with a USB cable or power it with an AC-DC adapter or battery. You can try out the Uno without fear of making mistakes. Worst case you can replace the chip for a few bucks and start over.

The word "uno" means "one" in Italian, and it was chosen to commemorate the launch of Arduino IDE 1.0. The Uno board and Arduino Software (IDE) version 1.0 were the original versions of Arduino, which have since been superseded by newer releases. The Arduino Uno board is the first of a series of USB Arduino boards, and it serves as the platform's standard model; the Arduino index of boards contains a comprehensive list of current, historical, and obsolete boards.

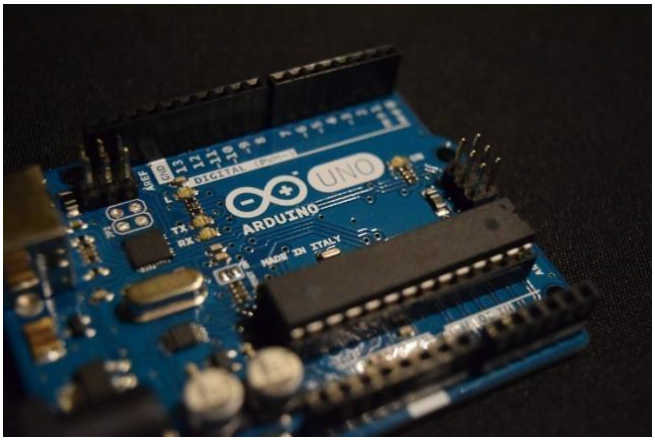

Fig no 4: Arduino uno LCD screen (16*2):

A liquid-crystal display (LCD) is a flat-panel display or other electronically modified optical device that use liquid crystals and polarizers to manipulate light. Liquid crystals do not directly emit light; instead, they use a backlight or reflector to create color or monochrome images. This lcd screen was used to display the message that was sent by flash light of our smart phone.

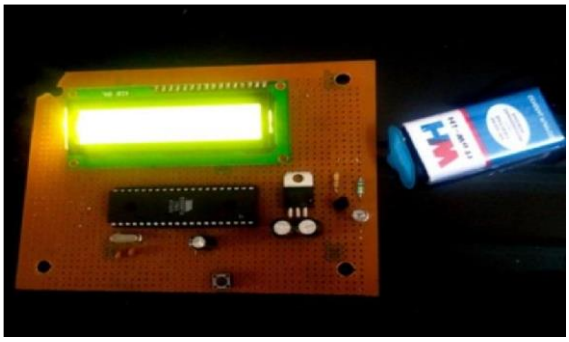

Fig no 5: Lcd screen 16*2

Applications:

Airways: - Whenever we travel by air, we face communication problems. Because all air communication is based on radio waves. To overcome these drawbacks, Li-Fi is being introduced into the wireless path.

Green information technology: -

Green information technology means that unlike radio waves and other communication waves effect on the birds, human body etc. Li-Fi never gives such side effects on any living thing.

In hospitals where mobile phones are not allowed and certain devices may disrupt due to the radio waves. Here LiFi technology will be the best used up technology.

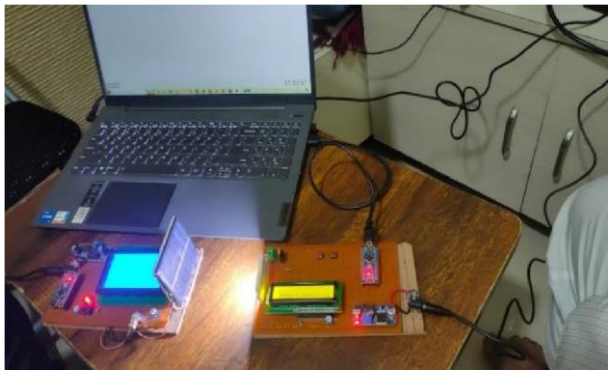

Fig no 6: Actual Implementation till now

VI. CONCLUSION

The project deals with designing a simple and low-cost data communication system using LED, DTMF transmitter and receiver, LCD, ATMEGA-8 microcontroller unit that transmits numeric data and also helps in audio communication. The project module is designed at the preliminary stage that reads numeric data and special characters *, # and makes audio communication possible but it can be enhanced further to read alpha-numeric data as well as to enable video communication using camera or some digital device.

The possibilities are numerous and can be explored further. If this technology can be put into practical use, every bulb can be used something like a Wi-Fi hotspot to transmit wireless data and we will proceed towards the cleaner, greener, safer and brighter future. The concept of Li-Fi is currently attracting a great deal of interest, not least because it may offer a genuine and very efficient alternative to radio-based wireless. As a growing number of people and their many devices access wireless internet, the airwaves are becoming increasingly clogged, making it more and more difficult to get a reliable, high-speed signal. This may solve issues such as the shortage of radio-frequency bandwidth and also allow internet where traditional radio-based wireless isn't allowed such as aircraft or hospitals. One of the shortcomings however is that it only works in direct line of sight.

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Forest Fire Security System using IoT

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***Abstract*—Everyone cognizes that, the forest is raised as one of the most significant and compulsory expedient and Forest fire injunction a permanent danger to bionomical systems and environmental aspects. Forest fire detection had become very important issue in the pre-suppression process which gives rise to the drastic need to perceive forest fires with the greatest speed. The expert usage of wireless networks as a potential explanation for the objective of forest fire has been emphasized in this literature survey. The proposed system depends on various sensors attached to it and the data from the wireless transmission, to fulfil the solution process. The microcontroller in the system dispatches these sensor data to the station on ground where they are scrutinized. The discourse plan impends on the data from Wireless sensor reticulation for the former discovery of Forest fire.**

Keywords—Wireless Sensor Networks, Data Transmission,GPS,SmokeSensor,IOT

I. INTRODUCTION

Forest fires are as old as the forests themselves. when there is no rain for months during summer, the forests become littered with dry leaves and twinges, which could burst into flames initiated by even the slight spark They pose a threat not only to the forest wealth but also to the entire regime to fauna and flora seriously disturbing the bio-diversity and the ecology and environment of a region, also there is a danger for wild life, domestic crops and to the nearest people. So, there is a necessary to avoid the excess of losses due to forest fire by controlling the fire in its early stages. In the present technologies like ruled base image processing and MODIS systems there are many drawbacks like having high false alarm rate where alarm notification may not give a proper and exact notification at emergencies, also response time is quite big as they use robots to extinguish the fire accidents and temporal representation of the affected area. The main drawback is there is no facility of getting direct notifications to the mobile app immediately at the time of fire burst, all these drawbacks may lead to the rapid spread of the forest fire throughout the larger area of the forest leading to major damage and loss. It requires human force in big number which is a risky process. In the proposed system we have used highly sensitive sensors which reduces the false alarm rate by enhanced data collection. The sensors and microcontroller will continuously monitor and sends the data to the database (cloud) as value due to which minimization of the false alarm is achieved also response time is minimized. This system is user friendly as we have introduced mobile application where direct pop-up alert message can be received through the mobile app by more than one device at the same time and also this message can be received being at any corner of the globe which has internet access and linked with our cloud. Cost is affordable and minimized the human efforts. The main aim of our project is detection and monitoring the forest fire and to minimize the effect of fire breakout by controlling in its early stage also to protect wild life and domestic crops by informing about the fire breakout to the respective forest department as early as possible. We have implemented the IOT technology to achieve our objective.

II. LITERATURE SURVEY

Some of the relevant literary works in this field are briefed below: The one-fourth area of Karnataka is covered by forest; the forest and bio-diversity of India are at considerable chance and beneath enormous pressure. The general causes of forest fire are extreme hot and aired weather, lightning, and human carelessness. In order to protect these huge stretches of forest land, there need to be taken early caution measures to control of spreading fire. Usually, it requires massive dependency of man power where due to climate situation, transportation facility and lagging to trace true area will leads to delay in taking actions. Through this look up we have come up with the technology where sensing surrounding can be developed with large vast range of wireless sensor nodes, and Node MCU based IOT empowered fire indicator and observing framework is the answer for this issue [8]. The research work performed by Ahmed Imateaj and T Saikumar and Vinay Dubey describes, “The objective of this work is to design a IOT based system that can detect the fire as early as possible before the fire spread over the large area and to prevent poaching. Our system consists of flame sensor which is used for fire detection, PIR sensor for intruder detection with the help of image processing, if any catastrophic event occurs the system will immediately send the alert message along with picture of the affected region and device location” and T. Saikumar says,

"Implement IOT to monitoring atmospheric CO2 rate using MG811 carbon dioxide sensor and early detection of forest fires using temperature and humidity sensor with Raspberry pi. The main aim of the system is to detect the fire and protect our entire system from fire related calamities." Vinay Dubey says, "According to a survey, approximately 80% losses are accrued in the forest due to the late detection of fire. So to overcome this problem, we use the Internet of things technology. In this paper, early fire detection model has been proposed with the help of the Raspberry Pi microcontroller and required sensors". [11] In this paper Forest fire detection system using IOT, early warning and immediate response to a fire breakout are the only ways to avoid great losses and environmental and cultural heritage damages. Hence, the most important goals in fire surveillance are quick and reliable detection and localization of the fire. It is much easier to suppress a fire when the starting location is known, and while it is in its early stages. Information about the progress of fire is also highly valuable for managing the fire during all its stages. Based on this information. In existing system, they use robots to extinguish the fire accidents but robots have its own advantages and disadvantages. In this system we go for detection and Monitoring of forest fires through several sensors and send to IOT cloud, Continuous monitoring and uploading values to cloud can be achieved.

III. PROPOSED METHODOLOGY

The system comprises of Node MCU Microcontroller. This microcontroller is selected as it has in-built Wi-Fi which makes it suitable for IoT Application. A smoke sensor is used to detect smoke due to fire outbreak. When smoke is detected, the relay is triggered which in turn switches on the pump motor. The location as well as other data is stored to ThingSpeak. An application is designed using modular for monitoring complete system.

A. Block Diagram:

The following Block Diagram explains all the connections of the components so in this figure all components are first connected to NODEMCU like the smoke sensor, Neo6m GPS module, power supply, and relay module which is further connected to the pump motor And ThingSpeak cloud storage is connected to an android app where the information is displayed.

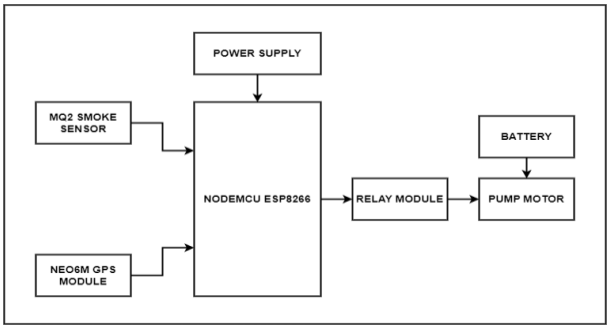

Fig. 1. Block diagram of the System

B. Circuit Diagram

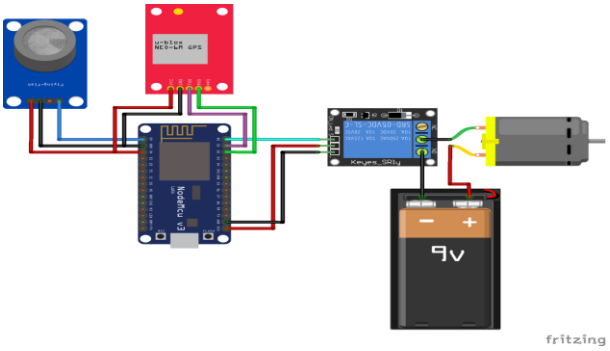

Fig. 2. Circuit Diagram of the System

C. Flow Chart

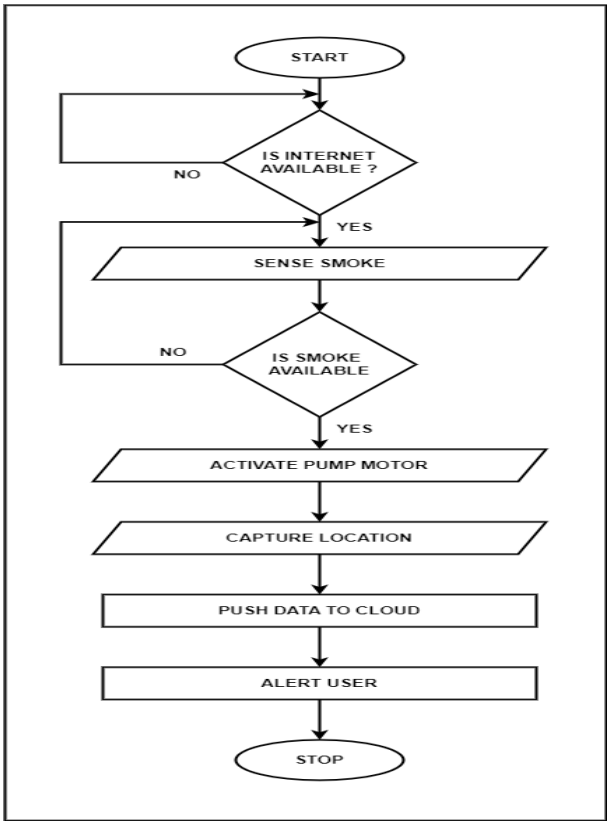

Fig. 3. Flow diagram of working of the System

D. Hardware Components

1. NodeMCU ESP8266: NodeMCU is a low-cost open-source IoT platform. It initially included firmware that runs on the ESP8266 Wi-Fi SoC from Espress if Systems, and hardware which was based on the ESP-12 module. Later, support for the ESP32 32-bit MCU was added.

Fig. 3. NodeMCU ESP8266

2. Neo6M GPS Module: The NEO-6M GPS module is a well-performing complete GPS receiver with a built-in 25 x 25 x 4mm ceramic antenna, which provides a strong satellite search capability. With the power and signal indicators, you can monitor the status of the module. Thanks to the data backup battery, the module can save data when the main power is shut down accidentally. Its 3mm mounting holes can ensure easy assembly on your aircraft, which thus can fly steadily at a fixed position, return to Home automatically, and automatic waypoint flying.

Fig. 4. Neo6M GPS Module

3. Relay: The operating range is between 3.75V to 6V. It consists of 6 pins as shown in the image below.

Fig. 5. Relay

4. Smoke Sensor: The MQ-2 Smoke LPG Butane Hydrogen Gas Sensor Detector Module is useful for gas leakage detection (home and industry). It is suitable for detecting H2, LPG, CH4, CO, Alcohol, Smoke, or Propane. Due to its high sensitivity and fast response time, measurements can be taken as soon as possible.

Fig. 6. MQ-2 Smoke Sensor

5. Pump: A 4V to 6V DC pump through which the water is being pumped to the fire area.

. Fig. 7. Pump

IV. RESULT AND DISCUSSION

In this paper, the prototype module is built by using different components Arduino, GSM Module, Smoke detector, Fire detector Wires, water sprayer and Jumper cords, and bread Board. Figure 2 shows the block diagram with different components. Few tests were done to observe the system's performance. The tests were completed by applying heat figure 2 exhibits the condition after the fire has been put out. The SMS received by the user. The artificial fire is lit at the center point in an enclosed environment (11 × 10 × 10 ft) where the temperature smoke detectors were placed. The signal from the smoke detector is obtained within 45 seconds while it took around 4 minutes and 40 seconds to get the signal from the temperature sensor. This is because the temperature increase takes a significant time while the natural circulation of smoke takes less time. To verify this observation the different intensity of the fire was lit at different location in the enclosed environment. It was observed that the time for the signal from the smoke detectors was clearly dependent (from 20 seconds to 10 minutes) on the location of the fire while the time for the signal from the temperature sensor was of the order of 5 minutes. This justifies the use of both sensors. The signal from either of the sensors was able to trigger the water sprayer as the fire extinguisher.

V. CONCLUSION

This type of system is the first of its kind to ensure no further damage is done to forests when there is a fire breakout and immediately a message is sent to the user through the App. Immediate response or early warning to a fire breakout is mostly the only way to avoid losses and environmental, and cultural heritage damage to a great extent. Therefore, the most important goals in fire surveillance are quick and reliable detection of fire. It is so much easier to suppress fire while it is in its early stages. Information about the progress of the fire is highly valuable for managing fire during all its stages. Based on this information the firefighting staff can be guided on target to block fire before it reaches cultural heritage sites and to suppress it quickly by utilizing required firefighting equipment and vehicles. With further research and innovation, this project can be implemented in various forest areas so that we can save our forests and maintain a great environment.

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Weather Monitoring System Using IoT

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Abstract— Weather monitoring plays an important role in human life, which is why gathering information on the temporal dynamics of climate changes is very important. In any industry, during certain hazards, it is very important to monitor the weather. The basic objective of this article is to develop an integrated system to develop a meteorological monitoring system that allows the monitoring of meteorological parameters in an industry. Such a system contains two sensors such as temperature, gas and humidity that are monitored with an Arduino microcontroller. The data from the sensors is collected and the Arduino sends the data from the sensor to the LABVIEW via serial communication with the help of the WIFI Module. Programs are developed in Embedded C using the Keiluvision4 IDE. C language is used to load programs into the microcontroller.

Keywords— Arduino UNO, Humidity sensor,Temperature Sensor, LABVIEW, Wi-Fi Module

I. INTRODUCTION

Weather conditions need to be monitored to maintain healthy plant growth and safe working environment in industry, etc., cloud storage where they can be analysed even in real time. This means that the measured data can be viewed from anywhere in the world with internet-enabled devices. This can be monitored even in difficult geographical terrain. It can also reduce labour requirements and therefore the risk of visiting inhospitable places. The main motivation tostart this project is the great benefit of wireless weather monitoring in various areas ranging from agricultural growth and development to industrial development. The systems were primarily focused on monitoring the room temperature and humidity status up or down and sending data to a remote server. It is the future technology that connects the entire world in one place.

II. PROBLEM DEFINITION

The expense of a weather monitoring system, which is essential for greater solar plant performance, is prohibitive. The hard drive-based data logging function needs a separate computer configuration for operation, and the data saved is frequently inaccessible.

When it comes to weather, these two 'issues are the most important considerations. We've developed a cost-effective, creative method to monitor the system, and we've come. up with a cost-effective, unique 'approach to supply a weather monitoring system for the average person.

III. REVIEW OF LITERATURE

In the work titled "*A Smart Weather Monitoring System Using Internet of Things*", the authors Chaw et al proposed a system which is an advanced solution for monitoring the weather conditions at a particular place and makes the information visible anywhere in the world. The technology behind this is the Internet of Things (IoT). The system deals with monitoring the environmental conditions like temperature, humidity with respect to its measured time with a microcontroller interfaced with sensors and GSM module to send the information wirelessly to remote server and then plot the sensor data as graphical statistics [1].

In the work titled "*Design and Implementation of Weather Monitoring and Controlling System*", published by the authors P. Sushmita et al Weather monitoring plays an important role in human life, so the collection of information about the temporal dynamics of weather changes is very important. In any industry, during certain hazards, it is very important to monitor the weather. Such a system contains a pair of sensors like temperature, Gas and humidity will be monitored and LPC1768 microcontroller.

The data from the sensors are collected by the microcontroller and sends the sensors data into the LABVIEW by using Serial Communication and this module will keep the data on the excel page & also we can get the SMS on the mobile with the help of GSM module. The system uses compact circuitry built around LPC1768 (ARM9) microcontroller Programs developed in Embedded C using the IDE Keiluvision4. JTAG is used for loading programs into Microcontrollers [2].

In the work titled "*Review on weather prediction using machine learning IJEDR*" published by the author Rubhi Gupta. Comparative analysis of weather forecasting using ML techniques is presented in this research along with

analysis of several machine learning algorithms. First off, there are numerous issues with weather forecast. Even the most straightforward weather forecasts lack precision. The difference between the forecast and the actual temperature is often one to two degrees. Although predictions are made for a longer period, this accuracy of weather prediction is not poor. Additionally, weather predictions can occasionally be even less accurate. Furthermore, weather forecasts in some regions with inconsistent climatic conditions are even more inaccurate. For evaluating more accurate output, machine learning algorithms and numerous classifiers, such as Naive Bayes Bernoulli, Logistic Regression, Gaussian, and support vector machines, are used [6].

IV. Proposed Design

The fundamental components of an IoT device are Control Unit, Power Supply, Input Devices, Output Devices, and Internet Mechanism etc. The weather monitoring model has got almost all things automated so that it gets an advantage of the real time direct measurement of the parameters through GSM. Maintaining backup of sent data is easy and can be done within a few seconds. The proposed weather monitoring model uses a DHT11, GSM module (SIM900A), and an Arduino Uno. The data is stored inside a database with a timestamp. That data can be seen in visualization by the help of html, JavaScript, and PHP language. The data updated from the implemented system can be accessible on the internet from anywhere in the world.

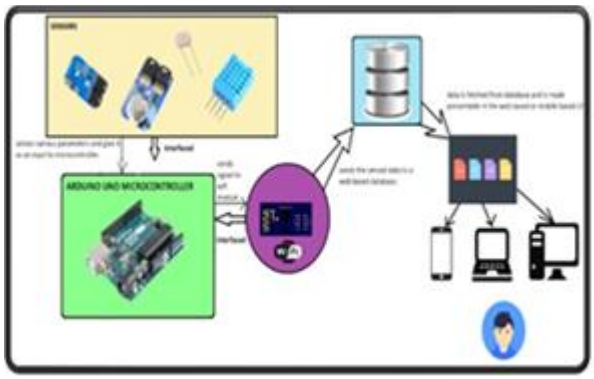

Figure 1. Proposed Methodology

A. Arduino Uno

Arduino UNO is a widely used open-source microcontroller board based on the ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with digital and analog input / output (I / O) pin sets that can be connected to various extension boards (shields) and another circuitry. The board has 14 digital pins and 6 analog pins. It is programmable with the Arduino IDE (Integrated Development Environment) via a Type B USB cable. It can be powered by a USB cable or a 9-volt external battery, although it accepts voltages between 7 and 20 volts. You have the Atmega16U2 programmed as a USB serial converter (Atmega8U2 to version R2). The Arduino UNO is widely regarded as the most popular and user-friendly board or the Arduino board series [1].

B. LM 35

LM35 is a temperature sensor that outputs an analog signal which is proportional to the instantaneous temperature. The output voltage can easily be interpreted to obtain a temperature reading in Celsius. The advantage of lm35 over thermistor is it does not require any external calibration. The coating also protects it from self-heating. Low cost (approximately $0.95) and greater accuracy make it popular among hobbyists, DIY circuit makers, and students. Many low-end products take advantage of low cost, greater accuracy and used LM35 in their products. Its approximately 15+ years to its first release but the sensor is still surviving and is used in any products [7].

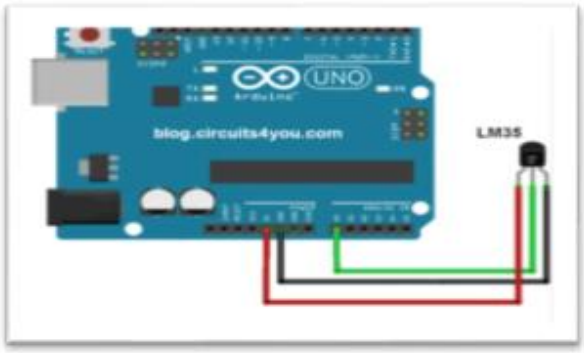

Figure 1. LM35 with Arduino

C. DHT 11

The DHT 11 is another commonly used Temperature and humidity sensor. The sensor comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data. The sensor is also factory calibrated and hence easy to interface with other microcontrollers. The sensor can measure temperature from 0°C to 50°C and humidity from 20% to 90% with an accuracy of ±1°C and ±1%. So, if we are looking to measure in this range then this sensor might be the right choice [1].

D. BMP180

BMP180 is one of the sensors of BMP XXX series. They are all designed to measure Barometric Pressure or Atmospheric pressure. BMP180 is a high precision sensor designed for consumer applications. BarometricPressure is nothing, but the weight of air applied on everything. The air has weight and wherever there is air its pressure is felt. BMP180 sensor senses that pressure and provides that information in digital output. Also, the temperature affects the pressure and so we need temperature compensated pressure reading. To compensate, the BM180 also has a good temperature sensor [1].

BMP180 MODULE Features

i. Can measure temperature and altitude.
ii. Pressure range: 300 to 1100hPa
iii. High relative accuracy of ±0.12hPa
iv. Can work on low voltages.
v. 3.4Mhz I2C interface
vi. Low power consumption (3uA)
vii. Pressure conversion time: 5msec
viii. Potable size

E. Rain Sensor

Rain sensors are used in the detection of water beyond what a humidity sensor can detect.

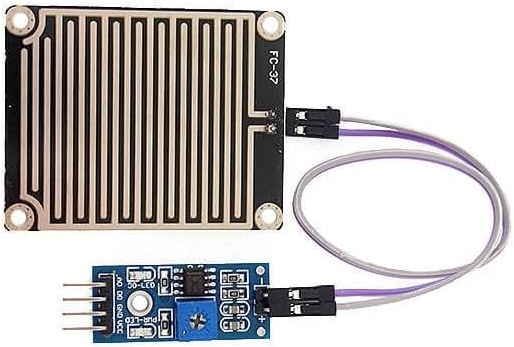

Figure 2. Rain Sensor

The rain sensor detects water that completes the circuits on its sensor boards' printed leads. The sensor board acts as a variable resistor that will change from 100k ohms when wet to 2M ohms when dry. In short, the wetter the board the more current that will be conducted.

F. WiFi Module

ESP8266 is Wi-Fi enabled system on chip (SoC) module developed by Espressif system. It is mostly used for the development of the Internet of Things (IoT) embedded applications. The ESP8266 is a low-cost Wi-Fi microchip with full TCP/IP stack. The ESP8266 is capable of either hosting an application or offloading all the Wi-Fi networking functions from another application processor. Each ESP8266 Wi-Fi module comes pre-programmed with an AT command set firmware, now you can simply hook this up to your Arduino device and get as much Wi-Fi ability as a Wi-Fi Shield offers. The ESP8266 module is an extremely cost-effective board with a huge, and fastest ever growing, community [1].

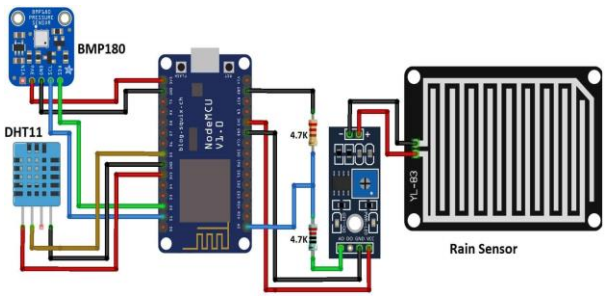

Figure 3. Circuit Diagram

SYSTEM SOFTWARE

After the model was developed, the Arduino passes on the signals to the computer system in the form of binary signals where live temperature readings and other factors were displayed on the webpage. The data displayed on the webpage can be used in taking timely actions according to the weather conditions.

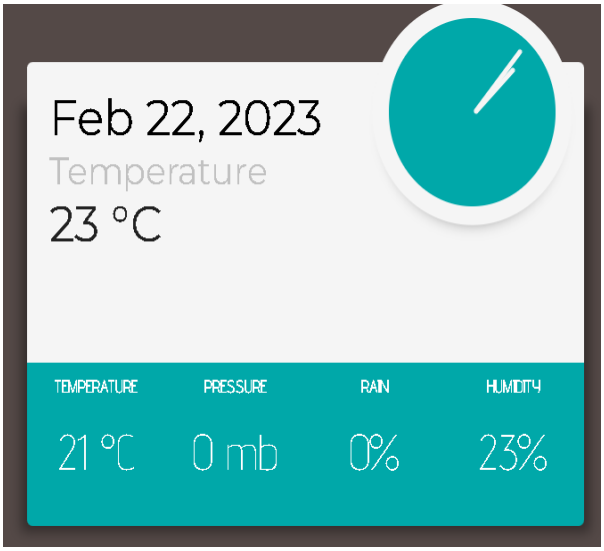

Figure 4. Web Server

RESULT & DISCUSSIONS

The environmental monitoring data sensors automatically monitor the temperature, humidity, Accelerometer and other gas concentrations. It can realize the remote access of sensor monitoring data and download of the environmental monitoring data to the client according to requests. In this project, we have to acquire all the environmental parameters like temperature, humidity, gas and accelerometer sensors and measure these sensor values using Arduino UNO. Here in the above figure, we use Multi sensor Board for placing the sensors, and accelerometer sensor for checking the earthquake condition.

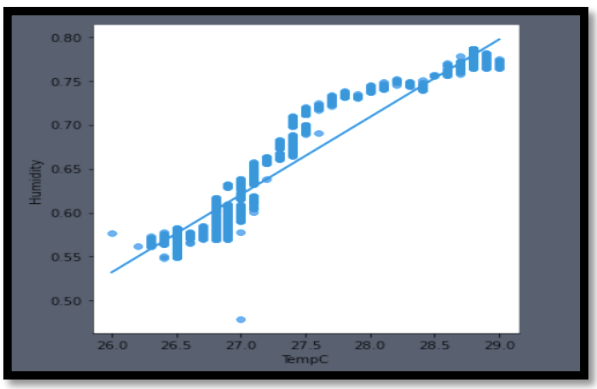

Figure 5. Temp Vs Humidity

CONCLUSION

This paper exhibits Design and Implementation of Weather Monitoring System utilized for controlling the gadgets just as observing the ecological boundaries. Installed controlled sensor networks have shown themselves to be a solid arrangement in giving controllers and detecting ecological observing frameworks. The sensors have been coordinated with the framework to screen and figure the degree of presence of Accelerometer, gas, temperature, and mugginess in the environment utilizing data and correspondence advancements. The sensors can transfer the information in Lab see utilizing sequential Correspondence

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A Review on Physical Unclonable Function for IoT Devices

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***Abstract*–In Recent years, there has been an increase in the use of IoT devices due to their importance in home automation, designing of smart cities, upgrading supply chain and improving healthcare, etc., which has given rise to security concerns. To address security concerns, we can implement a PUF-based authentication system that uses the inbuilt components of IoT devices to generate private key for said device at server side. PUF (Physical Unclonable Function) is a security primitive that uses inherent instance-specific measurements of physical objects to generate digital fingerprint. Many researchers are researching on PUF to fully implement PUF for identification and authorization of an electronic devices. It has the potential to become a next-generation technology for authentication and security purposes. PUF offers several advantages over traditional authentication mechanisms, such as unique and unpredictable authentication codes, high levels of security, low power consumption, and cost-effectiveness. There are many applications of PUF based authentication system in Military, Finance, Healthcare, etc. However, like any emerging technology, there are still some challenges and limitations to overcome before PUFs can become mainstream. For example, there are concerns about the reliability and stability of PUFs over time, and the need for standardization and interoperability between different PUF implementations.**

Keywords–Physical Unclonable Function, IoT Security, Hardware Security, authentication

I. INTRODUCTION

Internet of Things (IoT) is a system of interconnected network of various type of computing devices that is able to transfer data without requiring between computer-to-computer interaction or human-to-computer interaction. An IoT ecosystem consist of web enabled smart devices that uses embedded system that can collect, send and act on data they acquire from environment. Since IoT devices send data across internet there is chance that data can be read by unauthorized user or device could be hacked. To address security concerns, we can implement low-cost lightweight solution such as PUF to IoT devices.[1] Edge devices are devices that provide entry point into major network. In IoT, Edge Devices is used to collect and process data. Examples of Edge devices in IoT are sensors, actuators, and IoT gateways.

Modern Cryptography uses multi key authentication which requires authenticating devices to store public key. Edge Devices have low memory capacity so, they cannot store cryptography private key. Physically Unclonable Functions (PUFs) are cryptographic primitives used to implement low-cost device authentication and secure secret key generation. It is a physical object that for a given input and conditions (challenge), provides a physically defined "digital fingerprint" output (response) that serves as a unique identifier, most often for a semiconductor device such as a microprocessor. PUFs are most often based on unique physical variations which occur naturally during semiconductor manufacturing. A PUF is a physical entity embodied in a physical structure. We can use PUF as it does not store private key and it uses nano scale variation caused during manufacturing of the components. Main Characteristics of PUF is responses received from different devices should be Unique or major difference in response among difference devices, responses received from same devices should be reliable or difference should be smaller response difference irrespective of temperature, noise or other factors and unpredictability of a response.

Table 1: Difference between Weak PUF and Strong PUF

Weak PUF	Strong PUF
Small number of Challenge Response Pair(CRP)	Large number of Challenge Response Pair(CRP)
CRP is linearly related to number of components whose behavior depends on manufacturing variation	ideally, CRP is expontenial related to number of bits
Secret Key Generation	IC Identification and Secret Key Generation
Susceptible to invasive attack	Not susceptible to any attack
Eg. Arbiter PUF	Eg. SRAM PUF

II. LITERATURE SURVEY

Herder, C. et al,[2] gives basic overview and lays foundation for starting research in PUF related application. This paper discusses about key generation using PUF, classification and implementation of PUF.

Shamsoshoara, A. et al,[3] discusses about PUFs roles in IoT sector and also reviews attack and security challenges faced in emerging IoT networks. It also presents Proof of concept for PUF-based solution for secret key generation using resistive random-access memories (ReRAM) embedded in IoTs.

McGarth, T. et al,[4] discusses about different PUF family, classification and architecture and their example such as Optical PUF, Magnetic PUF, etc.

Gebali, F. et al,[5] discusses statistical model of five most common type of PUF and it identifies main parameter that defines the performance. It also reviews some of the recent algorithm that can be used to provide authentication and key generation without the need for helper data or secure sketch algorithm.

Al-Meer, A. et al, [6] reviews the possibility of using PUF in IoT networks and devices. It evaluates some of the PUFs architecture and also discusses possibilities of implementation of PUF.

Silvério, T. et al, [7] implemented an optical PUF for mobile based 2 Factor authentication. In this paper they implemented Optical PUF using PUF j

Lee, J. et al,[8] implements PUF based 3 Factor authentication protocol in IoT environment. PUFTAP can be used in IoT environment to provide three factor authentication to sensing devices. It uses PUF technologies to withstand device capture attack.

Asif, R. et al,[9] proposes PUF using blockchain technologies. Proposed Technologies uses emerging concept of Blockchain that integrates hardware security primitives via PUFs to solve bandwidth, integration, scalability, latency, and energy requirements for the Internet-of-Energy (IoE) systems.

Idriss, T. et al,[10] proposes lightweight PUF based solutions for authentication using secret pattern recognition. It also discusses few of the security attack on Lightweight PUF solution.

Vaidya, G. et al,[11] proposes that we can create a novel device identifier based on Digital Fingerprint which we can obtain using PUF. They experimentally implemented PUF on live deployment of 50 devices for over a month. They used clock frequency as input for a challenge to assign unique id to PUF.

Fukushima, K. et al,[12] proposes that we can assign unique id to IoT devices using inbuilt sensors of the said devices. In paper they implemented Sensor based PUF on smartwatch using inbuilt sensor such as accelerometer and gyroscope.

III. TYPE OF PUF ARCHITECTURE

A. Magnetic PUF

Magnets are traditional used as Anti-Counterfeiting measures in Banknotes, coins, debit card and credit card. Magnetic PUF is created using magnetic arrangement in electronic devices. It is used to designed for creating distinctive magnetic swipe card. The magnetic media is created during the manufacturing process by depositing a mixed ferromagnetic material onto a receptor layer in the card. The ferromagnetic atoms are of random distribution.

Due to manufacturing variance, size, shape, and land randomly on the receptor layer. A magnetic strip card's random ferromagnetic particle arrangement can be used to differentiate one card from another and confirm its legitimacy when compared to a database. Here, the position along the magnetic strip would be the problem, and the solution would be the precise magnetic field strength.

B. Delay PUF

The PUF which uses random variation of delay in wires and gates are known as Delay PUF. Delay PUF belongs to Silicon PUF classification. Example of Delay PUF is Ring Oscillator PUF and Arbiter PUF. It is based on the inherent variations in the manufacturing process of integrated circuits, which result in unique and difficult-to-predict delays in the circuits. These delays can be measured and used as a signature for a device, much like a fingerprint. Delay PUFs are often used in embedded systems and IoT devices to provide secure authentication and protect against counterfeiting and cloning. They can also be used to securely store encryption keys and other sensitive information. One advantage of delay PUFs is that they do not require any external storage for the signature, which makes them very small and lightweight. They are also considered to be very secure, as the delays are difficult to predict or duplicate, even with access to the underlying hardware.

C. Optical PUF

The Family of PUFs which uses emitted light as mean of evaluation for implicit randomness in an object is known as Optical PUF. Example of Optical PUFs are Paper PUF and CD PUF. In CD PUF, evaluation is done on the basis of LASER. It was designed for Compact Disk verification. In Paper PUF, directed light is used for evaluation. It is mostly used in banknotes.

D. SRAM PUF

An SRAM PUF is based on the behaviour of standard SRAM memory. SRAM PUF uses SRAM memory to differentiate between different devices such as microcontroller. Every time the SRAM is powered, each SRAM cell has a unique preferred state that results from a range of threshold voltage variations. The startup settings of "uninitialized" SRAM memory reflect this

randomness. An SRAM reaction hence produces a distinctive and random sequence of 0s and 1s. Due to its exclusivity to a specific SRAM and thus a specific chip, this pattern is comparable to a chip's fingerprint.

E. DRAM PUF

A PUF which uses DRAM's behaviour for random variation evaluation of a devices is known as DRAM PUF. Standard DRAM cell work where capacitor act as a stored charge as a binary state and transistor act as flow of charge to and from capacitor. In DRAM cell charge on capacitor tends to lose over time which can cause change of state due to transistor subthreshold leakage. To counter this, all DRAM cell periodically performs refresh commands which reassert charge to "refresh" the storage capacitor. A DRAM PUF, on the other hand, works by pausing this refresh for a longer-than-usual specified interval of time and seeing how the cells have changed state due to leakage.

F. Sensor based PUF

Sensor-based Physically Unclonable Functions (PUFs) are a type of security technology used to create unique and unpredictable identifiers for integrated circuits and other devices. They work by harnessing the inherent variability and randomness in physical systems to create a unique "fingerprint" that can be used for authentication or identification purposes.

Sensor-based PUFs use physical sensors, such as accelerometers, temperature sensors, or pressure sensors, to measure and capture the variability of a system. This variability can then be used to generate a unique identifier that can be stored and used for authentication purposes.

One of the main advantages of sensor-based PUFs is their low cost and ease of implementation. They can be integrated into a wide range of devices, from smartphones and laptops to Internet of Things (IoT) devices and secure microcontrollers.

Another advantage of sensor-based PUFs is their resistance to cloning and counterfeiting, as the variability in the physical systems they use cannot be easily replicated or predicted. This makes them useful for a wide range of security applications, including device authentication, secure booting, and secure communication.

G. AI based PUF

Artificial Intelligence (AI)-based Physically Unclonable Functions (PUFs) are a type of security technology that use machine learning algorithms to generate unique and unpredictable identifiers for integrated circuits and other devices.

In an AI-based PUF system, the device undergoes a training phase, during which it is subjected to a set of known stimuli and the resulting outputs are recorded and used to train a machine learning algorithm. Once trained, the algorithm can be used to generate a unique and unpredictable identifier for the device based on its physical characteristics and behaviour.

One advantage of AI-based PUFs is their resistance to cloning and counterfeiting, as the identifier is based on the physical characteristics of the device and is not easily predictable or replicable. They can also be more flexible than traditional sensor-based PUFs, as the machine learning algorithm can be adapted and improved over time to better capture the variability of the system.

Another advantage of AI-based PUFs is their ability to generate more robust and secure identifiers, as the machine learning algorithms can take into account a wide range of physical characteristics and behaviours, making it more difficult for attackers to manipulate or spoof the identifier.

IV. FUTURE SCOPE

PUFs offer a promising and cost-effective security solution for IoT devices. Therefore, PUF based authentication systems present numerous advantages over other security tools and technologies used in IoT devices. Since PUFs rely on physical properties of devices, they can provide robust security even as computing power and encryption-breaking techniques advance.

One critical challenge is to improve the scalability and robustness of PUFs, so they can be used in a variety of applications and devices. Additionally, cost remains a significant barrier to the widespread adoption of PUFs, which requires cost-effective and reliable manufacturing processes.

Thus, addressing the challenges facing PUF-based authentication systems is essential to maximize their benefits for securing IoT devices. The scalability, robustness, and cost-effectiveness of PUFs must be improved to realize their potential for providing a secure and cost-effective hardware-based security solution.

Despite the obstacles faced by PUF-based authentication systems, their future prospects are promising as the number of connected devices continues to grow, making them more vulnerable to cyber-attacks. As devices carries information critical to various factors. Hardware-based security solutions, such as PUFs, are likely to be in higher demand in the future as they offer a robust defence against cybercrimes. Consequently, PUFs are expected to play an increasingly important role in securing the digital world in the years ahead.

V. POTENTIAL APPLICATIONS

Current application on PUF in real life is:

Low-cost authentication: PUF utilizes inherit nature of hardware to generate unique and random digital fingerprint of electronic devices. Output of PUF response can be used for key generation.

Information security: PUFs can be used as a secure authentication mechanism in embedded systems, IoT devices, and cryptographic systems, providing protection against counterfeiting, cloning, and hacking.

Intellectual property protection: PUFs can be used to ensure the authenticity and integrity of electronic products, such as integrated circuits, and to prevent unauthorized copying or reverse engineering.

Cloud security: PUFs can be used to securely store encryption keys and other sensitive information in cloud computing systems, providing protection against data breaches and unauthorized access.

Medical devices: PUFs can be used to secure the communication and control of medical devices, such as pacemakers, insulin pumps, and implantable cardioverter defibrillators.

Automotive: PUFs can be used for secure communication and control in automotive systems, such as vehicle-to-vehicle communication, remote diagnostics, and theft prevention.

Software Licensing: Queen's University Belfast demonstrated implementation of DRAM PUF for software Licensing.[13]

VI. CONCLUSION

This paper reviews Physical Unclonable Functions as a way to solve security challenges faced at edge devices in IoT Networks. Physical Unclonable Functions (PUFs) is a security primitive that produce unclonable and inherent instance-specific measurements of physical objects. There are variety of PUF architecture with each having its own merits and demerits. PUF is used to generate unique number specific to that device which can later be used in secret key generation which can help in IoT device authentication and assign unique Id to that IoT devices. Biggest challenges in implementation of PUF is they are sensitive to environmental variations such as temperature, Electromagnetic interference, supply voltage, etc which can really affect PUF's performance. Other than environmental variation there are many challenges such as error correction. Solving limitations of PUF can allow it to be implemented for authentication system, cloud security, IoT based Medical Devices, etc.

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Health Monitoring and Tracking System Based On IoT

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***Abstract*— The Internet of Things (IoT), which has recently emerged, connects all objects and has been dubbed the next technological revolution. Smart parking, smart homes, smart cities, smart environments, industrial settings, agricultural fields, and health monitoring processes are a few examples of IoT applications. IoT makes medical equipment more efficient by allowing real-time monitoring of patient health, in which sensors acquire patient data and reduce human error. One such application is in healthcare to monitor the patient health status IoT makes medical equipment more efficient by allowing real-time monitoring of patient health, in which sensors acquire data of patients and reduce human error. There might be many patients whose physical conditions have to be monitored periodically as a part of diagnostic procedures, which is why it becomes essential to find a cost-effective and fast-responding mechanism. Implementing such a mechanism can help to inform the hospitals in case of any emergencies regarding their patients. Also, the data from different sensors will be sent to the doctors/caretakers. This paper discusses, building a mechanism using NodeMCU and various other sensors for data collection and then transferring the data to the hospitals.**

Keywords*— *Node MCU, GMS and GSM, IOT, pulse sensors, temperature sensors, tracking.

I. INTRODUCTION

Extensive growth of the 'Internet of Things' is changing the world rapidly and low price of typical IOT components improves the scope to innovate new designs, mechanisms at low cost and make products at home. IOT is being used in many smart projects, making smart homes and cities. Similarly, patient monitoring systems can be made smart using IOT. Specialized sensors used for monitoring patients' heart rate, temperature, breathing rate, etc can be used in the smart monitoring system.

IoT has been making objects internally connected in the recent decade and has been considered the next technological revolution. IoT is extensively used in Healthcare sector, thus providing health and environment condition tracking facilities.In IoT, computers are linked to to the internet utilizing sensors and networks, and these components are used on devices for monitoring health status.

Two of the most significant indicators of human health are heart rate and body temperature. The number of times heart beats in a minute is called heartbeat, or pulse rate. The increase in the blood flow volume is used by calculating the pulses, for measuring the pulse rate. Normal heart rate ranges between 50 and 100 beats per minute for healthy people[1].

GPS and GSM are generally used in the manufacturing of tracking devices to enhance the privacy of patients. Previously, researchers focused on RFID technology only but now GPS modules are widely used in tracking because of real time navigation even though it takes some time to establish the connection. The free accessibility of GPS technology has boosted the mass research and production of GPS tracking devices. And also using GPS or RFID technology helps the patients enjoy the independence as well as safety at the same time.

II. REVIEW OF LITERATURE

A. Real-Time Healthcare Monitoring And Tracking System.

This system's goal is to cover an end-to-end smart health application which can be build using two functional building blocks, in which, the function of the first building block is to gather all sensory data that are related to the monitored persons, and the second block stores, processes and presents the resulted information of this stage to the doctors and nursery staff that are following the case of the particular monitored person[2].

The components which are used in this system are: NodeMCU, heart beat sensor, body temperature sensor(LM35), room temperature sensor(DHT11), CO sensor(MQ-9) and Co2 sensor(MQ-135).

In this system, when the patient's heartbeat rate changes badly, the Arduino first has recorded the pulse and temperature readings, and then instructs GSM shield to send an SMS message containing these readings, patient ID and his/her location, with the help of GPS shield, to his doctor's mobile phone, who then sends an ambulance to the patient's location.

B. A Review on IoT Based Smart Healthcare Monitoring System for ICU Patients

This paper focuses on introducing a system that monitors the basic important signs of patients like heart rate, body temperature, blood pressure and some measures of hospital room's condition such as room humidity, temperature. Authentic medical staff can view and track the data in real-time even though the patients perform the tests outside of the hospital. The system can also benefit nurses and doctors in situations of epidemics or crises as raw medical data can be analyzed in a short time. The developed prototype is very simple to design and use. The system can be very useful in the case of infectious disease like a novel coronavirus (COVID-19) treatment. The developed system will help improve the current healthcare system that may protect lots of lives from death[3].

C. Smart Real-Time Healthcare Monitoring and Tracking System using GSM/GPS Technologies

The system model that is presented and discussed in this paper, can measure heartbeat rate and body temperature and communicate them in cases of extraordinary behaviors to supervision medical entities using GSM, GPS and web technologies to provocate immediate actions to rescue patient's life with potentiality in the future to add other vital factors measurements according to available sensor in the market which can achieve the objective of providing a reliable effective application for real-time health monitoring and tracking[4].

D. Utilization and Impacts of GPS Tracking in Healthcare: A Research Study for Elderly Care

This paper mainly focuses on how can elderly people can feel independent and it becomes easier for them to perform daily routine tasks with the help of tracking devices. However, these devices took a long time to establish a GPS connection. There were some important suggestions given by the elderly users; the device size needs to be smaller to help them in handling. It must be foolproof and needs to be good enough for long-distance travelers. The device must work inside buildings and that can be possible by embedding A-GPS (Assisted-GPS) hardware. Moreover, all the history of each elderly must be maintained in an electronic patient record system[5].

III. METHODOLOGY

Proposed Methodology

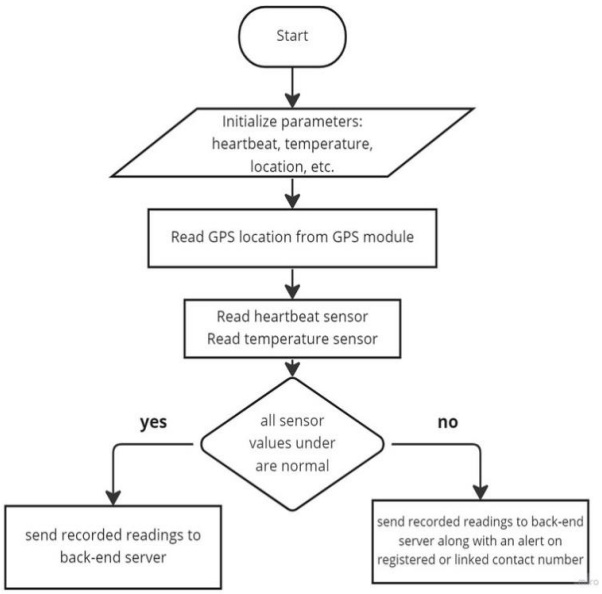

Fig1. Flowchart of proposed methodology

The above flowchart represents the proposed methodology for this health monitoring system. The proposed working of the system is, as we turn on the system i.e. as the device is in use it will first initialize all its components and will start recording the parameters. The parameters include heart-rate, body temperature and geographic location of the user (location of the device). The system will keep recording the values coming from the sensors connected and also will keep them stored on the backend server. The recording and storing process will continue as long as the parameters are meeting normal condition level. If any fluctuations are observed in the readings the system will send an alert on the registered or linked phone number about the change in readings along with the location so that the required medical help can reach the user[6].

3.1 Major hardware components

Some sort of hardware component is being used in the proposed system. The components which are used to develop the system are outlined as follows.

a. NodeMCU: NodeMCU is a low-cost open-source IoT platform. It initially included firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems and hardware which was based on the ESP-12 module. Later, support for the ESP32 32-bit MCU was added. The name "NodeMCU" combines "node" and "MCU" (micro-controller unit). The NodeMCU is shown in Fig. 2a.

b. Pulse sensor: A pulse wave is a change in the volume of a blood vessel that occurs when the heart pumps blood, and a detector that monitors this volume change is called a pulse sensor. It is used to incorporate live heart-rate data in IoT projects. The pulse sensor is depicted in Fig. 2b.

c. Body temperature sensor(LM35): The LM35 series are precisely advanced temperature circuits with yield voltage, which is straightly compared with the temperature in centigrade. The LM35 has a vantage point over Kelvin's direct temperature sensors, as a reasonable centigrade scaling doesn't permit the purchaser to erase the colossal steady voltage from the presentation.LM35 is shown in Fig. 2c.

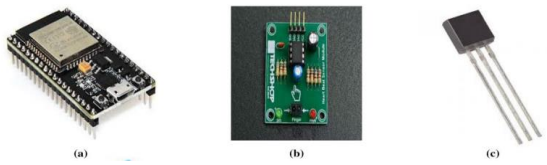

Fig2. Hardware Components, a NodeMCU b.Pulse Sensor c LM35

IV. ARCHITECTURE AND IMPLEMENTATION

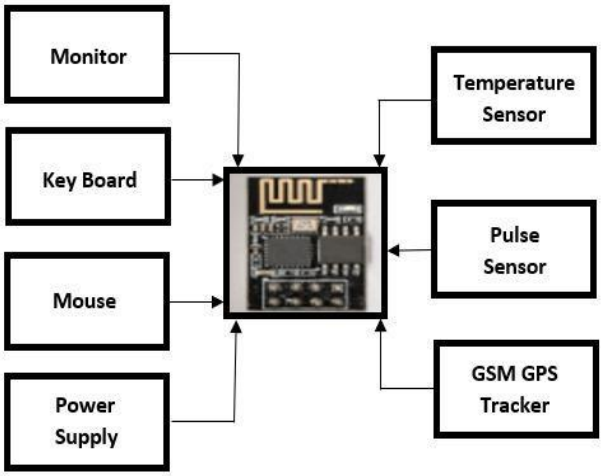

Fig3. Block Diagram of proposed system

The proposed methodology shows a patient monitoring and tracking system planned to design using NodeMCU, and various sensors for monitoring pulse, temperature, and GSM GPS tracker for location tracking.

The NodeMCU will be used as the main unit for doing all the tasks. The sensors will be connected to it to perform their specific tasks. The NodeMCU will receive signals from these sensors and transmit them to the monitoring screen or can be monitored anywhere in the world using internet sources.

The GSM GPS tracker will be used to track the location of the patients in case any fluctuations are observed or if the patient moves out of the permitted area, and a message will be sent to the family as well as the professional caregiver to ensure the safety of the patient.

The collected data will be sent to the ThingSpeak platform for visualization and analysis.

V. RESULT

This project is aimed at developing a device that will monitor a patient's health status as well as can track their location. Various sensors and a GPS tracker will be used. Node MCU and IOT will be used for the development of the device. The data is collected by the sensors, but that data will only make sense if it has been observed and analyzed properly. For accessing the data, an open source software is used named ThingSpeak, this software is written in Ruby which allows users to communicate with internet-enabled devices[7]. All the data collected from the sensors get directly stored in the ThingSpeak cloud. So, doctors can easily access the data of the patients, which in turn results in better treatment. Critical situations can be easily handled using this continuous observation. Also, the use of GSM and GPS satellite technology in the health monitoring system of the patient can be proved to be helpful for family members as well as hospitals. This device is non-invasive and designed in such a way that patients can use them easily.

VI. CONCLUSION

The system introduced in this project focuses mainly on monitoring the basic important signs of patients like pulse, temperature, etc. The research for the development of the project has been successfully completed under Research Based Learning (RBL). The system is being developed using Node MCU and IoT, a combination that has high future scope in the healthcare field.

The developed system will improve the current healthcare system that may protect lots of lives from death. Although the system looks somewhat bulky, it will be a tiny device with proper manufacturing in the near future. New features can be added to the system in future as per requirements like adding more sensors for monitoring different health conditions, including an alarm button which can be pressed by the patient in times of emergency. The future of this project depends on the future developments in the field of wireless communication to enable the patient's mobility boundless.

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IoT based Patient Health Monitoring System

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***Abstract*— Technology is playing a leading role in the medical field, from touch devices to telecommunications and records. It is very important to observe various medical parameters and days after surgery. Therefore, IoT, the most recent development in medical communication methodology, has been adopted. IoT is a catalyst for healthcare and plays a key role in many applications. The IoT project developed here is based on the Arduino UNO. Paired with ESP8266 Wi-Fi modem to connect to internet router and access cloud servers. The Arduino communicates with the LM-35 temperature sensor to measure the body temperature and the pulse sensor to read the pulse rate. Heart rate and body temperature are continuously monitored and updated to the IoT platform. If an abnormality is detected, the system immediately sends a notification to the doctor. The IoT platform used in this project is ThingSpeak. Thingspeak has the ability to visualize the collected data in the form of charts, to create collaborative applications with web services or social networks and other APIs. Therefore, the IoT-based patient health monitoring system effectively uses the Internet to monitor the patient's health status and save lives in a timely manner. For this reason, rapid conditional treatment can be performed simply with this technique. The system is easy to set up and offers high performance and response time.**

Keywords—Embedded system, IoT, Patient monitoring system, Thingspeak

I. INTRODUCTION

Today, the Internet has become one of the important components of our daily life. Modified to fit the methodology in which people live, work, play and learn.

The Internet serves as a tool for many purposes, including education, finance, business, industry, leisure, social media, and shopping. The new internet megatrend of the future (www.netpublikationer.dk) is IoT. With the help of IoT, visualization of the world can be realized where multiple entities perceive, communicate and communicate via private network protocols or public networks.

As the devices go online, they are enabling better lifestyles, creating safer and more active communities, and revolutionizing health care. In countries with low to moderate economic growth, a growing number of people suffer from chronic diseases due to a wide variety of risk factors, such as malnutrition and physical inactivity. According to the WHO, snuff causes 4.9 million deaths from carcinoma, 2.6 million from being overweight, 4.4 million from high cholesterol, and 7 deaths. 1 million for hypertension [1]. Chronic diseases vary greatly in symptoms, development, and treatment. Some of them end the patient's life if not controlled and treated early. For many years, standard indicators of glucose levels, blood pressure and heart rate have been calculated in specialized medical centers. Thanks to technological developments, there are various operational sensors that provide vital indicators such as blood pressure monitors, glucometers and heart rate monitors along with electrocardiograms, allowing patients to measure their vital signs every day.

Daily readings can be sent to doctors to suggest medications and exercise regimens that can improve quality of life and defeat such ailments. Applied to patient care and monitoring, the Internet of Things is becoming more and more prevalent in the medical field to improve people's living standards. Arduino is a programmable device that can sense and interact with its environment. Combining the Internet of Things with Arduino is a new approach to bringing IoT into patient health monitoring systems. The entire concept of IoT is based on sensors, gateways and wireless networks that enable users to communicate and access information.

IoT offers more guarantees in the field of health awareness. As the saying goes “Health is wealth”, shaping the use of innovation to improve well-being is of exponential importance [4]. The Arduino Uno collects information from the sensors and sends it to an IoT website.

II. BACKGROUND OVERVIEW

A. EXISTING SYSTEM

Systems used for health monitoring are stationary monitoring systems that can only detect when a patient is in the hospital or in bed. Currently available systems are vast and can only be used in hospitals in intensive care units [5]. Currently, ZigBee can be used to relay information about patients to relatives or interested

doctors.

Fig.1. Existing System

B. DRAWBACKS

In the current system, patients must be admitted to the hospital for regular follow-up. After discharge, it is impossible. This system cannot be used at home. The existing system was used only for short-range communication for data transmission by measuring the patient's health indicators and transmitting them through ZigBee and Bluetooth protocols.Doctors may not always be able to obtain this data.

III. PROPOSED SYSTEM

The main purpose of this system is to monitor patients' health in a timely manner and update information at any time for doctors in remote locations. This powerful device allows continuous monitoring of critically ill patients. It can be used to track the health of older people with frequent heart or blood pressure problems. Simplify patient monitoring with intelligent healthcare systems. The project includes a number of steps that, if implemented in writing, can address health concerns.

IoT platforms offer promising technologies for healthcare delivery and can further improve healthcare systems. The project includes a series of steps that, when implemented in writing, can solve health problems and can also be used to identify health problems. You can monitor your heart rate, pulse, body temperature and blood pressure and diagnose abnormalities.

IV. SYSTEM OVERVIEW

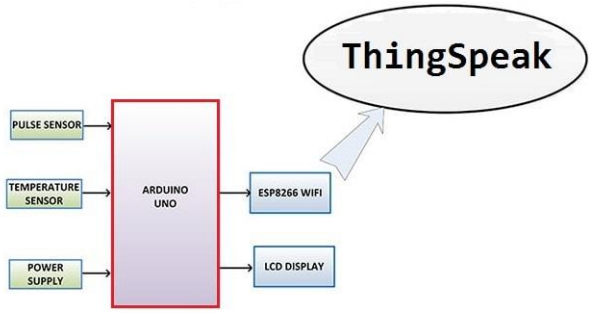

Fig.2. System Overview

A. MICROCONTROLLER

The microcontroller is the most important link in the entire system. He is actually responsible for the entire transfer process. You can access and control any peripheral or component connected to your system. Arduino UNO is a free source microcontroller based on the (www.ijert.org) Mega 328p chip. It has some important features that make it easy to transfer the necessary information, for example using a computer or other microcontroller.

In other words, the complete success of the project depends on the microcontroller's programming code.

Fig.3. Arduino UNO

B. TEMPERATURE SENSOR

The LM35 series (www.ijert.org) is an integrated circuit temperature sensor whose output voltage is linearly proportional to (www.ijareeie.com) the temperature in degrees Celsius. Therefore, temperature sensors are preferred over linear temperature sensors. Like yours, a sensor calibrated in Kelvin is not needed to reduce the large DC conductivity from the output to the Celsius conversion [4]. A temperature sensor is a device (www.ijert.org) that detects changes in temperature. The LM35 does not require (www.ijareeie.com) an external power supply for typical accuracy.

It is a 3-blade IC that outputs analog output directly. It requires +5 VDC to operate. The reading given by the sensor is in degrees Celsius.

Fig.4. Temperature Sensor

C. HEART BEAT SENSOR

The heart rate sensor is used to provide a digital output of heart rate when a finger is placed over it. Here we will make a resonator with a bright LED and one LDR (www.ijert.org) right in front of it. You can detect the heart's pulse by placing your finger between (www.ijert.org) the light emitting diode and the LDR.

When the heart rate sensor is working, the LED blinks with each heartbeat. The digital output can be connected directly to a microcontroller to determine beats per minute (BPM).

It works on the principle of light modulation by the flow of blood through the finger with each pulse.

Fig.5. Heart Beat Sensor

D. IoT

The heart rate sensor is used to provide a digital output of heart rate when a finger is placed over it. Here we will make a resonator with a bright LED and one LDR right in front of it. You can detect the heart's pulse by placing your finger between the light emitting diode and the LDR. When the heart rate sensor is working, the LED blinks with each heartbeat. The digital output can be connected directly to a microcontroller to determine beats per minute (BPM).

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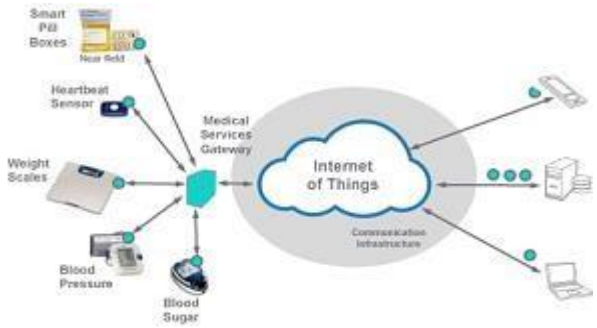


Fig.6. IoT

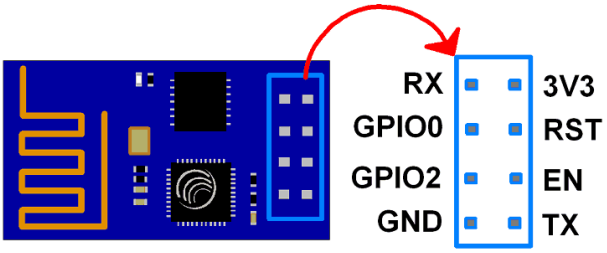
E. ARDUINO IDE sketch

The Arduino IDE (Integrated Development Environment) is software for Arduino. It is a notepad-like text editor with many features. It is used to write code, compile code to check for errors, and upload code to Arduino. It is a cross-platform software that can be used on all operating systems like Windows, Linux and macOS. Support C/C++ language.

This is open source software that allows users to use the software however they want. You can also create your own modules/functions and add them to your software. We have also included an interface to use this software to get proper results, as well as a pulse sensor and temperature sensor library.

F. ESP8266 WiFi MODULE

The ESP8266 is a Wi-Fi enabled system-on-chip (SoC) module developed by Espressif Systems. It is primarily used to develop embedded Internet of Things (IoT) applications. The ESP8266 module is a low-cost, stand-alone wireless transceiver that can be used to develop IoT endpoints. To communicate with the ESP8266 module, the microcontroller must use the AT command set. Here we would be interfacing the Hardware with the Thingspeak cloud server.



V. IMPLEMENTATION

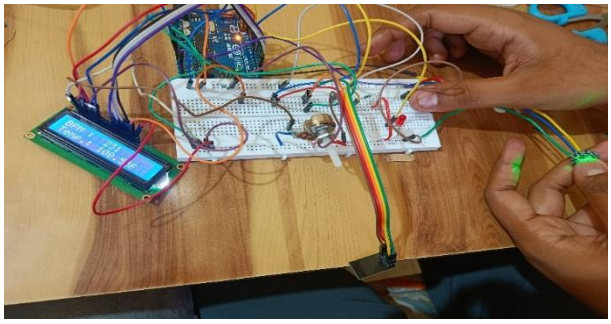
In this project, various patient parameters are determined using the Internet of Things. In a health monitoring system based on an IoT project, real-time patient metrics are sent to the cloud via an internet connection. This data can be sent anywhere in the world so that users can view details at any time. This is a major advantage over SMS-based health monitoring systems. In IoT-based patient health monitoring systems, patient health data is often visible to doctors or loved ones.

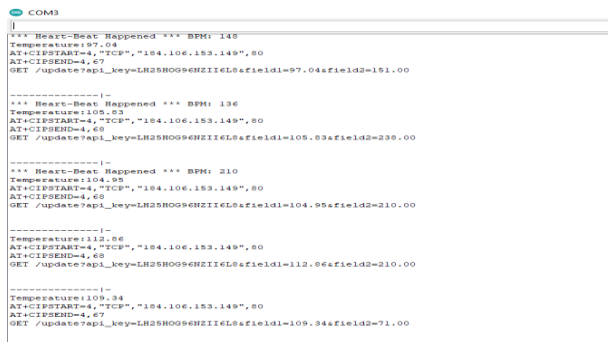
The reason is that you have to visit a website or computer address to access the data, but in Global System for Mobile Communications-based patient monitoring systems, health parameters are transmitted using GSM over SMS. The IoT-based health monitoring system has three sensors. The first is a temperature sensor, the second is a heart rate sensor, and the third is a respiration sensor. This is very useful as it allows doctors to determine a patient's health parameters simply by visiting a website or IP address. And many IoT applications are also being developed today.

In this way, doctors and relatives monitor or monitor the patient's health through an Android application. The IoT-based health tracking system requires a Wi-Fi connection to function. A microcontroller or Arduino board connects to a Wi-Fi network using a Wi-Fi module. The system won't work without a Wi-Fi network, and the Arduino UNO board continuously reads data with all three senses. It then transmits that information to the cloud by sending it to a specific URL/IP address.

Then, this operation is repeated for a period of time, accelerating the transfer of data to the cloud. (www.ijert.org)

VI. OUTPUT/RESULTS





VII. SCOPE & APPLICATION

Healthcare IoT is one of the most developing areas in medicine. This project is primarily for seniors who are home alone. It is also helpful for the elderly who live alone or with 1 or 2 family members. This is really useful when relatives or family members have to leave the house for unavoidable reasons. A multitasking person can use this project.

Patients with disabilities that make it difficult to see a doctor regularly or patients who require constant medical supervision [3]. IoT tracking has proven to be really useful when you need to record, monitor and track changes in patient health parameters. An IoT-based patient monitoring system may have a database of health parameters. This allows doctors to easily find changes in a patient's health parameters or medical history and suggest treatments or medications for the patient. Hospital stays are reduced thanks to remote patient monitoring.

Hospital visits for regular checkups are also minimized. Patient health parameters are stored in the cloud. (www.ijert.org) This provides advantages over storing hardcopy records in separate files or on digital computers, laptops, flash drives, or specific memory locations. In this case, there is a possibility of data loss. On the other hand, in the case of IoT, data is stored in the cloud, minimizing the possibility of data loss (www.ijert.org) [1].

Treatment may be given at an early stage. Even if the patient is unable to provide details, doctors are notified if they are in critical condition.

VIII. CONCLUSION

Using the internet at very large extent, it is used as a source for establishment of the system to communicate where we can get the update of the health of the patient (doi.org) remotely. Internet of Things (IoT) is used widely in different sectors especially in medical sectors. In the above project, we would be measuring the heartbeat and temperature of the patient (doi.org) even if we are present remotely using IoT.

In the event of an emergency, a notification is sent to the doctor's mobile phone to alert the doctor, while a buzzer activates to notify the medical team. Doctors can view (doi.org) submitted data by registering a specific website or IP address. Therefore, a system for continuous monitoring of patients has been developed.

IX. FUTURE WORKS

The future work (doi.org) for the same can be getting some advancement in the design system. We can also add various other sensors for getting some additional data related to the patient. Adding GPS would get some additional features on the project which can be operated using IoT. Using this we can get to know the position or we can track the patient at real time and can get to patient when need in emergency.

And if you create a Wi-Fi-mesh network, your coverage will also increase.

ACKNOWLEDGEMENT

We thank the Department of Electronics and Telecommunications, Thakur College of Engineering (doi.org) and Technology for permission to work on Paper, IoT-BASED PATIENT HEALTH MONITORING SYSTEM. Thank you parents and the Most High for blessings.

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Early Warning for Natural and Manmade Disaster

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Abstract – Emergency and disaster are on the rise in the world. One of the most important components of disaster risk management is the early warning system. Studies have shown divergent models of warning systems with different structures. However, since no systematic review of early warning systems in disasters has been conducted so far, a systematic review of the models, components, and structures of these systems is essential. This protocol is a systematic review study, which aims to evaluate the existing warning systems and their structure. An Early Warning System (EWS) represents the set of capacities needed to generate and disseminate timely and meaningful warning information that enables at-risk individuals, communities and organizations to prepare and act appropriately and in sufficient time to reduce harm or loss. On one hand, the gathering, processing and presentation of information in a consistent and meaningful manner to allow the generation of alert messages and, on the other hand, the generation and transmission of alert messages to the citizens at risk means of warning communication. An EWS allows harm and loss reduction with getting and disseminating warning information about hazards and vulnerabilities in a group of people who are considered at risk. Each word has an important meaning, for example, community involves a network of social interaction, early refers to prevention of any disaster or reduction of the potential harm or damage, warning means a message that announces danger and system put all together.

Keywords— Digitization, OCR, Python, php, file management system, open standard storage format.

I. INTRODUCTION

Risk analysis involves systematically collecting data and undertaking risk assessments of predefined hazards and vulnerabilities. Monitoring and warning involve a study of the factors that indicate a disaster is imminent, as well as the methods used to detect these factors. Dissemination and communication concerns communicating the risk information and warnings to reach those in danger in a way that is clear and understandable. Finally, an adequate response plan, and the promotion of readiness to ensure that people know how to respond to the warnings. An early warning system is more than a warning system, which is simply a means by which an alert can be disseminated to the public. Because of changes in extreme weather and sea level rise, due to climate change, the UN has recommended early warning system as key elements of climate change adaptation and climate risk management. Flooding, cyclones and other rapidly changing weather events can make communities in coastal areas, along flood zones and reliant on agriculture very vulnerable to extreme events. Since the Indian Ocean tsunami of 26 December 2004, there has been surge of interest in developing early warning systems. However, early warning systems can be used to detect a wide range of events, such as vehicular collisions, missile launches, disease outbreaks and forth.

II. PROBLEM DEFINITION

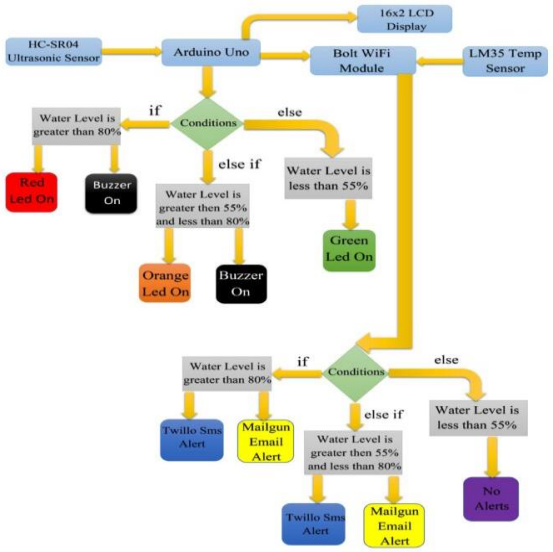
An integrated system of hazard monitoring, forecasting and prediction, disaster risk assessment, communities, government, businesses and others to take timely action to reduce disaster risks in advance of hazardous events. Effective “end-to-end” and “people-centred” early warning systems may include four interrelated key elements: disaster risk knowledge based on systematic collection of data and disaster risk assessments; detection, monitoring, analysis and forecasting of hazards and possible consequences; dissemination and communication, by an official source, of authoritative, timely, accurate and actionable warnings and associated information on likelihood and impact; and preparedness at all levels to respond to the warnings received. These four interrelated components need to be coordinated within and across sectors and multiple levels for the system to work effectively and to include a feedback mechanism for continuous improvement. Failure in one component or a lack of coordination across them could lead to failure of whole system.

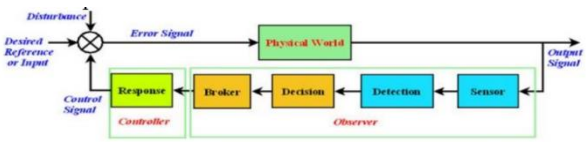
III. LITERATURE SURVEY

Emergency and disaster and their consequences are increasing worldwide. The increasing trend of emergency and disaster has changed the paradigm of response to risk management is advanced early warning system. Upstream documents such as the Hyogo and the Sendai documents have emphasized the importance of the early warning system as one of the key elements of disaster risk reduction. The Sendai document has set out an early warning system with a multi-hazard approach as a requirement for the countries road map by 2030. The United Nations Office for Disaster Risk Reduction (UNISDR) defines warning system as a set of capabilities needed for the timely and meaningful generation and dissemination of alert information to individuals, communities and organizations at risk for optimal preparedness and response and at the appropriate time to reduce the likelihood of injury and death. Early warning and timely response play a major role in reducing the vulnerability and mortality caused by disasters and in enhancing the resilience of communities. Deploying appropriate framework and model with the most optimal elements of the warning system can play a significant role in reducing the risk of disasters. In addition, development of warning system modelling will improve system performance. Until now, different models of waning systems with single- or multi-hazard approaches have been developed at various levels. For example, the United Nations Office for Disaster Risk Reduction has proposed a four-element platform including risk knowledge, monitoring, warning dissemination and response or there are a traditional three phase model proposed by Villagran, and an integrated model that has been proposed by Basher.

IV. METHODOLOGY

Early Warning for disaster management system requires precise amount of accuracy and sustainability as it can work in extreme weather conditions such as cyclones and pre-tsunami weather conditions. In order to do so we can take the help of Internet of things in which the sensors used would be accurate and with the help of programmability, these would be the right choice. The Early Warning for Disaster Management system can be made by using IOT based Arduino chipset and other important hardware components such as ultrasonic sensor and temperature sensor as well water level flood sensor





V. RESULT & DISCUSSIONS

After building this project we can detect the upcoming calamity or disastrous event and can prevent it from happening. And it can be seen socially helping others living in the disaster-prone area.

VI. SCOPE OF PROJECT

Early warning disaster management system will provide better and more accurate results after some more use of sensors and in the near future we can develop and include a server which will provide the user with more accurate weather conditions and the possible disaster and weather forecasting. Eventually we can take this initial small-scale IOT based project into large-scale IOT based project which are nowhere to be seen

VII. CONCLUSION

This paper tells us about the disaster management using EWDMS which stands for Early Warning Disaster Management System. This device will help to obtain information about future disastrous event and will help us to prevent it. And will also help the people living in disaster prone areas to be aware of the future calamity.

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Forest Fire Control System using Modern Technology

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***Abstract*— Drones (Unmanned Aerial Vehicle) are rapidly gaining popularity as a target tracking, and monitoring facility, surveillance tool. A lot of situations more than a number of Unmanned Aerial Vehicle must fly to an area of interest as live video is being streamed to a ground station, where one or more operators inspect the area of interest and fine-tune the Drone's location.**

Keywords- Drone, Flight Controller, Multi rotor, Live stream

I. INTRODUCTION

Drone is the other name of the unmanned aerial vehicles; they are small aircraft that fly by them. Unmanned aerial vehicles (UAVs) are a type of unmanned aircraft. The unmanned aircraft system (UAS) consists of a UAV, a ground- based controller, and a communication system between the two. Drone can fly with various angle with autonomously and also with the help of human under control of remote.

ROTOR

A. Fixed Wing

A fixed-wing drone is one with a single rigid wing that can only fly in one direction. To resemble an aeroplane in appearance and operation. What distinguishes fixed-wing drones from other types of drones? With vertical lift rotors, they can't remain in one position for long, so they float along a fixed as long as their electricity permits. As a result, they can be significantly more effective than the other two types of drones. Wings that have been fixed in the military, unmanned aerial vehicles (UAVs) are commonly used when manned flight is deemed too dangerous or difficult. In addition, they are employed in the private sector.

B. Vertical Take-off and landing

The benefits of fixed-wing UAVs are combined with the ability to hover in a new form of hybrid that can take off and land vertically. There are several different styles in production; some of them are only modified fixed-wing planes with vertical lift motors attached. 'Tail sitter' aircraft, for example, are another choice. which resemble conventional planes However, 'tilt rotor' planes, which can swivel their rotors or even the entire wing with propellers attached from pointing upwards for takeoff to pointing horizontally propels forward flight, rest on their tails on the ground, pointing straight up for takeoff before pitching over to fly normally, and 'tilt rotor' planes, which can swivel their rotors or even the entire wing with propellers.

C. Multi Rotor

The most popular type of drone for getting an "eye in the sky" is the multi-rotor drone. This camera is commonly used for aerial photography, recording, and surveillance. It is used by both professionals and hobbyists due to its small size and ready-to-fly capabilities. Multi-rotor drones are also the least expensive and easiest to build. Their bodies are covered in rotors and can be further classified according to the number of them on the drone's platform. There are three rotors on a tricopter, four on a quadcopter, six on a hexacopter, and eight on an octocopter. Quadcopters are the most popular multirotor drones.

HEXACOPTER

Before choosing a drone that meets the application's requirements and specifications, there are many factors to consider. These characteristics and before constructing or installing a new drone, requirements are taken into consideration.

- Standard type.
- Easy to set up.
- Plenty of frame choices are only a few of the specifications to think about when choosing a drone.
- No servos needed.
- Less expensive than the competition.
- Simple to maneuvers.

A. Flying Principle

A propeller converts the rotational motion in the thrust for the power required for the aircraft. Both Bernoulli's theory and the principle of conservation of momentum can be used to model propeller dynamics. The third law of Newton is a set of rules that governs how things should be done.

B. Principle and Working

A propeller's theory and operation are based on Newton's Third Law and Bernoulli's Principle. A drop in pressure or the potential energy of the fluid occurs concurrently

with an increase in the fluid's speed. Newton's third law states that any action has an equal and opposite reaction. The top of a propeller's aerofoiled is formed such that air flows faster over it than under it. The lift coefficient is a Dimensionless that compares the lift generated by an aerodynamic structure to the lift produced by an aerodynamic body such as a wing or an entire aircraft, as well as the dynamic pressure of the fluid flow around the body and a reference area associated with the body.

C. Live Streaming

It's impossible to beat the mix of live streaming and drone cameras. Humans gain two incredible superpowers thanks to drone live streams: the ability to see and hear. All that is happening right now, as well as the ability to fly and see the ground from a bird's eye view. Video footage for live events is one of the many new drone-based live streaming applications on the horizon.

Figure 1: Camera view

Our system guarantees soft real-time delays, enabling operators to pilot UAV fleets interactively while optimizing performance. In terms of video quality, dependability SENSOR AoI GS R3 R2 R1 SENSOR AoI GS R3 R2 R1 SENSOR AoI GS R3 R2 R Two UAVs (sensors) are manually controlled using video streams to detect desired.

PIXHAWK FLIGHT CONTROLLER

The PX 4 autopilot system is an open-source autopilot system aimed at low-cost autonomous aircraft. Hobbyists will use it because of its low cost and availability. Remotely piloted aircraft are small planes that can be controlled from afar. PIXHAWK is a high-performance autopilot-on-module that can be used in fixed wing, multi rotor, helicopter, vehicle, boat, and any other robotic platform that can roll. It caters to the needs of high-end science, amateurs, and industry.

Figure 2: PIXHAWK

II. RESULT & DISCUSSIONS

• Your drone must not be flown higher than 120 meter above the earth.
• You must not fly your drone over or near an area where public safety is at risk or where emergency operations are taking place (without prior approval). This could involve things like a car accident.
• You must not fly after a collision, police operations, a fire and related firefighting activities, and search and rescue operations.
• Unless the other person is involved in controlling or navigating the drone, you must not fly the drone within 30 meters of people. Just one drone can be flown at a time.
• If your drone weighs more than 100 grams, you must keep it at least 5.5 kilometer away from controlled aerodromes (usually those with a control tower). If your drone weighs less than 100 grams, you may fly within 5.5 kilometer of a
non-controlled aerodrome.

III. CONCLUSION

The main aim is to investigate Quadcopter's entire design process from the engineering perspective and improve its equilibrium and System of Stability. The main purpose of this project is to detect the presence in live streaming videos as also images of a face mask on human face. Our face detector model was developed with profound knowledge and in many practical applications the live streams are used.

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Advanced Driver Assistance System (Adas): A Review

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***Abstract*— According to the Global Status Report on Road Traffic Injuries 2022 by the World Health Organization (WHO), the number of road traffic deaths has climbed to 1.3 million globally. Non-fatal injuries increased significantly in the same year (from around 20 million to 50 million), with many people becoming handicapped as a result of these injuries. The vast majority of these mishaps are the consequence of human error. Over speeding, driving under the influence of alcohol, or distractions while driving can all lead to these errors (such as usage of mobile phones). Failure to utilize seat belts, helmets, or other safety equipment is another problem. The high mortality rates, financial losses, and rising consumer demand for smart safety systems are just a few of the important reasons that OEMs (Original Equipment Manufacturer) are developing Advanced Driver Assistance System (ADAS). Adoption of autonomous technology offers several advantages, including a significant reduction in the frequency of crashes, increased dependability, improved traffic flow and reduced traffic congestion. Another point to emphasize in the transportation sector is energy emissions as well as energy consumption in large number particularly in road transport, which must be taken into account.**

Keywords—Human mistakes, ADAS, traffic congestion, road transport

I. INTRODUCTION

The primary goal of every automobile company is to enhance safety and prevent fatalities. Several OEMs have made an attempt to deal with this matter by creating a wide range of protective measures to secure vehicle passengers in addition to minimizing human casualties outside the vehicle. When it comes to automotive safety, there are primarily two categories of safety systems. Cushioned dashboards which also are add on features to a vehicle, along with seat belts and airbags are examples of passive safety features that protect people from injuries following a collision. Hence, these systems which have been in steady improvement for years, have been reinforced with active safety systems, which aim to prevent an accident from happening in the first place. Active systems are a popular topic of discussion and have grown in popularity in today's automobiles.

Automated parking and braking system, lane assist and adaptive cruise control are examples of such systems. These systems are frequently referred to as ADAS. This technology routinely prevents accidents and advises, even notifies passengers to potential hazards. It supports real-time interactive multimedia, along with video processing and different kinds of sensor fusion modules using advanced algorithms and tools.

The remainder of this paper is organized as follows. The elaboration of Literature review is explained in Section II. Limitations of the Existing System is explained in Section III. The Problem Statement is explained in Section IV. The proposed system is explained in Section V. Finally, Section VI gives the concluding remarks of this paper.

II. REVIEW OF LITERATURE

The traditional automobile sector is of age, centrally regulated environment that has been evolved through five decades with the latest developments in the last two decade. However, with the development of all the industries in the latest revolution, there has been a great progress in road transportation in terms of electric battery operated cars, automated driving, and shared mobility. Autonomous Vehicles (AVs) of the future has drove them to become agile, fast-moving organizations. Since the car industry is so well-established, it has grown alongside a broad network of numerous technical organizations to generate global, regional, and national standards to allow engineering efforts to be harmonized, safe, and competitive across regions. With the AV sector growing so quickly, the lengthy process of standard development by international standards groups is being put to the test as industry and policymakers contemplate their future needs for assessing the safety of automated cars. As a result, different manufacturers have already begun putting ADAS systems in their vehicles in order to raise awareness about vehicle safety and assist drivers in maintaining control of the vehicle. The Tesla cars are already Level 2 ADAS systems and they are nearing to ADAS Level 3 [12]. The only certified ADAS Level 3 car in the world is Honda Legend which hit the Japanese roads in the year 2020. Even in India, we have ADAS systems; they are summarized in the table below [11]:

TABLE I. REAL WORLD EXAMPLES OF ADAS IMPLEMENTATION IN INDIA

Vehicle	Year	ADAS level	Features
Honda City HEV	2022	Level 1	Collision mitigation system, auto high beam assist and adaptive cruise control
Mahindra XUV 700	2021	Level 2	Adaptive cruise control, lane departure warning, automatic emergency braking, lane keep assist high beam assist, traffic sign recognition and forward collision warning system
MG Astor	2021	Level 2	Lane departure warning/ prevention, forward collision warning, high beam assist, adaptive cruise control, automatic emergency braking, blind-spot detection, lane keep assist and rear cross traffic alert
Hyundai Tucson	2022	Level 2	Driver attention warning, lane keep assist, auto high beam assist, front collision avoidance assist, smart cruise control, safe exit warning, lane follow assist, blind-spot collision avoidance assist and rear cross traffic collision avoidance system
MG Gloster	2022	Level 1	Automatic emergency braking, lane departure warning, automatic parking assist, forward collision warning and adaptive cruise control

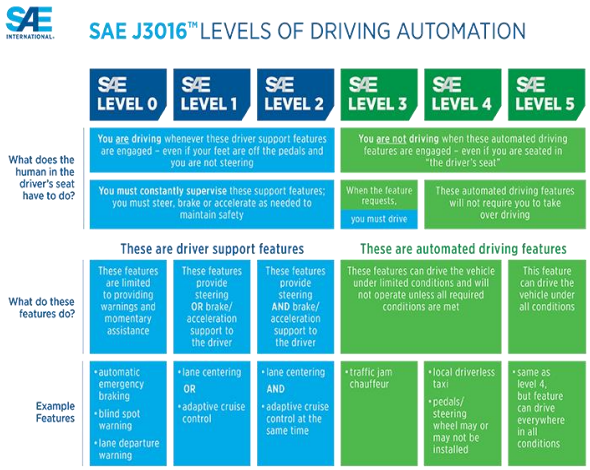

Fig. 1. Different levels of ADAS [15]

III. REVIEW OF LITERATURE

A. Development of ADAS

There are many research papers that examines the advantages and disadvantages of autonomous systems and demonstrates how vehicles can be fully autonomous [5]. The main highlight of the paper was that the approach to ADAS Level 4 and Level 5 will always be event driven and task based. These approaches can be split into two categories: first is a hierarchical autonomous framework based on the process through which sensory information is utilized to orient behaviour towards the external environment and a comprehensive overall learning framework. The fundamental downside of this method is that it is unprepared for unpredictable real-world scenarios. Furthermore, it pointed out how levels 1, 2 and 3 have the ability to self-learn, self-predict and self-adapt, but it is just one way. There is slight modularization in level 4 as along with all these things, it can perform decision making processes, but in a limited working condition Level 5 systems, on the other hand, must cope with unforeseen scenarios in addition to all of the tasks from levels 0 to 4. It also states that the development is advanced. It was proposed that researchers working on AVs should thoroughly investigate the changing regulations of the traffic environment, analyze the dynamic intents of other road users, estimate, judge, and anticipate the risk degree in the traffic environment. One should improve the judgement and ability of intelligent automobiles in complex circumstances by developing specialized navigation tactics and trajectories.

Similarly, another paper described that now currently semi-automated vehicles are getting manufactured which one of the top choices are for the people as they get an extra shield of safety in their vehicle along with the passive components like airbags [12]. It further says that around the year 2030, there will be an exponentially increase in demand for Autonomous Vehicles and in order to fulfill people's demand we need to focus on complete autonomy of the vehicle. The paper then tells us the different levels of ADAS and how it can be designed using five modules, namely, Sensor Acquisition (Camera, LiDAR, V2X, etc.), Sensor Processing (Input), Data Processing and Fusion (Processing) and Vehicle Systems (Output or action like Braking, Throttle, Steering, etc.). Also, the paper compares the features of Level 2 ADAS System cars, Tesla Model X and Mahindra XUV 700 and tells us how the rate of accidents was decreased due to implementation of Level 2 features like Blindspot Detetction, Forward Collision Warning and Rear Automatic Braking.

One of the community magazine mentioned the existing ecosystem and how the automotive sector has evolved rapidly in the last decade [13]. It further says that due to the increasing demand of vehicles there needs to be Standard Bodies which evaluates the vehicle based on international standards. Here's when SAE International comes into picture which has defined the levels of Self Driving Cars. There are many organizations like ISO,

ASAM and IEEE who also have standards defined for autonomous vehicles which are followed internationally. Furthermore, it states that because all future vehicles will be EVs, all open and automotive software architecture must be standardized, which supports portability between application software and basic vehicular functions. Some organizations like AUTOSAR and AVCC are working behind this. Also for safety related standardization, we have AVSC, IAMTS, Pegasus and Safety Pool, while for in vehicle networks we have Anvu and NAV.

Another magazine, where gives us an overview of ADAS system [4]. They give an overview of several hardware and software ADAS technologies, as well as their capabilities and limitations, and describe methodologies utilized in ADAS systems for vision-based recognition and sensor fusion in ADAS s olutions. For inputs, they have distinguished between Monocular, Stereo and Infrared Cameras and how LiDAR captures a high resolution 3D images and their operation at longer distances. For Image Processing, they have emphasized on Image Segmentation, Depth Based Estimation and System Control in order to achieve high accuracy and true positives as our output. Further, for communication purpose, they have introduced to V2V (Vehicle to Vehicle), V2I (Vehicle to Infrastructure) and V2X a combination of previous two which helps in traffic analysis and vehicle to pedestrian signaling which saves both the fuel and money of the driver. In the end, the author has also envisioned some challenges in front of ADAS like Changing Environment Conditions, Resource Constrained System, Geo-Spatial Constraints and Security.

B. Machine Learning Techniques and Implementation

In [7], the authors have implemented a simulation based deep learning neural network test solution. It is search based which returns the test scenarios in which the vehicle has failed to react keep itself in a lane. The main motive of the paper was to design a solution for lane assist system. They have named this solution as Deeper. In the newly proposed version, the authors have made some modifications in the bio inspired genetic algorithm and particle swarm optimization. In the newly proposed version, we consider a random population seed and run several epochs on it. After each epoch, some of the seeds die and we mutate the best survived seeds to get accurate results. This mutation cycle goes on till we get the optimized seed and hence, a proper functioning model. Their model works on 'Winner takes it all'. In order to test and prove the functionality of their solution, they conducted a verifiable judgement and comparison with the findings of five competing tools in the SBST 2021 cyber-physical systems testing competition. Deeper test generators, the newly suggested method not only represent a considerable advance over the previous version, but also shown to be successful and efficient in producing a huge number of different failure exposing test cases for demonstrating an ML powered lane assist system. The following tasks can be done, inducing numerous malfunctions while encouraging test scenario diversity using a strict speed limit constraint, high target failure severity, and limited test time budget.

In [2], the primary goal of the author was to reduce accidents and improve efficiency on single-lane, two-way roads. Their system is based on vehicle communication, vehicle automation, and vehicle to infrastructure communication. Various ADAS systems rely their decision algorithms on vehicle positioning, precise digital maps, and clever map-matching algorithms. The paper defines certain features of ADAS like adaptive cruise control and overtaking assistance system. For both of these applications to implement, road length and approachable speed on the roads are considered. To avoid the confusion of the vehicle at intersections/junctions, the vehicle uses collision detection and avoidance system and finds the safest path to go in the particular direction. For object detection and classification, Point Cloud Clustering (PC) and Support Vector Machines (SVM) were used respectively.

The study in [6] performs a step by step review of Machine Learning in a constraint environment with respect to the physical computational resources. It provides multiple algorithms for detection of humans and vehicles, their behaviour and identity with respect to the driver, lane detection and environment reading. Also, the paper provides brief information about various techniques for using ML algorithms for ADAS. The first one is model modification or selection. Like [7], selecting pre building models, SVM has been used which resulted in computationally cheap model and hence not needing the use of transfer learning. Moreover, other deep learning models, such as Convolutional Neural Networks (CNNs), are more operationally intensive is discussed for ADAS. The main advantage of CNNs is that there are existing numerous strategies to adjust these models suitable for devices with low computational power, including quantization, layer fusion, model compression, and pruning, among others.

Another paper suggests a method for a partial automatic assistance system which detects the following: Lane Detection and Tracking, Lane Departure Warning and Blind spot detection and Warning System [3]. Here, their implementation is only demonstrated on flat terrains with proper road markings (access controlled highways). The components used for the same are Raspberry Pi 3B and OpenCV for image processing. Here the captured RGB image is converted into HSL format, but for processing operations, it is converted into grayscale images.

One more paper discusses the problem of randomness while a person is driving a vehicle and should Autonomous Vehicles react to it with the help of interactions between the road user and the car [8]. Here, they have used 'Wizard of Oz' technique, for understanding the behaviour of both driver and the pedestrians. Here, in this case, the experimenters may disguise themselves as a car seat or control the vehicle from a hidden place inside the vehicle that is not observable by the participants. They researched about the pedestrian's behaviour and found some factors like group size, carelessness, social norms, physical context, traffic characteristics and traffic volume decide him to cross the

road or not. Now, when it comes to autonomous driving, one has to see at all these factors and train our vehicle on how to react to each situation. After pedestrian's, they also conducted a similar kind of experiment with drive's mindset under different conditions like paying attention to detail, recklessness, doziness and on a call. The vehicle in this case should alert both the driver and the pedestrian to avoid any mishap. Some solutions they came out with are Umbrellium Smart Crossing, moving eye concept and an array of LEDs indicating yield.

The study's traffic system is dispersed, sophisticated, and dynamic, requiring the employment of a ML model to show its different outputs using the same processes [10]. It has developed two separate models utilizing the DNN (Deep Neural Networks) deep learning algorithm to assess its confidence in a self-driving car. The first model uses its assessed trust level to evaluate whether a specific car is trustworthy, whereas the second model focuses on the inputs (LiDAR, camera, and radar) and examines which among these were faulty and calculates their trust values. In order to illustrate this typical (uncomplicated) traffic situations VicRoads traffic data was used, while representation of random or intricate cases were generated by SUMO, a simulation tool. The results show that their proposed models can measure trustworthy scores with high accuracy. Furthermore, the availability of larger training datasets might boost the ability of deep learning models even further. With the introduction of smart city projects, ITS can collect a large chunk of traffic and real time road scenarios independently on its own at various driving conditions and places, which then can be used to improve their model further.

C. Hardware Resources

The whole automotive industry is excited about self-driving cars and aided technologies. Using new and affordable sensors, automotive firms are developing breakthrough technologies in Advanced Driver Assistance Systems. After the model, the second most preferable thing to do is finding appropriate hardware resources for manufacturing of the vehicle. Various processors are used which are used to control the vehicle as well as to implement the machine learning model. There were three major groupings in this case: embedded boards (MSP, STM family), ASIC/FPGAs (Artix, Spartan, Numato families), and smartphones. When we have a look at embedded boards, the ones that really stand out are those which have an internal GPU, such as the NVIDIA Jetson or Tegra family [6]. This eases the deployment and revamping of deep learning models. Currently, many researches are under the process to implement the ADAS with FPGA. Small ADAS prototype model can also be made by Raspberry Pi [3]. Along with the main processor we need some supporting sensors and devices which will help the model to accurately behave according to the situation.

As we know the safety of the passengers is the utmost priority, we cannot just depend on our vision and RADAR based sensors. Though they can provide high levels of automation to cars, the concept of a completely autonomous self-driving vehicle is impossible to imagine without LIDAR-based sensors. Autonomous vehicles outfitted with them provide entire automation in all driving modes [2][12][10]. The edge that LiDAR based sensors has over RADAR is that the latter cab only detect the objects present in its surrounding whereas the former can detect what exactly is that object (cars, pedestrians, etc.). Another important device is the camera. It records its surroundings and gives the input to the processor. Three types of cameras are used in ADAS. They are Monocular, Stereo and IR cameras. All these three cameras can be distinguished on the basis of illumination, camera lens and its processing capability [2]. Monocular cameras as its name suggests has only one lens and low image processing capability than others. The stereo cameras have multiple lenses and extract the 3D information from the two dimensional images. IR cameras are used everywhere but their main purpose is illumination with the help of IR source which is embedded in them.

D. Communication

The communication between the AVs and the existing infrastructure can be done with the help of VANET (Vehicular Ad Hoc Networks). They are an envision of the Intelligent Transportation System (ITS). Three different types of communication are possible, i.e. V2V, V2I and V2X [2][12][12]. They are a short range wireless communication networks which incorporates existing networking technologies like WiFi, WiMAX and Bluetooth. This is famous for communication among the vehicles is due to the high computational power of a car and can be greatly used in the traffic monitoring in the future.

IV. LIMITATIOJNS OF THE EXISTING SYSTEM

Although ADAS is utilized in the world, they are nothing but, Levels 0, 1 and 2 are just add-on features to the car which gives partial autonomy. If we want the vehicle to be completely autonomous, we need to implement the further three levels of ADAS, i.e. Levels 3, 4 and 5. It takes a lot of time for any car manufacturer to research and implement them. They are still in the trial phase in a controlled environment where they are experimented and their reaction time and behaviour are analyzed.

V. PROBLEM STATEMENT

To design a safe Level-5 Advanced Driver Assistance System (ADAS) model capable of efficient decision making by making use of incoming surrounding data

VI. PROPOSED SYSTEM

A. Dataset

The dataset which we are planning to use is Indian Traffic Sign Image Dataset with over 4000 high resolution images (many of them are 1920x1080 and above dimensions). There are almost 400 plus crowd source contributors for this dataset. The main feature of this dataset is that it captured images of all signs with 400

cities across India. The images taken were under various conditions like day, night, variation in distances, viewpoints, etc. This dataset is captured by mobile phones and collected in the year 2020-2021. This dataset is very helpful for traffic sign detection, self-driving vehicles, etc. The available annotation formats of this dataset are in YOLO, COCO PASCAL-VOC and Tf-Record.

B. Proposed Block Diagram

The above figure is the proposed Block Diagram of our project. It consists of various types of inputs like GPS, LiDAR, Stereo Camera which will be sent for processing to Jetson Nano and then as per our algorithm, it will give us an appropriate output (action taken by the vehicle). We are planning to use the VANET (Vehicular Ad Hoc Networks).

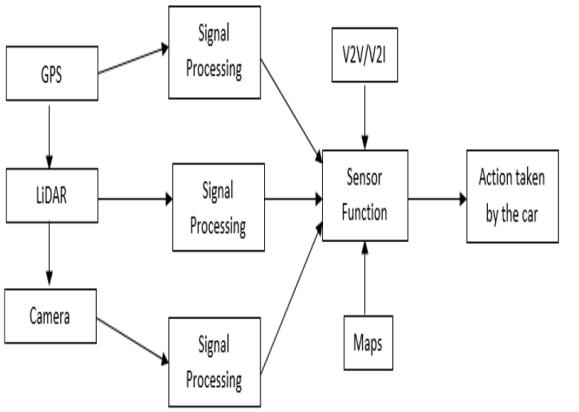

Fig. 2. Proposed Block Diagram

VII. CONCLUSION & FUTURE SCOPE

In this paper, basic information about ADAS and its different levels along with the autonomy of the vehicle is explained. After reviewing all of the articles, we can conclude that Deeper is one of the better options for dealing with the ADAS which consists of appropriate test scenarios. Many papers and articles researched to find solutions to the random situations (perception of the pedestrian about the driver and vice versa). The potential for ADAS systems to improve the safety, comfort, and effectiveness of our automobiles and transportation networks is enormous. Many consider ADAS to be a stepping stone toward completely autonomous vehicles. Still in the research stage, the Level 5 ADAS system can be a game changer in the context of driving and avoiding fatal accidents. Many automotive companies are spending exorbitantly to make our world a safe place from the accidents.

It's still early to comment about the coming future of Level 5 ADAS system. The next version can be the Self Sufficient Autonomous Vehicle with green energy resources and using hydrogen fuel.

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Smart Vehicle Security Black Box

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***Abstract*— The primary goals of this project are to create a smart vehicle black box prototype, provide vehicle safety, and find a way to automatically warn drivers to drive carefully. It is utilized in aircraft. There are so many accidents happening all around us today for unknown causes. [1] According to statistics, over 1.35 million people worldwide die in mishaps each year. Each year, there are more than 4.5 lakh fatalities just in India. The Black Box was installed in the car to avoid accidents. For use in accident inquiry, data from the sensors is stored on an SD card mounted on a Raspberry Pi computer or in the cloud. This article describes a method for creating a GSM-GPS-based intelligent vehicle monitoring system with a Raspberry Pi controller. The suggested system makes use of a MQ135 light sensor. For the purpose of preventing car collisions and warning proprietors of vehicle collisions, alcohol sensors, temperature sensors, GPS, and GSM modems are used. The info collected is useful for further research. This project's extra feature alerts the driver any time the sensor values surpass the standard specification value. The SD card that is connected directly to the Raspberry Pi contains the data.**

Keywords—Light sensor, Alcohol sensor, Raspberry pi, GSM, GPS

I. INTRODUCTION

We undoubtedly encounter difficulties whenever we alter the demands of society[2]. Hence, everyone must constantly innovate our technology to discover solutions to the issues facing society in order to meet these challenges. This article presents a cutting-edge and reasonably priced vehicle monitoring system that uses GSM and GPS (Global Positioning System) for informative purposes alone (Global System for Mobile Communications). The system uses the GPS module to track the location and speed of the car, and then uses the GSM module to send an SMS message containing this data to the registered phone number. A Raspberry Pi- Pico, a GSM module, and a GPS module are all included in the system [3].

Besides from this, the prototype also contains some advanced features. It contains accident-detecting sensors.The SD card stores the date and time, which may be used to calculate the vehicle's trajectory and display its motion on a Google map. The system will offer answers to the issues that truck, car, and other vehicle owners encounter while travelling. Because, as we know, road accidents are a major threat to India. The project's goal is to track down incidents and report their locations along with previously provided contact information so that the patient can receive instant assistance from an ambulance [4][5]. In the modern era, car technology is advancing quickly every single year, and accidents are also happening more frequently every single second. In order to use some technologies, such as black boxes installed in cars, it is necessary to upgrade the vehicle's internet service. The job of the car black package is similar to that of the aircraft black package[7]–[9].

The first objective of this project is to cut back on human work. Automation has perpetually been a first-rate issue for

security systems[12].The main aim of the project is to style and implement a security system. IOT is suggested by a system that provides control via a hand-held movable. Furthermore, the police have no idea what caused the accident or whether it was their fault or not. Considering all these problems, proposed system came up with the idea of using the black box, which is mainly used in an airplane, in a vehicle. Like flight data recorders in aircraft, "black box" technology can now play a key role in motor vehicle crash investigations [13].

II. COMPONENTS

A. *Hardware Requirement*

Hardware requirements for implementation are Raspberry pi, GSM module, GPS module, SD card, Buzzer, LCD, MAX232, GSM Modem, Accident Detection Sensor, Buzzer, MEMS , ADXL335

B. *Software Requirement*

Software requirements are Raspbian, Arduino Compiler, PyCharm

III. METHODOLOGY

Proposed Approach In the proposed system, the black box contains the Raspberry Pi 3, Alcohol Sensor, and IR sensor, GSM & GPS Module, Pi-Webcam, and power supply. The outcome of these parameters is sent as an SMS through the GSM module to the registered mobile number. The GPS tracking system developed for this system helps to track the vehicle in case of an accident and enables authorities to extend immediate emergency medical service. This data is stored on an SD card and can be used for investigative purposes [3].Fig. 1 shows the basic block diagram of the project. First there will be a physical quantity block, which is basically a vehicle. The second block is the sensor, the third is the controller, the fourth is the SD card, and the final block is the data file[14]. The sensors that are used are vibration sensors, alcohol sensors, and IR sensors[15]. With all of these sensors, there are also used GSM and GPS modules, a used controller such as a Raspberry Pi, and one SD card for data storage. All the sensors and GPS-GSM modules are connected to the Raspberry Pi. Suppose an accident has occurred, all the sensors connected to the cars are active. First, set some threshold value for all the sensors[16]. If the vibration sensor value goes beyond the threshold value, that time it sends. The alert message is delivered to the registered mobile 9 number via GSM.

Similarly, at that time, if an accident occurs, the GPS module sends the live location to the registered mobile number, hospital, and nearby police station. An SD card is used to store the all-captured image at accident time for that used Pi camera. If the driver's eye is closed at that time, the camera captures the image and stores it on the SD card, which is useful further for investigation purposes. The data has to be stored in encrypted form, so while reusing the data for investigation purposes, we have to describe the data[9].

$$EAR=|e2-e6|+|e3-e5| / 2|e1-e4|..... \quad (1)$$

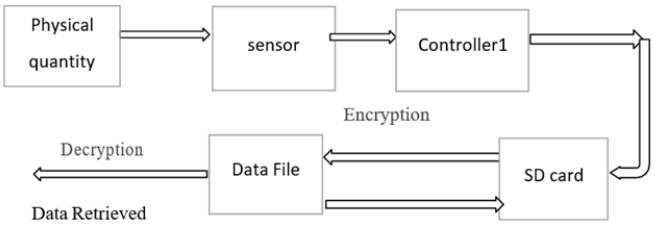


Fig. 1. Blockdiagram of Vehicle Black Box

IV. WORKING PRINCIPLE

The image on the basis of the eye moment shown in Fig.1. There will be one theoretical concept, i.e., eye aspect ratio(EAR). With the help of this formula, one can calculate the theoretical value of EAR and While coding, we have to set that theoretical value[10]. If the value goes below the threshold value, it means the driver's eye was closed at that time with the help of the pi camera, capturing the image and giving an alert signal to the diver. As shown in the graph (Fig 3), EAR is almost constant for the open eye, and it decreases to near zero when the human eye is closed.

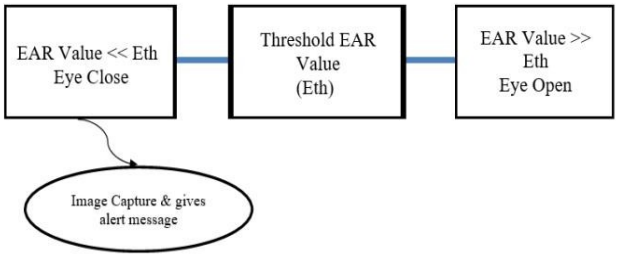


Fig. 2. Block diagram of capturing image on basis of eye moment

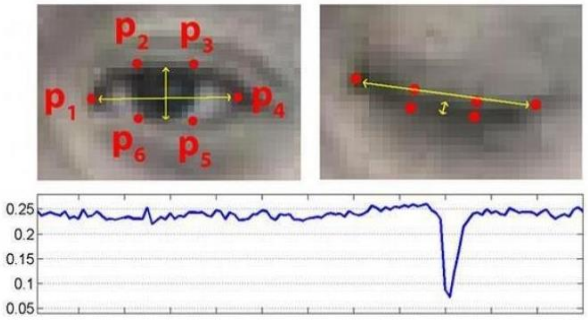
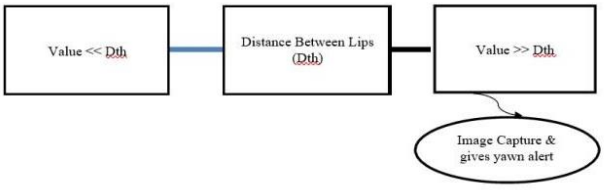


Fig. 3. Eye Aspect Ratio graph for closed and open eye



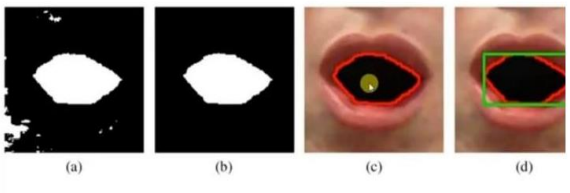


Fig. 4. Block diagram of capturing image on basis of mouth moment

Fig. 4 show the image on the basis of mouth moment. First, we have to set the width between the two lips and consider that width as a threshold Value (Dth). If the distance between the two lips is greater than the threshold value that time with the help of pi camera 12 capture the image. Suppose if the driver is yawning at that time the width between two lips is greater than the threshold value, it considers as driver was in sleepy at that time and system will capture the image and gives an alert message.

IV. RESULT AND DISCUSSION

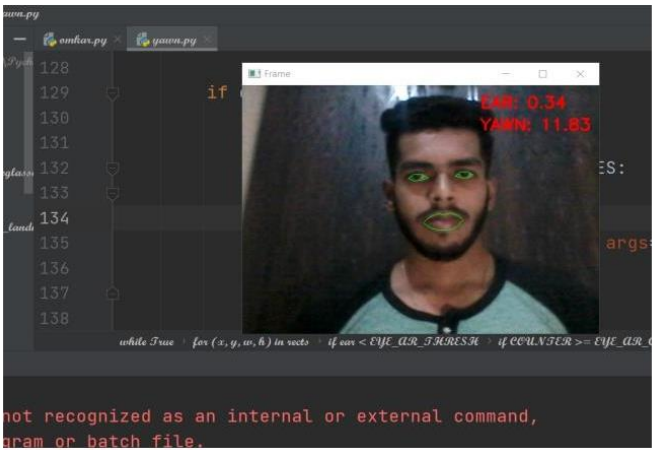
Fig. 5(a)(b) show the desired output that is needed after the successful implementation of the GSM and GPS modules in the system. If accidents happen, then all these modules get activated and start working for their purpose[8]. If an accident occurs, the registered mobile number will receive notification or an alert message, as shown in fig, that the accident occurred. We will receive information such as the location of the accident (right, left, front, or back) as well as a Google map link in the GSM message. So, one can easily find the live location of an accident by clicking on the link that we are getting through GSM. Also, all this monitored data will be stored on an SD card. And all this data at the end will be used, i.e., after accidents, all this data will be used for the investigation of the accidents. As we know, some cases remain unsolved, but this saved data will play a vital role.

Fig.6(a) shows the output of continuous capturing of the human face with the help of a picamera. It will show the given threshold value for the eye , i.e., the EAR value, as well as for a 19 yawn, i.e., the width between the two lips. Fig.6(c) shows the drowsiness alert message that we get if the values go below the given threshold value. If the driver is sleeping, then at that time the EAR value will be less than the EAR threshold value. At that time, the system captures the image and stores it on the memory card with the proper date and time, as well as sends an alert message.

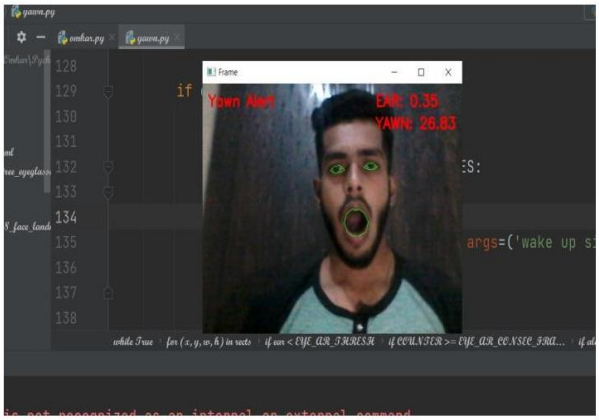
(a)

(b)

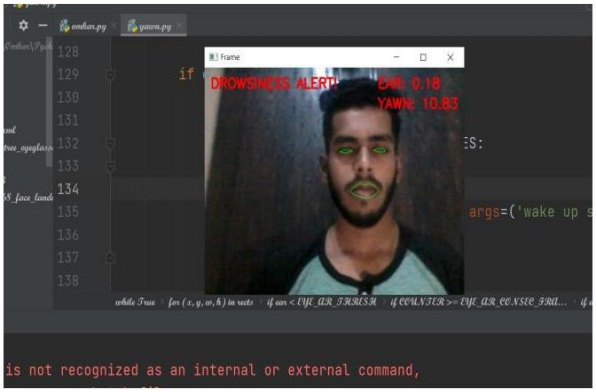
Fig. 5. Desired output



(a)



(b)



(c)

Fig. 6. Screen shot of result achieved.

VI. ADVANTAGES AND DISADVANTAGES

A. *Advantages of system*

- It is simple to pinpoint the precise location of the vehicle; • It offers protection for the vehicle at a very affordable price.
- Easy to setup and use
- It will assist in giving emergency responders vital information as soon as feasible.
- Security and remote surveillance of vehicles, particularly during military activities. • Used in auto motives and transport vehicles, from lighter vehicles like cars to heavier auto motives like ships and aeroplanes.
- This system can also be connected to a vehicle's airbag system so that the air bags will deploy when the sensors sense an accident.

B. *Disadvantages of system*

- Black box insurance promotes low mileage, so if you drive a lot, travel a lot, or must frequently drive in congested areas, you may wind up paying more.
- Additional fees, as the majority of providers will charge you for a variety of services that could prove expensive. For instance, there is typically a fee for installing the box, switching the box over if you get a new vehicle, or disconnecting the black box.
- Delay will be their (Approx. 10-15 sec)

VII. FUTURE SCOPE

The current framework can be modified to check several characteristics before starting the car, such as fuel level, tyre pressure, and lamp functionality. Basic features like the front and back cameras that keep taking live photographs and saving them in the memory are also there. The most important piece of information during an accident investigation will be the video data. Hardware with a rechargeable battery built may prevent power loss caused by the usage of GPS and GSM modules and allow the device to operate for longer.

VIII. CONCLUSION

The proposed idea aims to detect and save the system from accidents. The database provides accident data. When an accident occurs, an alert message will be sent to the nearest police station with one of your contacts, a nearby hospital and location. GPS networks broadcast messages indicating that an accident is occurring. This scheme has been tested in cars in real applications. No false alerts about test results. This project aims to design and develop "Design and implementation of an intelligent black box system for collecting vehicle safety information". Any system that can use GPS to track your car's location simply sends an alarm SMS to your emergency contacts. The proposed system makes good use of GPS by providing travelers with a safe journey. Various sensors are used to continuously monitor various vehicle parameters. When your car has an accident, the vibration sensor will automatically activate, start monitoring mode and store this data in the cloud. We have accepted the storage of monitoring data in the cloud. So if your vehicle has an accident, it will send a message to your registration number, hospital and police.

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Design of Instrument Cluster To Display Various Parameters

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***Abstract*- The tool cluster or the dashboard is one of the vital additives in an automobile. The function of an instrument cluster is to display the important statistics to the driving force, inclusive of fuel indicator, speed, distance travelled, temperature and plenty of different information is to be displayed at the device cluster, with this information the driver can determine whether he can reach to desired location. Modern vehicles use nation of art liquid crystal display displays to display the records [2]. The purpose of this paper is to discuss a way to successfully display vital facts to the driver. The facts or the information from diverse sensors is sent to the principal manipulate unit or the digital control Unit and from here, the ECU displays the important records primarily based on the urgency or the priority of the information. The verbal exchange between the sensors and ECU is carried out the usage of the same old CAN Protocol.**

Keywords—Electronic Control Unit (ECU), Cluster, Liquid Crystal Display (LCD)

I. INTRODUCTION

An instrument cluster also called dashboard, instrument panel or fascia is a control panel set within the central console of vehicle. It is located directly ahead of the driver. It displays instrumentation and controls for the various operation of vehicle.

Currently many automobiles use both analog gauges and an LCD screen to display the information to the driver, due to the bigger sized dials of both speed and RPM gauges, the LCD screen will usually be small and it will display less information, such as odometer reading, fuel levels and the time [2]. The vital information such as oil levels, engine errors, ABS, Traction Control and many other such information lights up as tiny symbols on the instrument cluster. These tiny static symbols only light up if there is an error or the sensor is active. The information is gathered from various sensors from different parts of the automobile by using the standard CAN protocol. The information gathered is sent either to the ECU (Electronic Control Unit) or to a central control unit. The ECU then processes the sensor data and then sends it to the analog gauges and digital display, which is the information cluster.

This paper intends to present an overview of developing digital instrument cluster of an electric vehicle. It investigates the essential components in terms of hardware and software entailing to build a digital instrument cluster. Also, detailed presentation of communication protocols used for automotive applications is given. Simulation plays a vital role in a product development life-cycle. We have also discussed various simulation techniques used in automotive industry which are performed to verify the functionality of the product implementation [1].

The instrument cluster or the dashboard is one of the important components in an automobile. The function of an instrument cluster is to display the vital information to the driver, such as fuel indicator, speed, distance travelled, engine state, temperature and many other information is to be displayed on the instrument cluster, with this information the driver can determine whether he can reach the destination. Modern automobiles use state of art LCD screens to display the information. The goal of this paper is to discuss how to efficiently display vital information to the driver. The information or the data from various sensors is sent to the central control unit or the ECU (Electronic Control Unit) and from here, the ECU displays the vital information based on the urgency or the priority of the information. The communication between the sensors and ECU is achieved using the standard CAN Protocol.[6]

This paper intends to present an overview of developing digital instrument cluster of an electric vehicle. It investigates the essential components in terms of hardware and software entailing to build a digital instrument cluster. Also, detailed presentation of communication protocols used for automotive applications is given. Simulation plays a vital role in a

product development life-cycle. We have also discussed various simulation techniques used in automotive industry which are performed to verify the functionality of the product implementation.

II. PROBLEM SATEMENT

Improving the instrument cluster in an automobile by providing accurate real time information to the LCD display screen by using the CAN protocol which has properties like high speed and high accuracy.

To be able to add and remove additional sensors without having to make much changes in the hardware and software components.

To be able to prioritize critical information which is to be presented first to the driver rather than presenting the information which is of less significance.

III. DESIGN PLAN

Instruments cluster usually consists of the following parts: speedometer, tachometer, warning lights, multi-information display systems and lighting systems. In order to meet the driver's habits, speedometer, tachometer using conventional pointer instruments, will gather speed, temperature, fuel information through the power of information processing to indicate out by driving the stepping motor. The multi-function information display integrates odometer. The contents of the main display are the total mileage, small mileage, real-time clock and fault diagnosis and other information. The warning lights mainly indicates engine failure warning signal, battery charge warning signal, fuel level warning signal, seat belt switch alarm signal and the related information. CAN bus data transfers relying on communication, not only to improve data transmission reliability but also reduce wiring complexity.

The various sensors will send data to the CAN bus, here the CAN bus is used as a medium of communication between the sensors and the central control unit or the ECU. Once the ECU receives the data from the sensors, the ECU identifies the sensor from which the data has been received; the data is then processed by the ECU and the information is then sent to the information cluster to be displayed to the driver. If the data consists of both critical and non-critical data, the ECU must identify the critical data and display that information before any other information is displayed to the driver, for example the ECU receives the data that Traction Control System is active and the ECU also receives the data that the engine has an issue; here, the engine issue has to be shown to the driver first rather than showing that the Traction Control System is active.

IV. HARDWARE DESIGN

Electronic devices can be analog or digital. Values on analog devices are (normally) infinitely variable. A speedometer that shows a car's speed by means of a dial is an analog device. The hand on that dial moves smoothly around the dial and can take any value that the car's engine can create. In a digital device, values are represented by numbers and therefore do not have the variability of analog devices.[5]

Microcontroller specifications of digital instrument cluster are supplementary than analog dashboards. Semiconductor industry have been altering and expanding the functionalities of microcontrollers especially for automotive applications. Electric Light Commercial vehicle manufacturers prefers microcontroller possessing combined functionality of graphics and real time data processing. To satisfy exceptional instrument cluster applications, prominent semiconductor companies are developing microcontroller platforms with both the features. Below is the Block Diagram of the architecture of instrument cluster. Tell-tales includes the indicators necessary for the drivers while driving such as seat-belt not ON, door open, battery temperature etc. Earlier cable from engine was used to display speed but modern gauges needle function through stepper motor. Motor controller in processor drives the gauges of analog instrument cluster. TFT LCD Screen is used to display digital instrument cluster. Companies such as NXP, PIC Electronics, Cypress Semiconductor, Microchip Technology Inc. etc., have designed microcontrollers for digital instrument cluster. These satisfies the hardware and graphical requirements of dashboards [3].

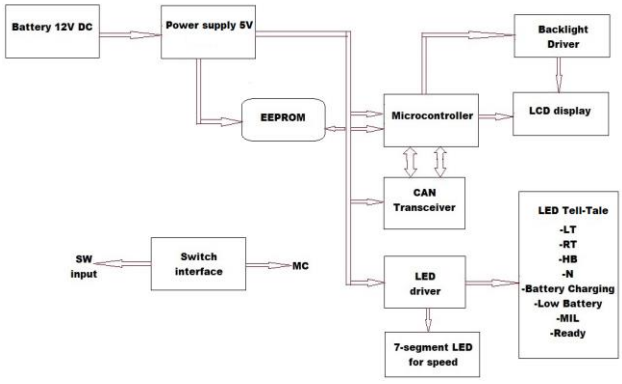

Fig 1: Block diagram of Instrument Cluster

A. *Instrumental Setup:*

The instrument cluster to display the important information, the ECU should have a sorting algorithm to sort the information which has the highest priority and then send that information to the instrument cluster. The instrument cluster will always display the basic information such as speed, RPM, fuel level, distance covered and temperature, for example, in case of an error in the Anti-lock Braking System and this data will be sent to the ECU that there is an error, and the ECU will compare the priority level of the data against the priority levels of other sensor data and then display the information with the highest priority in the queue, in this case, a message is shown to the driver on the

instrument cluster stating that there is an error in the Anti-lock Braking System.

B. Communication Protocol

CAN protocol is used to achieve communication between the sensors and the central control unit or the Electronic Control Unit (ECU). In CAN protocol the messages are sent in a format called frames. A frame is defined structure, carrying meaningful sequence of bit or bytes of data within the network. Framing of message is done by MAC sub layer of Data Link Layer. There are two types of frames standard and extended. These frames can be differentiated on the basis of identifier fields [1]. A CAN frame with 11 bit identifier fields called Standard CAN and with 29 bit identifier field is called extended frame. The identifier field is used for two purposes one is to determine which node has access to the bus and second to identify the type of message. The messages are sent to the ECU or the central control unit through the CAN Bus.

V. SOFTWARE DESIGN

Automotive instrument cluster has a large number of functions. CPU's tasks are heavy and some of them need higher real-time quality. Real-time multitasking operating system uC/OS-II helps to improve response rate of the program and simultaneously make the process modular, hierarchical and reduce the difficulty of program's design and upgrade. Software modules are divided into the main program module, CAN communication module, data acquisition modules, stepper motor driving module, TFT- LCD module, alarming module, interrupt module and so on [1].

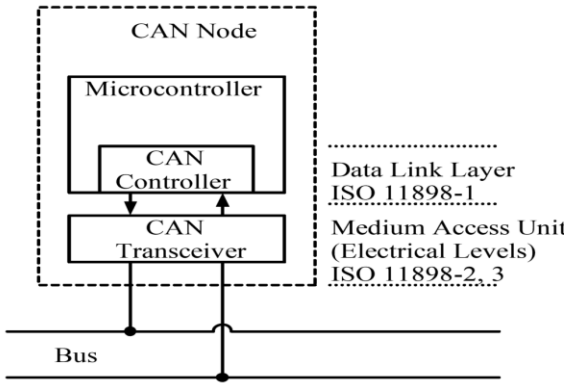

Fig 2: CAN communication module

CAN communication module is divided into three parts, namely, the initialization of CAN controller sending data and receiving data. Besides receiving and sending data, CAN bus is responsible for data processing, and network management gateway function to complete the processing. CAN communication module. Alarming sub-module mainly outputs alarm signal under the control of abnormal conditions. For example, when the coolant temperature is near boiling point or when the fuel is less than a specified value in the fuel tank, the audio alarm device will issue the alarm signals and the corresponding indicator lights up to attract the driver's attention. There are three interrupt sources in the interrupt subroutine: buttons, wheels (each turn of the wheels generates an interrupt pulse) and power-down protection circuit, respectively to complete LCD functionality setting, speed testing and data saving when power is off. Data acquisition and A/D conversion routine based on the input parameters on the corresponding analog signal do the sampling, quantization and processing, and return the corresponding value of the signal to the main program. Data collection need treat the interference to reduce the use of error and improve data accuracy. The display subroutine completes the LCD initialization, symbolic processing and numerical display output. Motor drive subroutine modules use acceleration, constant speed, deceleration to overcome the lag when starts and the overshoot phenomenon when stops. Micro-step drive (each micro-step rotating 1/12 degrees) ensures the accuracy that can guarantee the accuracy of the pointer display [4].

The display subroutine completes the LCD initialization, symbolic processing and numerical display output.
Motor drive subroutine modules use acceleration, constant speed, deceleration to overcome the lag when starts and the overshoot phenomenon when stops. Micro-step drive (each micro-step rotating 1/12 degrees) ensures the accuracy that can guarantee the accuracy of the pointer display.

VI. CONCLUSION

Implementing an easy to understand instrument cluster will reduce the accidents caused due to the malfunction of electronic components by helping the driver to know that the vehicle is not fit for driving. The sooner the driver knows that an electronic component has malfunctioned the sooner the driver will get the automobile repaired or serviced before another component malfunctions, thereby reducing additional service costs.

The use of CAN protocol to obtain all the sensor data is speedy and simple. Using the CAN bus to connect all the wires to a single bus cable is cheaper, quicker and simplifies the process of either adding or removing an electronic component in an automobile.

VII. FUTURE SCOPE

Increasing preference for digital solution in vehicle for various parameters by which driving can be automated effectively.

This paper rising use of advanced technologies in developing innovative solutions in automotive vehicle for making the driving effortless.

VIII. ACKNOWLEDGMENT

We are grateful to our project guide Dr. S. M. Turkane for their help in the design and experiments. We also thank Dean of R&D Dr. S. L. Kurkute, for helping us to reach various resources of study. We are also thankful to Ms. Darshana Bhanage for their suggestions.

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Pick and Place Robot for Injection Moulding Machine

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***Abstract*—Injection molding is the maximum not unusual manufacturing method for polymers. This paper presents a detailed description of the injection molding process, together with its technique parameters and their impact on the molded component. Gating structures play an important function in part great. The injection molding process works while plastic mass flows from gate to gate in a gate device, via gates and into the mould hollow space. Contemporary plastics enterprise uses business robots in all components of plastics manufacturing, along with injection molding related strategies. From loading components into injection molding machines to finishing and assembling injection molded components, the use of robots offers plastics manufacturers a aggressive advantage with huge productiveness gains and excessive satisfactory. Additionally, robots are an increasing number of being utilized in publish- processing outside the injection molding method. B. Welding, assembly and packaging operations because of the developing demand for more bendy answers. Pick and place robots permit agencies to pick gadgets from one vicinity and location them at any other the usage of an automatic answer. Simple responsibilities like lifting or moving an object do not require advanced concept processes. Therefore, the use of human exertions for those responsibilities may be wasted as hard work may be used for different responsibilities that require better intellectual capacity. these repetitive obligations are treated by way of choose-and-place robots. These robots are frequently equipped with sensors and imaginative and prescient systems to raise items from shifting conveyors.**

Keywords-Injection Molding, Pick and Place Robot.(key words)

I. INTRODUCTION

Injection molding technology is one of the main methods of industrial processing. Most injection machines used in industry today are screw-type injection machines. According to the driving mode, injection machines are mainly divided into electric injection machines and hydraulic injection machines. It is a powerful molding method that can mold plastic products of various shapes and sizes. It is also the preferred process for products with complex three-dimensional structures. From micron gears,micron needles,etc. to plastic bottles, plastic barrels and daily necessities that are common in daily life, they can be molded by injection molding. Injection molding technology can be used for a variety of materials, including composite materials, foamed materials, thermoplastic and thermosetting plastics and rubber, etc. There are also various forms of injection molding such as gas-assisted molding, water assisted molding, micro-injection molding, injection foam molding, low-pressure molding, injection compression molding, etc. An injection mold consists of two halves that are forced together to form a cavity in the shape of the part to be produced. Hot, liquid plastic is then injected at high pressure into this cavity. The high pressure is needed to ensure that the plastic resin fills in every crook and cranny of the mold cavity. Once the plastic has had time to cool, the two halves of the mold are pulled apart, and the part is ejected. Although designing for injection molding can be quite complicated, and the cost of the molds themselves are incredibly expensive, there is one huge reason why injection molding is still used today. No technology can beat injection molding when it comes to producing millions of identical copies of a part at an incredibly low price. Plastic injection molding is a technique used to create molded products by heating plastic materials into a molten form and injecting into a custom-designed mold. Then the material is cooled to solidify the parts. The method can be utilized to mass produce parts featuring complex, unique shapes. An injection molding project consists of three basic steps: Product design, mold design, then the actual manufacturing process. If the product is designed with ease of mold creation in mind, the mold designed and made with precision, the manufacturing process will proceed smoothly. The manufacturing process itself includes six major steps: Clamping, injection, dwelling, cooling, mold opening, product removal. Plastic injection molding companies use machines that work by melting, compressing and injecting plastic resin pellets into the runner system of a custom constructed mold. A mold can be made for making a one-time test part or a run of parts for filling a customer's order or manufacturing a more complex item.

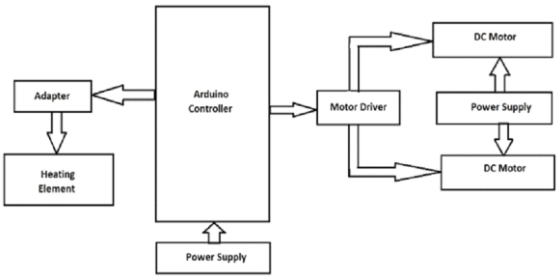

Fig 1:- Injection moulding machine using robotics

Robotic technology plays a significant role for plastic injection moulding post processing. A robotic trimming cell provides superior repeatability when compared with a human performing the same task, and it increases flexibility by performing multiple operations. A robot will consistently dispense the same amount of sealant or adhesives following a highly repeatable pattern, offering greater shot accuracy, improving cycle times and reducing waste. With or without vision, robots can pick and place plastic moulded parts for further operations such as inspection, testing and hot stamping. In the assembly of injection moulded parts, robots can perform complex welding operations using laser, ultrasonic and infrared, increasing precision and driving down cycle times. Robots also meet the needs of automated finishing, ranging from PAD printing to polishing. Further, automating the end of plastic production line can make a big difference to production rates and cost effectiveness. Robots can liberate workers from strenuous and repetitive manual work such as wrapping, labelling, palletising, and provide flexibility for quality packing, storage and logistics.

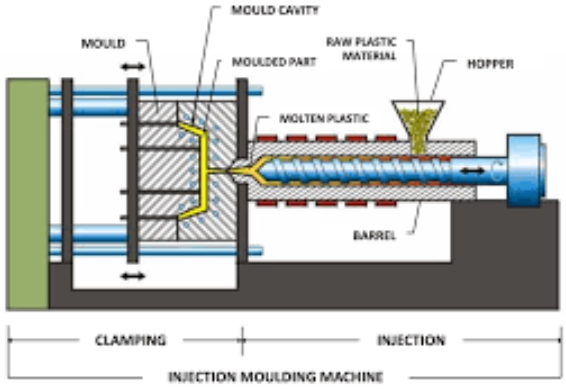

Fig 2:- Injection molding process parameters

High-molecular polymers undergo very complicated heating cooling and mechanical shearing in the injection molding process. Due to different thermal-cold history and mechanical shearing history of polymer regions, the crystalline morphology in the thickness direction of the part is also different, and it will show a clear skin-core structure with an obvious anisotropy. The use of different injection molding process parameters will lead to different polymer microstructures. The differences in polymer microstructures are mainly manifested in the differences in molecular chain arrangement, molecular chain orientation, and crystallization. The differences in these microstructures of polymers will be different. Crystallization is also a major factor in the evolution of the aggregate structure and microstructure of the molded product, which has a significant effect on the physical properties and dimensional stability of the product. In the crystalline polymer, due to the incomplete crystallization of the melt, the polymer will contain two components: crystalline and amorphous regions.The physical quantity used to quantitatively describe the crystalline and amorphous regions is called the crystallinity of the polymer. Crystallinity is defined as the mass percentage (or volume percentage) of the crystalline phase in a polymer containing both crystalline and amorphous regions.

II. ADVANTAGES

1.Precision
Plastic injection moulding is perfect for very intricate parts. Compared to other techniques, moulding allows you to incorporate more features at very small tolerances. Have a look at the image to the right. You can hold this moulding in the palm of your hand and it has bosses, ribs, metal inserts, side cores and holes made with a sliding shut off feature in the tool. That's an awful lot of features on a small part! It would be impractical to make using plastic fabrication and impossible to make using the vacuum forming process.
2. High repeatability
Once your mould tool is made, identical products can be made over and over again. And again. A decently made mould tool has a very long mould tool life, as long as it's treated well by the moulding machine setters.
3. Low cost per part
Whilst there is an initial high investment for the plastic injection moulding tool, after that the cost per part is very low. Other plastic processing techniques may require multiple operations, like polishing, whilst injection moulding can do it all at once. If you chose to CNC machine the part above, it would cost hundreds of pounds per part. If you're looking to go into full production, injection moulding is the way to go.
4. Fast
Cycle times can be as low as 10 seconds. Combine that with a multi-impression injection moulding tool and you get a LOT of products very quickly. That part above takes a bit longer as it's a specialist material and has a lot of features to be moulded correctly, but at about 50 seconds you'd still get 70 parts per cavity per hour. CNC machining a one-off would take half a day - 3D printing it even longer!
5. Material choice
There's a vast amount of materials available for plastic injection moulding. A range of more common materials, but also things like antistatic plastic, thermoplastic rubber, chemical resistant plastics, infrared, biocompostable...and with colour compounding or masterbatch colouring you have an endless choice of colours as well. The moulding above is boring black, but

it's made out of PPO - poly(phenylene oxide) - which is an extremely rigid and flame-retardant material.

6. Special Surface Finishes, Engraving & Printing

In addition to a range of colours, the injection moulding tool can be made with a special finish which will show on the moulding. Just about any finish you like, for example leather look, soft touch, sparked, high shine, you name it. You can also have logos or other text engraved in the tool. Finally, you can have your mouldings printed, as a range of inks are available that will print well on plastic.

7. Little plastic waste

Part repeatability is very high for injection moulding. Even the sprues and runners (the leftover bits of plastic created by the 'tunnels' through which the plastic material reaches the actual mould) can be reground and the material reused. You can explore this in more detail on our environmental impact of injection moulding page.

III. APPLICATIONS

1) Injection moulding is used to create many things such as wire spools, packaging, bottle caps, automotive parts and components, toys, pocket combs, some musical instruments (and parts of them), one-piece chairs and small tables, storage containers, mechanical parts (including gears), and most other plastic products .

2) Industrial robots can be used to automate the injection molding process by using a pick-and-place robot to load plastic parts into the machine or to place the finished pieces onto a conveyor belt.

3)An automated in-mould labelling /decorating uses robots to load pre-printed labels or decorated film directly into the open plastic injection mould.

IV. CONCLUSION

Injection moulding has a great many applications for manufacturing, particularly for producing high volume parts. While the tooling and moulding can be expensive, the cost of production once this is completed is low. In the field of manufacturing, polymer material presents advantages such as low cost, high machinability, good corrosion resistance, and biocompatibility. Thus, the development of polymer processing technologies such as injection molding has already become one of the research hotspots and vital developing aspects in the field of polymer industry. Injection molding is one of the most important parts of the polymer industry. This technology and related machines are also a world-wide big business, almost one third of the polymer products are fabricated by this method. Injection molding is a repetitive process, in which melted polymer materials are forced injected into the mold cavities. The heating of polymer materials in the plasticizing component, the forced injection of melted polymer materials into mold cavities, and the opening of the mold to eject the molded products are three basic operations during the injection molding process. Besides the injection molding for pure polymer materials, this technology is also developed for high efficiency processing of composite material as reviewed in this paper, including metal matrix composites, cement-based composite materials, carbon composites, and other composites. Moreover, new and improved methods are successfylly being developed and applied in laboratories and industries. Although researchers around the world have already proposed a series of modified injection molding methods, significant improvements in processing efficiency and accuracy still need be made for the complete commercial viability of the process.

V. FUTURE SCOPE:

The future injection molding technology will continue to progress around the innovation of injection molding equipment, injection molding materials and injection molding technology. The injection molding equipment will combine with the development of science and technology to develop more intelligent and precise equipment. At the same time, the mold technology supporting injection molding technology will also develop in the direction of new material molds, high-precision molds, and replaceable molds. Injection molding materials will also have different types of development. The injection molding technology of composite materials will gradually shape the research hotspot of injection molding technology. The injection molding process will also continue to be developed around the demand for high-precision, injection-molded products composed of different materials. In general, injection molding technology still has challenges in terms of equipment, materials, and processes that require researchers to continue in-depth research and continuously improve injection molding technology for different needs to gradually produce products that meet anthropological requirements.

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Examining the Efficiency of High-Speed, Low-Power 2-4, and 4-16 Mixed-Logic Line Decoders

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Abstract: **This summary presents a line decoder design blueprint system that makes use of a hybrid logic approach. This approach combines transmission portal basis, pass transistor twofold regard justification, and static relating metal-oxide-semiconductor logic. Ultimately, this results in a line decoder design blueprint system (CMOS). For the 2-4 decoder, we provide two novel topologies: one has 14 transistors and is aimed at decreasing the number of transistors and power consumption, while the other has 15 transistors and places an emphasis on high power-defer execution. Both topologies are presented below. In each scenario, we employ both fixed-function and adaptive decoders, which ultimately results in the creation of four unique designs. In addition to this, four brand-new 4- 16 decoders are being developed with a hybrid architecture that consists of 2- 4 pre-decoders as well as traditional CMOS post-decoders. All of the suggested decoders vary from their CMOS counterparts in that they have a greater full-swinging limit and a lower transistor check than the latter. This is one of how they differentiate themselves. Last but not least, 32 nm close-flavor multiplications demonstrate that the suggested circuits demonstrate a fundamental improvement in power and latency in comparison to CMOS.**

Keywords- Line decoder, mixed-logic, power-delay optimization.

I. INTRODUCTION

VLSI stays for "Generous Scale Integration". This is the field which incorporates squeezing progressively justification devices into smaller and more diminutive regions. VLSI, circuits that would have devoured boardfuls of room would now have the capacity to be put into a little space couple of millimeters over! This has opened up a noteworthy opportunity to do things that were improbable beforehand. VLSI circuits are everywhere .your PC, your auto, your new out of the plastic new best in class modernized camera, the cell phones, and what have you. This incorporates a lot of expertise on various fronts inside a comparative field, which we will look at in later portions. VLSI has been around for a long time, yet as a response of advances in the domain of PCs, there has been a passionate extension of contraptions that can be used to diagram VLSI circuits. Close by, conforming to Moore's law, the limit of an IC has extended exponentially consistently, to the extent computation control, utilization of available domain, yield. The combined effect of these two advances is that people would now have the capacity to put diverse helpfulness into the IC's, opening up new unsettled areas. Models are introduced structures, where smart devices are put inside normal things, and ubiquitous handling where small enrolling contraptions increase to such an extent, to the point that even the shoes you wear may truly achieve something supportive like checking your heartbeats. Facilitated circuit (IC) development is the engaging advancement for a whole host of creative devices and structures that have changed the way in which we live. Jack Kilby and Robert Noyce got the 2000 Nobel Prize in Physics for their production of the joined circuit; without the organized circuit, neither transistors nor PCs would be as basic as they are today. VLSI systems are extensively humbler and exhaust less power than the discrete sections used to build electronic structures beforehand the 1960s. Blend empowers us to fabricate structures with various more transistors, empowering essentially all the more enrolling ability to be associated with dealing with an issue. Composed circuits are furthermore considerably less requesting to plan and make and are more reliable than discrete systems; that makes it possible to make exceptional reason structures that are more viable than comprehensively helpful PCs for the activity that should be finished.

INTRODUCTION TO DECODERS

STATIC cmos circuits are used for most by a long shot of basis doors in fused circuits They involve complementary N - type metal-oxide-semiconductor (nMOS) pulldown and P-type metal-oxide semiconductor (pMOS) pullup frameworks and present incredible execution and also security from confusion and contraption assortment. Thusly, essential metal-oxide semiconductor (CMOS) method of reasoning is depicted by quality against voltage scaling and transistor estimating and thusly tried and true assignment at low voltages and little transistor sizes [2]. Data signals are

related with transistor entryways simply, offering decreased diagram versatile quality and help of cell-based method of reasoning mix and plan.

Pass transistor reason (PTL) was basically made in the 1990s, when diverse diagram styles were familiar pointing with give an appropriate differentiating alternative to CMOS justification and im-show speed, power, and region. Its rule layout differentiate is that data sources are associated with both the gateways and the source/exhaust diffu-sion terminals of transistors. Line decoders are basic circuits, for the most part used as a piece of the periphery equipment of memory displays (e.g., SRAM). This short develops a mixed method of reasoning procedure for their execution, picking improved execution appeared differently in relation to single-style layout. Whatever is left of this brief is dealt with as takes after: Section II gives a short survey of the assessed decoder circuits, realized with consistent CMOS reason. Portion III in-troduces the new mixed method of reasoning blueprints. Zone IV drives a close multiplication look at among the proposed and con-ventional decoders, with a point by point chat on the surmised comes to fruition. Fragment V gives the blueprint and last completes of the work presented.

A	B	D_0	D_1	D_2	D_3
0	0	**1**	0	0	0
0	1	0	**1**	0	0
1	0	0	0	**1**	0
1	1	0	0	0	**1**

TABLE II: TRUTH TABLE OF THE INVERTING 2–4 DECODER

A	B	I_0	I_1	I_2	I_3
0	0	**0**	1	1	1
0	1	1	**0**	1	1
1	0	1	1	**0**	1
1	1	1	1	1	**0**

OVERVIEW OF LINE DECODER CIRCUITS

In advanced frameworks, discrete amounts of data are represented by twofold codes. A n-bit parallel code can speak to up to 2n particular components of coded information. A decoder is a combinational circuit that proselytes parallel data from n input lines to a most extreme of 2n remarkable yield lines or less if the n-bit coded data has unused blends.

A. 2– 4 Line Decoder

A 2– 4 line decoder creates the 4 min terms D0−3 of 2 input factors An and B. Its method of reasoning movement is dense in Table I. Dependent upon the data mix, one of the 4 yields is picked and set to 1, while the others are set to 0. A changing 2– 4 decoder makes the fundamental minterms I0−3, consequently the picked yield is set to 0 and the rest are set to 1, as showed up in Table II. In conventional CMOS blueprint, NAND and NOR entryways are needed to AND or conceivably, since they can be realized with 4 transistors, rather than 6, likewise executing justification limits with higher adequacy. A 2– 4 decoder can be completed with 2 inverters and 4 NOR passages Fig. 1(a), while a changing decoder requires 2 inverters and 4 NAND entryways Fig. 1(b), both yielding 20 transistors.

B. 4– 16 Line Decoder With 2– 4 Predecoders:-

4– 16 line decoder delivers the 16 minterms D0−15 of 4input elements A, B, C, and D, and a switching 4– 16 line decoder creates the equal minterms I0−15. Such circuits can be completed using a predecoding procedure, as shown by which bits of n address bits can be predecoded into 1-of-2n predecoded lines that fill in as commitments to the last stage decoder [1]. Thusly, a 4– 16 decoder can be imple-mented with 2 2– 4 modifying decoders and 16 2-input NOR portals [Fig. 2(a)], and a changing one can be executed with 2 2– 4 decoders and 16 2-input NAND passages [Fig. 2(b)]. In CMOS method of reasoning, these layouts require 8 inverters and 24 2-input entryways, yielding an entirety of 104 transistors each

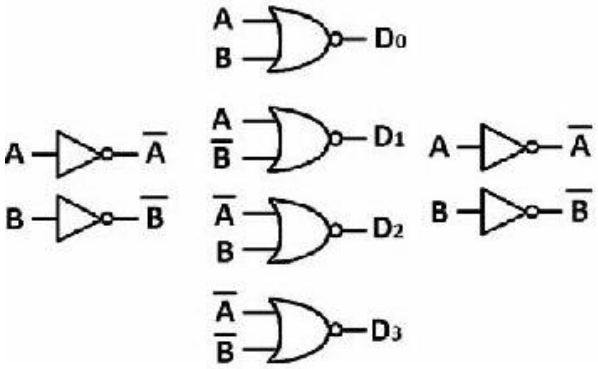


Fig 1:- (a) Noninverting NOR-based decoder

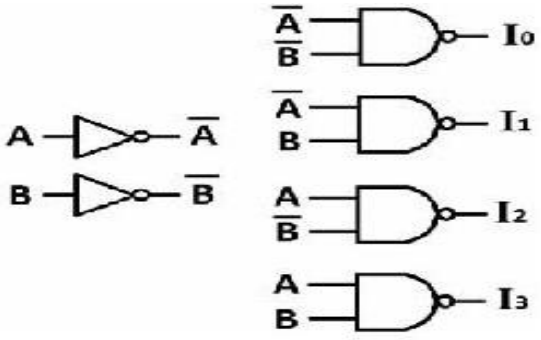


Fig 1 (b) :- Inverting NAND-based decoder

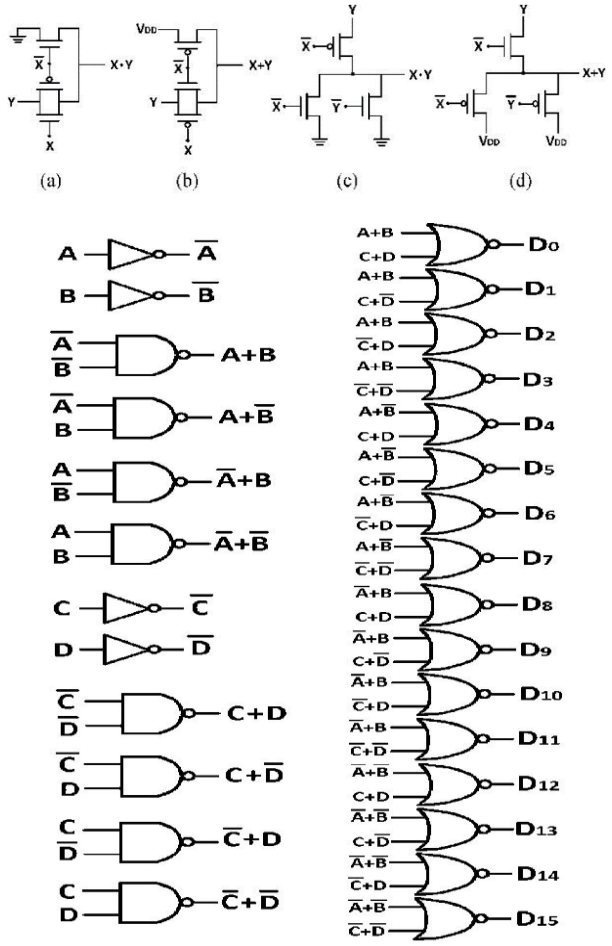


Fig 2 (a) Noninverting decoder implemented with two 2–4 inverting pre-decoders and a NOR-based post decoder.

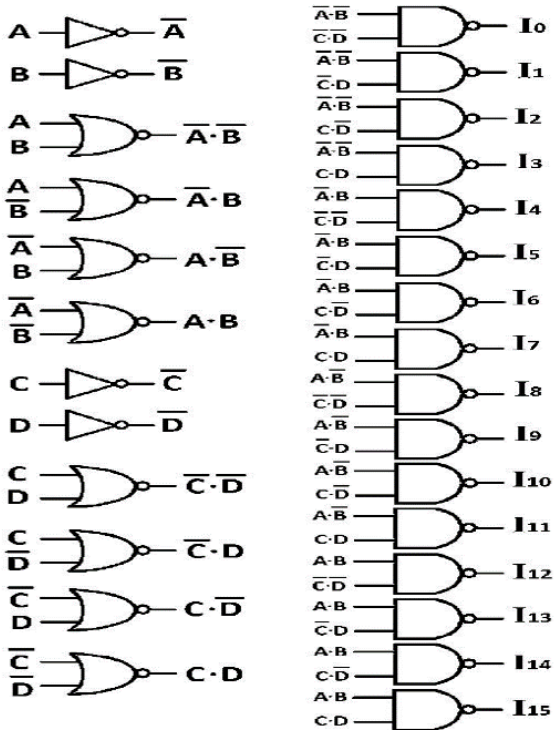


Fig 2.(b) Inverting decoder implemented with two 2–4 noninverting predecoders and a NAND-based postdecoder.

A. 14-Transistor 2– 4 Low-Power Topology

Planning a 2– 4 line decoder with either TGL or DVL entryways would require an aggregate of 16 transistors (12 for AND/OR doors and 4 for inverters). Be that as it may, by blending both AND door composes into a similar topology and utilizing appropriate flag course of action, it is conceivable to dispose of one of the two inverters, in this manner diminishing the aggregate transistor tally to 14.

Give us a chance to accept that, out of the two data sources, in particular, An and B, we intend to wipe out the B inverter from the circuit. At long last, The D3 minterm (AB) is executed with a TGL door, hence, the B inverter can be wiped out from the circuit, bringing about a 14-transistor topology (9 nMOS and 5 pMOS).

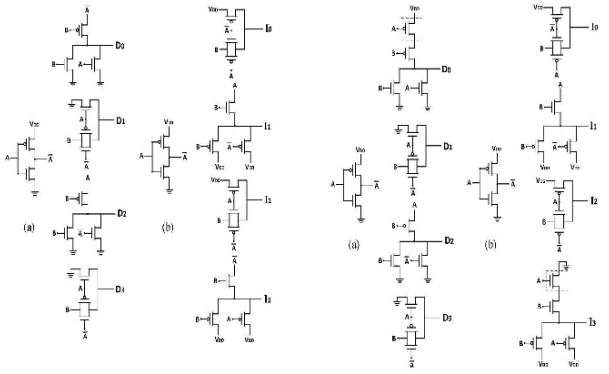


Fig. 3. New 14-transistor 2–4 line decoders. (a) 2–4LP. (b) 2–4LPI.

Following a comparable strategy with OR entryways, a 2– 4 reversing line decoder can be actualized with 14 transistors (5 nMOS and 9 pMOS) also: I0 and I2 are executed with TGL (us-ing B as the proliferate flag), and I1 and I3 are executed with DVL (utilizing An as the engender flag). The B inverter can by and by be omitted.

Inverter end lessens the transistor check, intelligent exertion and by and large exchanging action of the circuits, in this way diminishing force dispersal. The two new topologies are named "2– 4LP" and "2– 4LPI," where "LP" remains for "low power" and "I" for "altering." Their schematics are appeared in Fig. 4(a) and (b), individually.

B. 15-Transistor 2– 4 High-Performance Topology

The low-control topologies exhibited above have a downside in regards to most pessimistic scenario delay, which originates from the utilization of correlative An as the spread flag on account of D0 and I3. Notwithstanding, D0 and I3 can be productively actualized utilizing static CMOS doors, without utilizing integral sig-nals. In particular, D0 can be actualized with a CMOS NOR door and I3 with a CMOS NAND entryway, adding one transistor to every topology. The new 15T outlines present a huge change in delay while just marginally expanding power dissemination. They

are named "2– 4HP" (9 nMOS, 6 pMOS) and "2– 4HPI" (6 nMOS, 9 pMOS), where "HP" remains for "superior" and "I" remains for "transforming." The 2– 4HP and 2– 4HPI schematics are appeared in Fig. 5(a) and (b), separately.

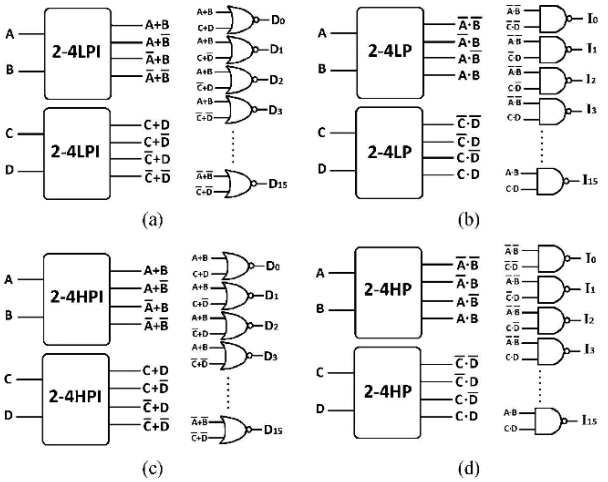


Fig.4. New 4–16 line decoders. (a) 4–16LP. (b) 4–16LPI. (c) 4–16HP. (d) 4–16HPI

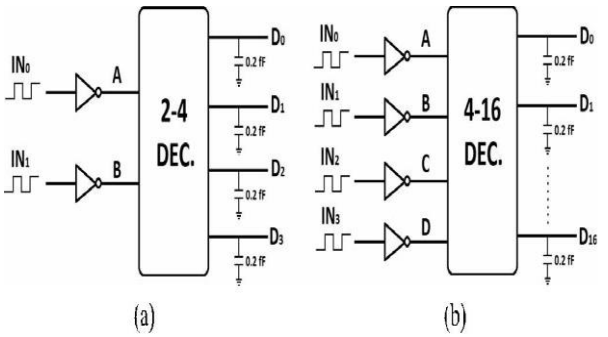


Fig. 5. Simulation setup regarding input/output loading conditions. (a) 2–4 de-coders. (b) 4–16 decoder

SIMULATIONS

In this area, we play out an assortment of BSIM4-construct flavor recreations in light of the schematic level, keeping in mind the end goal to contrast the proposed blended rationale decoders and the ordinary CMOS. The circuits are actualized utilizing a 32 nm prescient tech-nology display for low-control applications (PTM LP), incor-porating high-k/metal door and stress impact [11]. For reasonable and fair-minded examination we utilize unit-measure transistors solely (Ln = Lp = 32 nm, Wn = Wp = 64 nm) for all decoders.

A. Recreation Setup

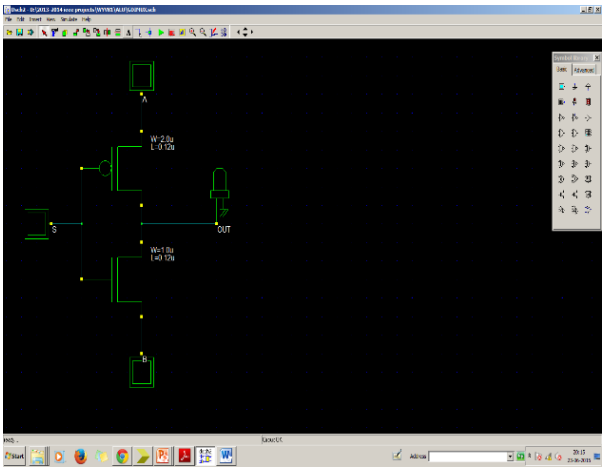
All circuits are recreated with fluctuating recurrence (0.5, 1.0, 2.0 GHz) and voltage (0.8, 1.0, 1.2 V), for a sum of 9 reenactments. Every reproduction is rehashed 5 times with shifting temperature (−50, −25, 0, 25, and 50 ◦C) and the normal power/delay is ascertained and exhibited for each situation. All in-puts are cushioned with adjusted inverters (Ln = Lp = 32 nm, Wn = 64 nm, Wp = 128 nm) and all yields are stacked with a capacitance of 0.2 fF, as appeared.

Moreover, legitimate piece arrangements are embedded to the in-puts, keeping in mind the end goal to cover every conceivable progress a decoder can perform. A 2–4 decoder has 2 inputs, which can create 22 = 4 distinctive twofold blends, in this manner yielding an aggregate of 4 ∗ 4 = 16 conceivable changes. The 2– 4 decoders are reproduced for 64 nanoseconds (ns), with the goal that the 16-bit input successions are rehashed 4 times. Also, a 4– 16 decoder has 4 inputs, 42 = 16 input blends and 16 ∗ 16 = 256 conceivable advances, in this manner the 4– 16 decoders are reproduced for 256 ns to precisely cover all changes once. Fig. 8 delineates the information/yield wave-types of our proposed 2– 4 decoders for each of the 16 input advances, showing their full swinging capacity.

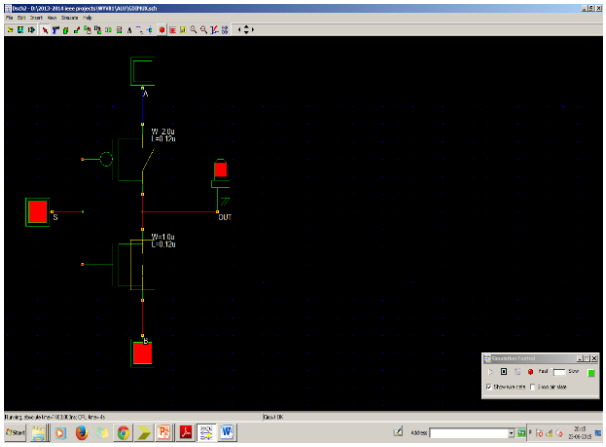
B. Execution Metrics Examined

The measurements considered for the correlation are: normal power dispersal, most pessimistic scenario deferral and power-postpone item (PDP). With persistent sub-micron scaling and low voltage task, spillage control has turned out to be progressively critical as it commands the dynamic one [12]. In our examination, both spillage and dynamic streams are viewed as and the aggregate power dispersal is separated from flavor recreation, estimated in nanowatts (nW). Concerning, we take note of the most elevated esteem that happens among all I/O advances, estimated in picoseconds (ps). At long last, PDP is assessed as normal power*max delay and estimated in electronvolts (eV). Results and investigation: GDI_MUX:

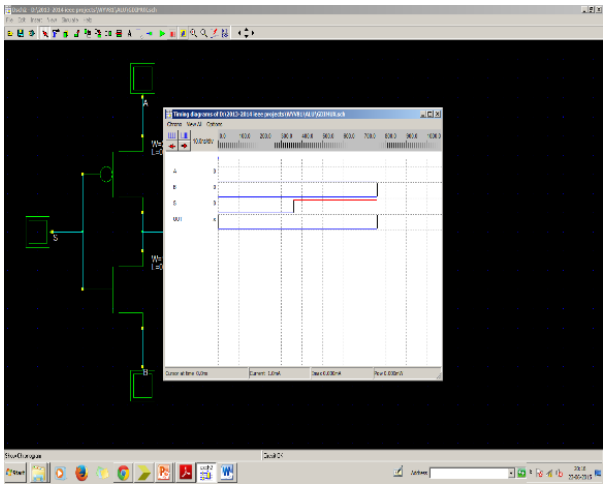
Schematic:



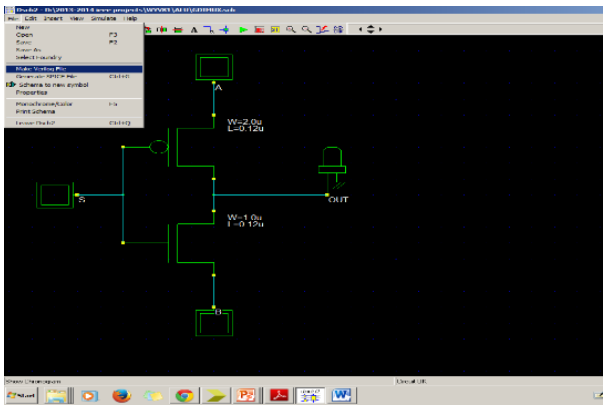
Simulation:



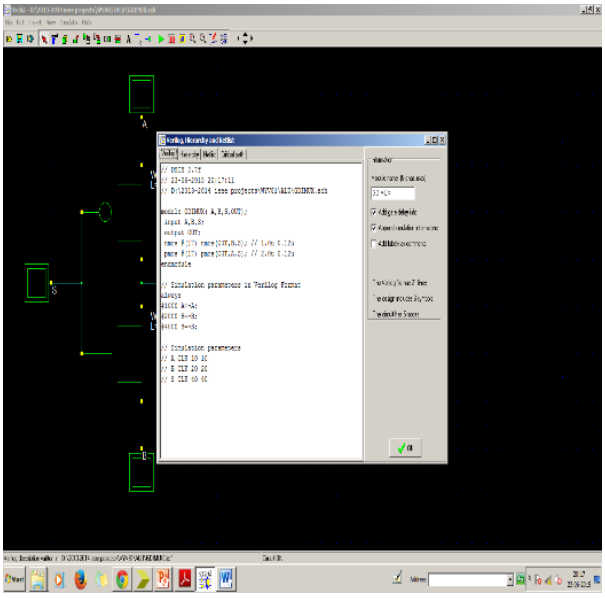
Characteristics:



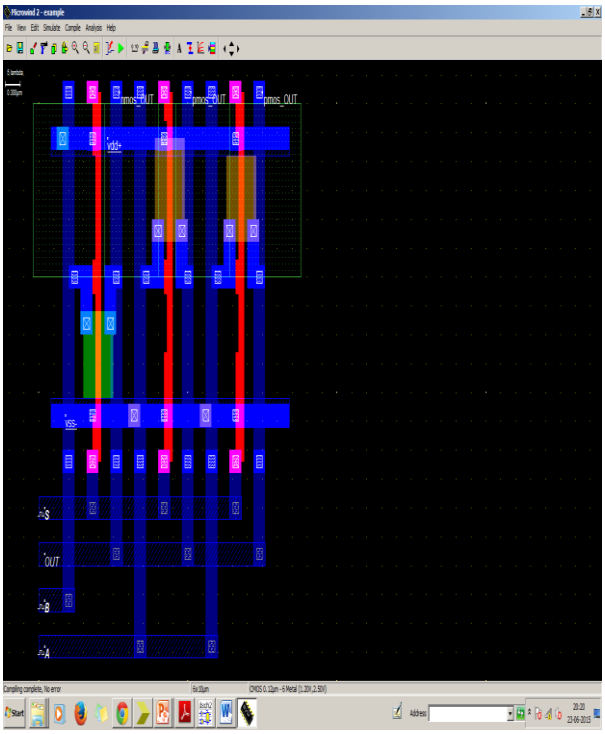
Making a Verilog file:



Verilog file:



Layout of GDI MUX:



RESULT & DISCUSSION

The recreation results in regards to power, PDP and postponement are appeared in Tables III– V, separately. Each of the proposed de-signs will be contrasted with its traditional partner. Specifically, 2– 4LP and 2– 4HP are contrasted with 20T, 2– 4LPI and 2– 4HPI are contrasted with upsetting 20T, 4– 16LP and 4– 16HP are contrasted with 104T lastly, 4– 16LPI and 4– 16HPI are contrasted with rearranging 104T.

As indicated by the got results, 2– 4LP presents 9.3% less power dissemination than CMOS 20T, while presenting

an expense of 26.7% higher postponement and 15.7% higher PDP. Then again, 2– 4HP beats CMOS 20T in all perspectives, diminishing force, deferral, and PDP by 8.2%, 4.3%, and 15.7%, separately. Both of our rearranging plans, 2– 4LPI and 2– 4HPI, beat CMOS 20T modifying in all viewpoints also. In particular, 2– 4LPI diminishes power, postponement, and PDP by 13.3%, 11%, and 25%,

TABLE III:- PROPAGATION DELAY RESULTS (IN PICOSECONDS)

	0.8V	1.0V	1.2V	4-16 DEC.	0.8V	1.0V	1.2V
CMOS	105	49	33	CMOS	214	97	66
2-4LP	132	62	43	4-16LP	203	93	64
2-4HP	99	47	33	4-16HP	195	88	59
CMOS INV	100	48	34	CMOS INV.	252	108	71
2-4LPI	89	43	30	4-16LPI	270	119	79
2-4HPI	87	42	29	4-16HPI	243	107	71

CONCLUSION

A TGL, DVL, and static CMOS mixed-reason plot for decoder circuits have been shown in this brief. This graphic incorporates all three of those types of reasoning. We built four novels with 2- 4 line de-coder topologies using this strategy. These topologies improve upon the performance of typical CMOS decoders by minimizing the amount of transistor checks and increasing the amount of control put out. These topologies are the 2- 4LP, 2- 4LPI, 2- 4HP, and 2- 4HPI. In addition, the authors presented four novel 4- 16 line decoder topologies, including 4- 16LP, 4- 16LPI, 4- 16HP, and 4- 16HPI. These topologies are based on the mixed method of reasoning 2-4 decoders as pre-decoding circuits, joined with post-decoders realized in static CMOS to provide driving capacity. These topologies are referred to as 4- 16LP, 4- 16LPI, 4- 16HP, and 4- 16HPI.

At 32 nm, we examined many flavor propagations and discovered, on the whole, that they provided support for the perspective that we prefer. The 2- 4LP or 4- 16LPI topologies are the ones that should be used for applications that want to minimize both domain and power consumption. Because of their applicability and general usefulness, the 2- 4LPI, 2- 4HP, and 2- 4HPI topologies, as well as the 4- 16 topologies under consideration (4- 16LP, 4- 16HPI, and 4- 16HPI), are all suitable for application as constructing impedes within the framework of larger decoders, multiplexers, and other combinational circuits with varying execution requirements.

The exhibited low-control properties and lower transistor count can be advantageous for both mass CMOS and SOI design implementations. The behavior that is intended to be carried out by the convinced circuits is to be carried out at the level of the organization, which makes them acceptable for use in both conventional cell libraries and RTL design.

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Efficient CMOS Multiplexer Layout Design and Implementation Using Various Technologies

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Abstract: **A multiplexer circuit is an essential piece of equipment that is utilized throughout several subfields of engineering. Research in very large-scale integration (VLSI) aims to streamline and condense design processes. Order to develop a 2-to-1 multiplexer utilizing CMOS logic, which will result in a circuit that is both simpler and more efficient, that is the purpose of this article. This article makes use of a wide variety of design techniques to reduce the footprint, complexity, and amount of power that the multiplexer requires. The technology at a 35nm wavelength has been investigated in this paper. In the end, we analyze the design procedures itself and work on increasing the effective area of the multiplexer.**

Key Words: MUX, Pseudo NMOS logic Low Power, Static CMOS logic, Low Power.

I. INTRODUCTION

The VLSI (Very large scale integration) is an important tool to integrate the number of components on a single chip. The choice of design style of VLSI product depends on the performance requirement, the technology being used, the lifetime and cost of the project. The important factors are area reduction, minimum power consumption and high speed. Now days, the demand for these factors are increasing. There are many design techniques are developed to enhance the performance of logic circuits. The operation in high temperature environment results in silicon failure and the circuit will be damaged. So, the requirement for low power consumption is increasing with the growth in devices like Mobile phones, medical instruments and Cs.Another factor is power consumption, which should be minimized because it results in low electricity consumption and less amount of heat is produced. [3] Multiplexer is major component in telecom industry and it‟s a key component of any arithmetic circuit. These are building blocks for data switching structure with resource sharing. In a communication system, the transmission takes place between transmitter and receiver by using a multiplexer at the transmitter side to transmit the data from many users on a single channel with the help of selection (control) lines.[4]

The field of field-programmable gate arrays (FPGAs) grew out of the PROM and PLD industries (PLDs). Any programmable logic device (PLD) or programmable read-only memory (PROM) could be modified in groups at a manufacturing facility or in the field. The Naval Surface Warfare Department supported Steve Casselman's early proposal in the late 1980s to create a personal computer capable of running 600,000 reprogrammable entries. In 1992, a patent was issued for the structure thanks to Casselman's efforts. The licenses granted for business central ideas and advancements for a programmable method of reasoning bundles, entryways, and justification squares.

1. MULTIPLEXER:

Multiplexer is a combinational logic circuit, in which the output is generated from one of the various inputs. Multiplexer is abbreviated as MUX. A practical application in which many users are requested to use a single channel to send their data, in that case multiplexer has ability to multiplex all signals and transmit on a single channel. So, it also called a data selector, to select the number of inputs one by one to provide a single output. The selection lines control routing of data input to the output.

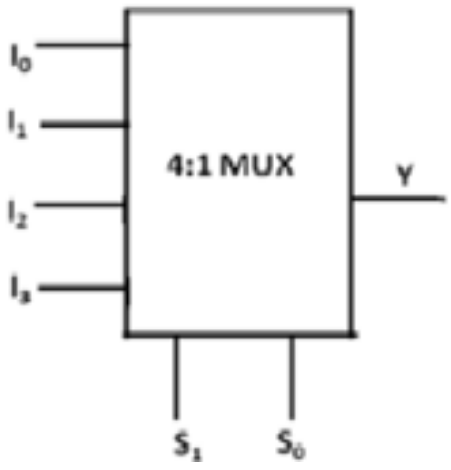

Fig 1:- 4:1 MUX

The 4:1 MUX consists of 4 external inputs with two selected lines to provide single output. An intelligent multiplexer is referred to concentrator in the telecom world. Multiplexers are used for switching application, A/D convertor, telephone network and Digital

semiconductors. [5] Multiplexers can be used as programmable logic devices. The circuit is combining two or more digital signals to give a single line. [6]

Table 1- 4:1 MUX truth table

Selection lines		Output
S_1	S_0	Y
0	0	I_0
0	1	I_1
1	0	I_2
1	1	I_3

The above table (1) shows the truth table for 4:1 MUX which consists of 4 combinations of input.

By using, selection lines are required to design 4:1 Multiplexer. Boolean expression for 4:1 MUX is written as:-

are the inputs applied to multiplexer, S0 and S1 are selection lines, Y is the output of the multiplexer

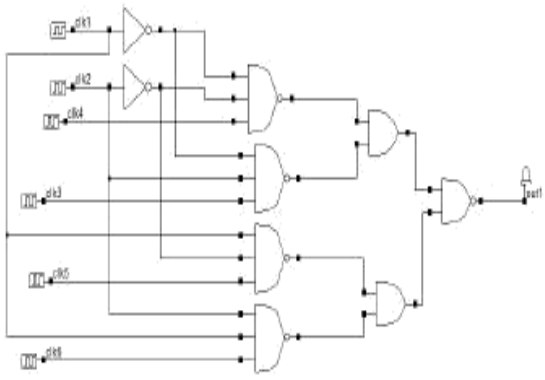

Fig2- 4:1 MUX Schematic

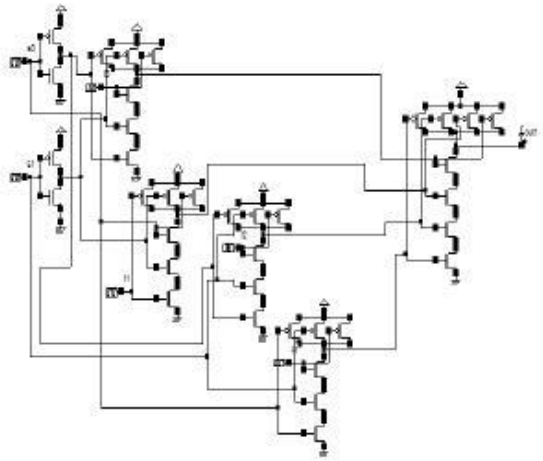

Fig.3- 4:1 MUX using CMOS

The circuit can also build with CMOS technology. It has been designed with implementing PMOS & NMOS transistors. In CMOS circuit, there is low power dissipation during switching operation of the device. The PMOS & NMOS transistors form the pull up and pull down network respectively. It is made by combining of NMOS and PMOS transistors with four external inputs (I0, I1, I2, I3) and normal & complemented inputs of S1 and S0 as selection lines to provide single output.

The above waveform is of 4:1 multiplexer, generated in DSCH in which s1 & s0 are control lines, (i0, i1, i2, i3) are input and out1 is output.

1. LAYOUT DESIGN:

DSCH3 & Micro wind are the CAD tools have been used to implement 4:1 MUX using NAND gate. Before the layout of 4:1 MUX, the schematic of circuit must be validate. The solution of this problem is taken by Dsch & micro wind. Dsch is a simulator for the simulation of logic design and to understand the proper function of the circuit. Then, the layout is created in micro wind. [8]

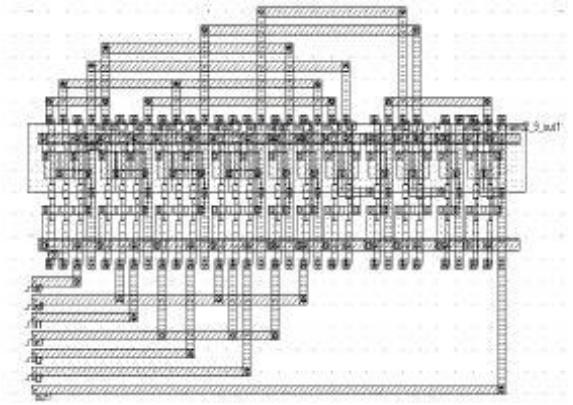

Fig.5- Auto generated layout of 4:1 MUX

This layout occupied the area of 432.2µm2 with power consumption by 25.645µw. The created layout can also be possible by semicustom design level.

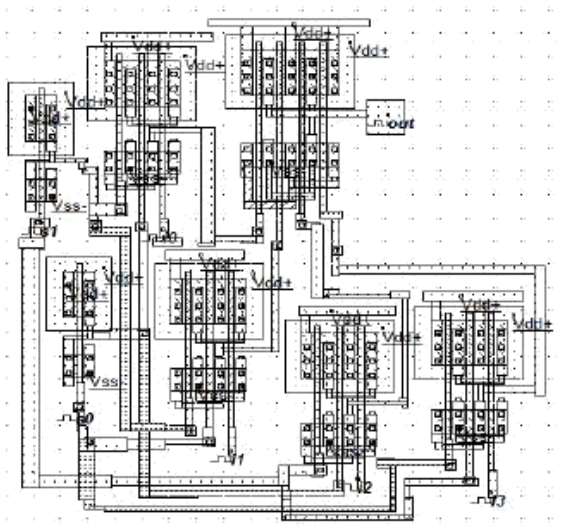

Fig.6- Semicustom layout of 4:1 MUX

The semicustom layout of 4:1 MUX is shown in the figure can be designed by different technologies 90nm. This layout occupies the area of 107.4µm2 with power consumption of 23.937µw in 90nm technology . Simulations have been done with micro wind 3.1 tool and it is performed on the layout of Semicustom design level. The logic „0" and logic „1" corresponds to low and high level respectively. Clocks are applied as inputs and selection lines.

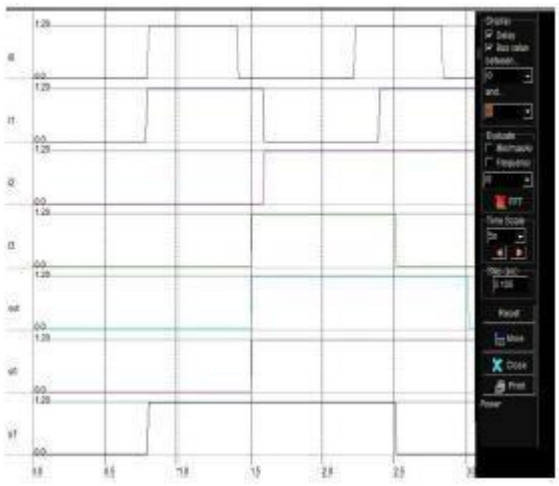

Fig.7- Waveform of 4:1 MUX for semicustom design

The 4:1 multiplexers have been designed by auto Generated and semicustom design tools. These are simulated and compared in terms of its power consumption and area at 90nm.

Table2- Comparison in terms of power and area

Technologies	Power	Area
Autogeneration (90nm)	25.645µw	432.2µm^2
Semicustom (90nm)	23.937µw	107.4µm^2

It has been observed that 4:1 multiplexer using Semicustom design level has low power consumption as compared to Auto generated design.

4. PROPOSED MULTIPLEXER USING CMOS

There are two types of MOS, i.e. the NMOS and the PMOS. Where NMOS transistor can gives the "LOW" signal completely, but it has poor performance at "HIGH" signal. Same as in PMOS transistor which gives the "LOW" signal completely but poor performance at "HIGH" signal. CMOS transistor is the combination of NMOS and PMOS transistor which gives full output voltage swing. Power consumption is very less in CMOS circuits compared to the NMOS design and bipolar transistors. There are different design methodologies of designing of integrated circuit such as full custom design, semi custom design and standard cell based design.

In standard cell design, a design is captured using the standard cells available in a library via schematic or HDL [2]. In the full custom design the function and layout of practically every transistor is optimized. This paper is based on the area efficient design 2 to 1 multiplexer using Micro wind tool. The schematic diagram of 2:1 MUX is as shown in fig.3.1.This circuit is designed with the help of universal NAND gates where 7 PMOS and 7 NMOS are used. The total numbers of 14 transistors are used in the CMOS design. P Switch is connected to the Vdd to the output and N switch is connected to the output to Vss [2]. In this CMOS design NMOS works as pull down network and PMOS works as pull up network.

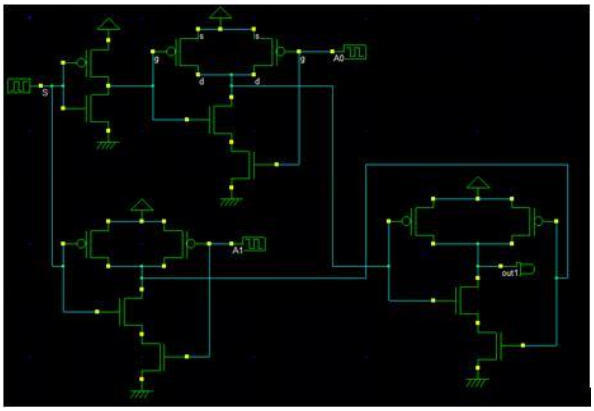

Fig.3.1 Schematic of 2 To 1 Multiplexer Using NAND Gates

Fig.3.2 shows the standard cell multiplexer layout design. Standard cell multiplexer design is complex and consumes more area.

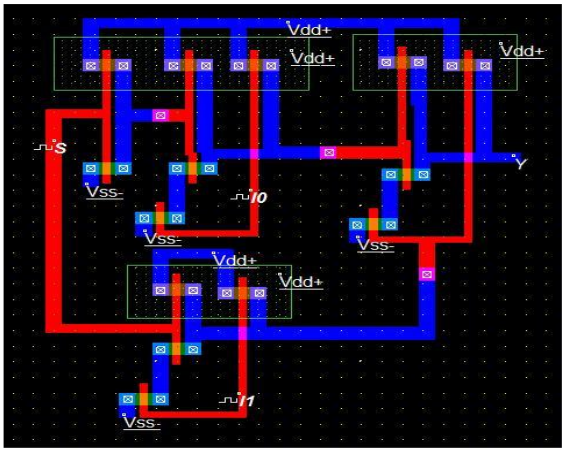

Fig.3.3 Semi Custom Design Of 2 To 1 Multiplexer

Fig.3.4 shows the design of 2 to 1 multiplexer using full custom layout design. Here all the PMOS"s has designed with common n well. Common n well requires single supply to the circuit and reduces the power consumption in the 2 to 1 multiplexer circuit.

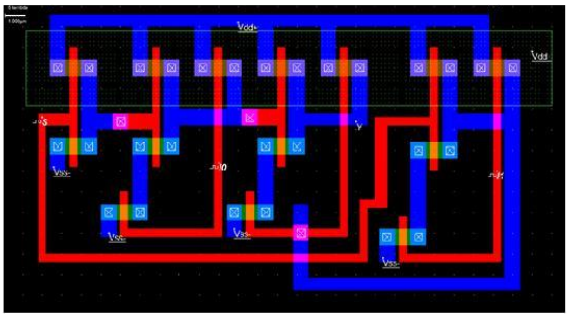

Fig.3.4 Full Custom Design of 2 to 1 Multiplexer

Fig.3.5 shows the simulation waveform of 2 to 1 multiplexer circuit. Here S is the selection line, Io and I1 are inputs and Y is the output. When S is low, output will follow I0 i.e. Y=I0. When S is High, output will follow the I1 i.e. Y=I1. In this way the logic has been verified for standard based design, semi custom design and full custom design.

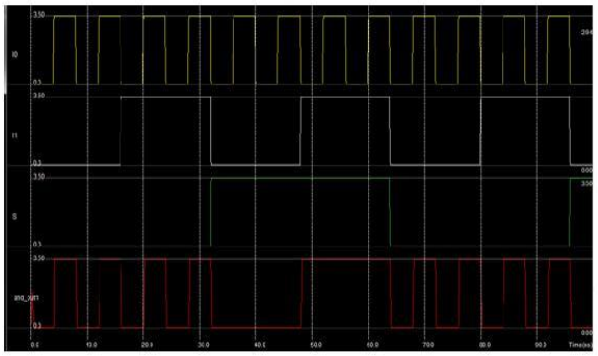

Fig.3.5 Simulation Result Of 2 To 1 Multiplexer

5. COMPARATIVE ANALYSIS

The main parameters of consideration are area, complexity and power of the 2 to 1 multiplexer in this paper. Table 4.1 shows the area and power consumption of 2 to 1 multiplexer circuit.

Table 4.1 Area and Power consideration

Multiplexer Layout	**Technology Used**	**AREA Used**	**POWER Consumption**
Standard Cell Based Design	35nm	696.32µm	46.800µW
Semi Custom Design	35nm	593.9µm	0.336mW
Full Custom Design	35nm	359.1µm	0.142mW

Here 35nm technology is used in the designing of standard cell based layout, semi custom based layout and full custom layout of 2 to 1 multiplexer with the help of Microwind tool. Transistor width (w) = 0.200 micrometer and length L=0.100 micrometer has been used in the design.

V. CONCLUSION

Based on this research, three different ideas for the layout of a 2–1 multiplexer have been offered. The 2-to-1 multiplexer may be constructed with a variety of different layout possibilities, including a basic cell-based layout, a semi-custom-based configuration, and a completely custom-made pattern. When evaluating the various design strategies, we measure their complexity, area, and power to make a comparison. Standard cell layouts are more complicated than other types of layouts, such as semi-custom-based layouts and full-custom layouts. In comparison to semi-custom-based layouts, full custom layouts have been demonstrated to result in a 35.67 percent reduction in the amount of energy that is consumed.

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Stampede Prediction for Public Protection

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***Abstract*— At present, there are so many issues regarding the crowd control, medical emergencies, security issues, identification and tracking of the pilgrims in the holy areas. Especially during pilgrimage, the pilgrimage authority finds it difficult to manage the situation. Thus, in order to identify, track and monitor pilgrims a system is needed. In this system camera is used to monitor continuously and to find high density with the help of image processing. The communication with base station is done through IOT platform called UBIDOTS. As soon as pre-stamped starts, people around pre-stamped, camera detect the picture and compare the density and message is send to the police if very high density is found. This embedded system is divided into two parts stamped detection and pilgrim monitoring unit. In Stamped detection unit, continuous monitoring of the stamped scenario by taking snapshots at regular intervals and will analyze the scenario for stamped threshold. If the people gathered in a particular area are more than the threshold, then stamped warning is sent and simultaneously an indication to the Pilgrim unit via UBIDOTS is also sent. In Pilgrim monitoring unit, continuous monitoring of the status of pilgrim using the health parameters of pilgrim and sending the Global Positioning System (GPS) co-ordinates along with the health parameters is initiated. The IOT module is installed to view the details and data obtained. The GPS co-ordinates are also sent to remote helpers for fast emergency response using Bluetooth module and Android application. At base station, data can be viewed using IOT.**

Keywords: stampede detection, crowd control, Global Positioning System, computer vision, automated analysis, closed circuit television, people tracking,

I. INTRODUCTION

In human social orders all over the world, massive events are renowned and always have been. Nowadays, typical illustrations include sporting events, celebrations, or shows. Mass events consistently attract a large crowd because of their increased versatility and population growth. Visitors utilize the surrounding facilities in addition to the event venue in order to reach the event area, resulting in large crowds at prepare stations and open spaces worldwide. More than 362 pilgrims perished in a stampede during the "stoning of the devil" Hajj in 2006, and 250 pilgrims perished in a similar incident in 2004.In 1990, a huge accident occurred when a stampede in Mina, Whitaker, killed 1400 pilgrims. For instance, more than 6 million people attend the Oktoberfest, with roughly 350 000 people watching on a daily basis. All things considered, the German football team has 40 000 fans at each match, and the largest stadium can only hold 80 000 people. The primary train stations in Frankfurt or Hamburg, for instance, accommodate 350 000 to 450 000 daily travelers. These significant social gatherings of individuals rarely cause any problems. However, despite all precautions, high person-to-person densities can occasionally lead to dangerous rushes and crowd stampedes. There has been an increase in research interest in this area over the past few years, with the goal of reducing the risk of accidents caused by stampedes with a large population and providing assistance to injured people. Another example is the devastating and fatal stamped in the Love parade crowd disaster that occurred at a music festival in Duisburg, Germany, in July of 2010.During that time, 21 people died and over 500 were injured in a section that was too small to accommodate a large number of people, making it impossible to help everyone. In group disasters, the passerby thickness reaches a fundamental level, causing members of the group to lose control of themselves and automatically move. In these circumstances, the pressure of the crowd rises, making it challenging to breathe and even to stand still. People tumble over one another. During pilgrimage seasons when people travel in large groups, these issues frequently arise. As a result, our goal is to cut down on accidents and stampedes by finding people before they start and following them to help those who are lost or in need of medicalassistance..

II. PROBLEM DEFINITION

We mostly mean the average number of people in a place when we say "crowd." A place becomes crowded when the total number of people living there exceeds its capacity. Numerous mishaps could occur as a result of the crowd. People lose control when there is a lot of people there, and the place becomes a disaster. This crowd is frequently used by criminals to engage in a variety of inhuman acts, such as harassing women. Presently, crowd counting is very important for keeping people safe in crowded places.

III. MOTIVATION

Computer vision, machine learning, and deep learning have demonstrated promising results in a number of everyday issues over the past few decades. The object detection task

is now more efficient thanks to recent advancements in deep learning. These techniques are frequently used by researchers Ramadass ,Arunachalam and Sagayasree to measure people's social distance across moving frames. Clustering and distance-based methods are used to determine people's distance from one another. As can be seen, the majority of the approaches are based on frontal or side view video sequences, which necessitate precise camera calibration in order to map pixels to distance in real, measurable units (such as feet, meters, etc.).Second, the overhead view's distance calculations will result in a better distance approximation and extensive scene coverage if we assume a top-down, or overhead, approach. An efficient framework for social distance monitoring was developed in this work by making use of an overhead view.

IV. LITERATURE SURVEY

Previously some engineers have proposed solutions for problems faced by pilgrims and authorities during the holy events. There are many systems under development used for tracking and monitoring which are using different means, protocols and facilities according to the need and convenience of the system. Some sites and journals where checked for literature survey of the project and the following information was acquired. The following mentioned below are the reference papers. The base paper was prepared by Sharley Kulkarni and S. K. Shah on “Monitoring and Safety of Pilgrims Using Stampede Detection and Pilgrim Tracking”, Vol 4, issue 7, July 2015.

A group of students from International Islamic University Malaysia, Malaysia demonstrated their project in “Hajj
Crowd Tracking System in a Pervasive Environment“. This paper proposes a structure for following Hajj pilgrims in a swarmed inescapable environment utilizing a framework called Hajj Locator. A talk on the model of Hajj Locator, as a framework to track and screen pioneers while performing Hajj and to spare lives, with an SOS component, is additionally displayed in this paper. Accessibility is identified with the accessibility/ presence of the association either by utilizing WiFi, GSM/GPRS or SMS to send the upgrade area information from a PDA/Smart Phone to the Hajj Locator server. Hajj Locator has the capacity to track the pilgrims in both indoor and open air environment which gives smooth tracking procedure. Accelerometer that will catch information that could be imperative during the time spent following pilgrims in indoor situations which incorporate the position, speed, controlling point and movement [1]. The main disadvantage of this is that it does not detect people before stampede begins and does not aide them during medical emergencies.

A computer vision framework is used that recognizes abnormal crowd occasions and basic circumstances from video streams and in this manner cautions security work force so as to take essential activities is used. Firstly, it works in real-time and, secondly, the privacy of the people being monitored is preserved. It coordinates the watched movement designs into models for mimicking person on foot movement and demonstrate that the proposed simulation model. This model mimics substantial human group and utilize methods from computer graphics to render manufactured recordings for further assessment of our programmed video observation framework [2].

Crowd behavior can be observed utilizing two methodologies, initial one is breaking down people conduct in a group which is named as question based and the other one is dissecting the group all in all which is named as comprehensive based approach. Distinguishing and following the group movement is a noteworthy fascinating exploration theme in vision investigation, swarm progression and visual observation fields. Framework will permit just approved individual to utilize it by entering the "Username and Password". The recordings comprise of numerous quantities of edges and this framework will remove those edges in the info video. Threshold optical flow values are chosen in such a way that the tracking of congested region in video is easily performed by comparing it with respective estimated optical flow values. The embedded system will by default detect the stampede scenario and also depict the results on a graph [3].

In another paper, Wireless Mobile Networks are used to track pilgrims during pilgrimage. Every pilgrim is given a WMN for tracking them and settled system is utilized for observing the pilgrims. The model comprises of the accompanying segments, for example, Tmote Sky module for following when GPS not in range, GPS module for proficient following, PIC Nano microcontroller for handling the signs, ISM band radio for correspondence to closest help focuses, Lithium particle batteries for WMN to work, RF handset and Personal PC [4].

A paper which relies on Wireless Sensor Networks aims at tracking lost people and aiding during accidents. WSN comprises of appropriated self-ruling sensors to screen physical conditions, for example, temperature, sound, weight and so on. These parameters are detected and helpfully transmitted through remote system to principle area. Every pilgrim is furnished with a portable unit. When server, gets the answer transmitted by portable unit, it will redesign the information of separate traveler in its stockpiling memory and re-transmit the data about the person to their separate relative and Guardian. As the portable unit held by traveler is inserted with keypad, the push catches gave on keypads can be utilized to create and transmit the caution/message in case of any emergency faced by the pilgrim [5].

Automated analysis of crowd activities using surveillance videos is a significant technique for communal security, as it permits location of perilous group and where they are going. Open places, for example, strip malls and airplane terminals are observed utilizing shut CCTV keeping in

mind the end goal to guarantee ordinary working conditions. Computer vision based crowd analysis algorithm can be divided into three groups; people counting, people tracking and crowd behavior analysis. These methods could lead to a better understanding of crowd behavior and increased safety from stampede [6].

A WSN network of fixed units is installed in the Holy area for receiving and forwarding data. Periodically, each mobile unit sends its user identification (UID), latitude, longitude, and a time stamp. A centralized server maps the latitude and longitude information on a geographical information system (GIS). The developed system can be used to track a specific or a group of pilgrims [7]. Another paper put forwards methods that resolve the problems related to the transportation and tracking of the pilgrims throughout the pilgrimage journey. This is done by installing a RFID tag on the bus in which the pilgrims are boarding and the pilgrims can be tracked by individually by the tags given to them. Another use of the RFID tags is that the traveler agency or bus driver can identify authorized passengers by providing the RFID tags [8].

V. PROPOSED METHODOLGY

This system was proposed after studying the requirements to identify, track, and monitor pilgrims in order to control stampedes caused by overcrowding, locate missing pilgrims, and guarantee assistance in medical emergencies. This is a system that works very well and is easy to use. The camera in this system is used to continuously monitor and find high density through image processing. UBIDOTS, an IoT platform, will be used to communicate with the base station. People around pre-stamped see the picture as soon as pre-stamped begins, and if a high density is detected, a message is sent to the appropriate authorities for action. The pilgrim monitoring unit and stamped detection sections of this embedded system are distinct from one another. The stamped scenario will be continuously monitored by the stamped detection unit, which will analyze the scenario for a stamped threshold by taking snapshots at regular intervals. A stamped warning and an indication to the Pilgrim unit via UBIDOTS are sent if the number of people gathered in a particular area exceeds the threshold.

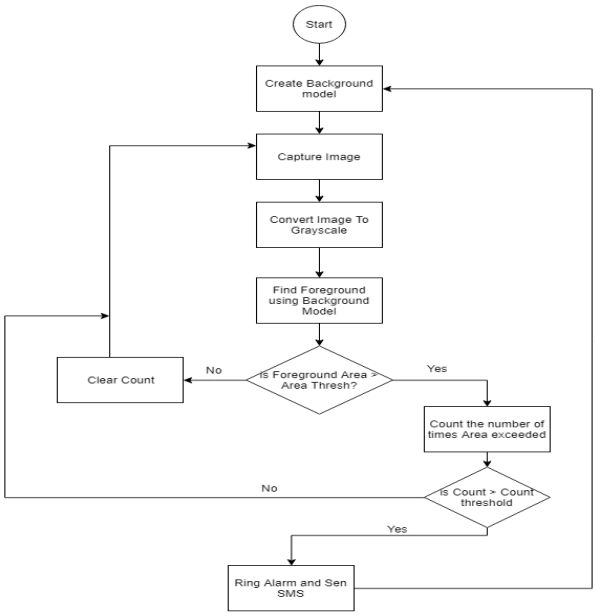

Figure 1 Flowchart for Stampede Detection.

VI. EXPECTED OUTPUT AND CONCLUSION

According to the survey, there are a number of methods for spotting stampedes in large crowds and locating individuals to assist them in an emergency. Crowd behavior can be identified using image processing algorithms. Algorithms for image processing come in many different varieties. In times of emergency, GPS and GSM modules can be used to track individuals and send messages or notifications. Utilizing an IOT (Internet of Things) module is yet another effective strategy. We came to the conclusion that image processing with deep learning, GPS, and an IOT module is the most efficient method for detecting stampedes and tracking individuals in large crowds in public places.

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Framework To Develop Smart Door Locking System With Authentication

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***Abstract*—Since ancient times locks have been invented by humans to protect their privacy and personal belongings. The locks are being constantly evolving for better protection. The main problem is that locking the door is not safe nowadays because the locks can be broken and easily bypassed. Locks nowadays are developed using technology that uses codes or phones or by cards to make the things safer. But these features can also be easily bypassed by hacking the codes or stealing the card. The comprehensive solution to this problem is combining features such as automatic door opening, motion sensing and camera verification into one lock to enhance the protection level of user's privacy and personal belongings.**

In this paper, we present a framework for a smart door that makes use of an ESP-32 Wifi module and a PIR Motion sensor. When a person rings the doorbell, the PIR Motion sensor detects their movement and sends a signal to the ESP-32 Wifi module, which activates the camera and sends the user an image of the person standing outside the door on the user's registered email address. The user can then open the door using the Blynk app.

Keywords— IOT, Sensors, App, Internet, Bluetooth.

I. INTRODUCTION

Every living being wishes to be safe whether it is a safety related to his belongings or safety of his own precious life. We have been taking several measures in order to attain it to live a worry-free life. In this project we propose a smart locking system which is designed to work based on the Internet of Things to prevent unauthorized access and trespassing. Normally the common targets where unauthorized access takes place are Banks, Financial organization, Government offices and organization, and shops. Such activities are performed with an intention of stealing money, or any important documents for personal gain. The main aim of our project is to provide a useful and a feasible solution to many of such issues.

II. PROBLEM DEFINITION

In recent times humans have a place of their own in which they keep their property with the help of locks to limit the penetration of their personal property or privacy, but there are many defects in these types of locks such as easy penetration into the property, poor security and the difficulty of dealing with these types of locks in one way that is the traditional key and no other way. The second problem is the occurrence of errors on the parts of human being like the loss of the key is very likely and also carrying many keys which expose the keys to be lost or to be stolen and also you can forget to close the lock, and here the lock cannot be closed by itself that is automatically because the locks that are used are mechanical and does not depend on electromechanical locks.

III. PROBLEM SOLUTION

In our project we are developing a Smart door lock using ESP-32 Wifi module with camera and PIR Motion sensor which will be connected using the Blynk app. In this lock when someone arrives at your door and presses the doorbell the PIR motion sensor will sense the motion of the person and send a signal to the ESP-32 Wifi module which will turn on the camera to take the picture of the person standing outside the door. The device will already be connected to the blynk app due to which you will receive the photo of the person on your registered email id with a notification. After checking the photo and the notification you can open the door using your mobile with the help of the blynk app. The main outcome or goal of our project is to provide an easy and convenient method for users to unlock the front door by removing the need of the old method of keys and to provide an enhanced level of security.

IV. METHODOLOGY

Our project is to make and IoT based smart door locking system. Therefore, the first step is the use of sensors, which will utilize Bluetooth to send signals and data to the app in response to the people's movement. We will collect sensor data with adruino uno and send it via email using the Blynk app. Our primary objective is to enable smart doors. For this we need to connect the app with the

system using internet. The owner of the area where the smart door is installed will have access to this system. Using mail, the app will be able to send the image of the person standing outside to the user.

We are utilizing an ESP-32 Wifi module with a camera that will take a picture of the person standing outside the door when the doorbell rings and notifies the mobile application. The door can then be opened using the mobile application and the person standing outside can enter. This process of opening the door after checking the image of the person standing outside the door with the help of blynk app can come under visual authentication.

Authentication is basically an act of providing an assertion, such as identity of a system user. Usually authentication by a server entails the use of a username and password. Other ways to authenticate can be through cards, retina scans, voice recognition, fingerprints and personal identification number(PIN). In our smart door lock we are using visual authentication because in our system the user will receive the image of the person standing outside the door on the user's registered email id and the user can then open the door using the Blynk app.

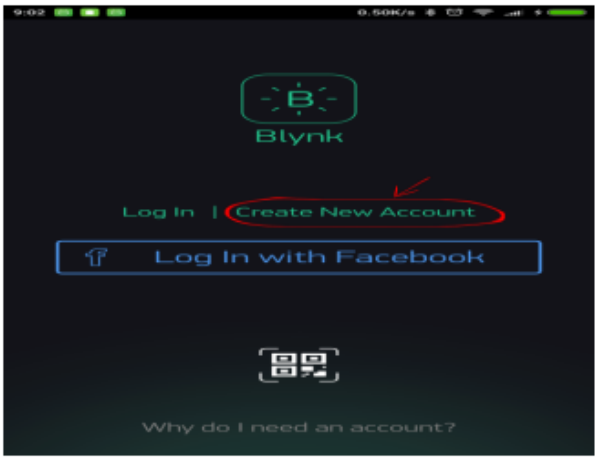

Fig. 1. Creating Account

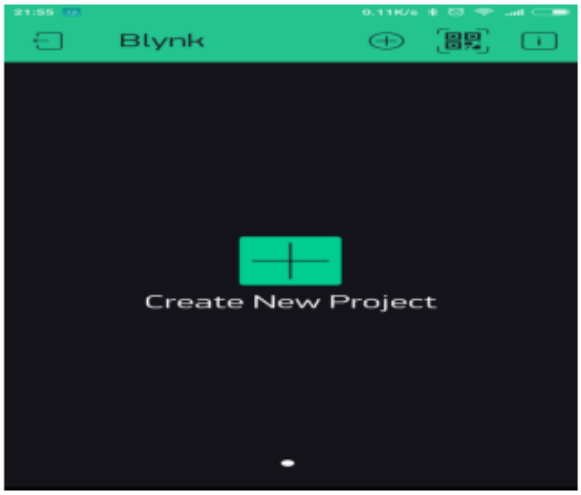

Fig. 2. Creating Project

V. Literature Review

There are just a few digital approaches for door security locks in the current system. This contemporary smart door locking system takes the place of the classic lock and key locking method. Modern living is largely reliant on technological advancements, such as opening doors, managing the air conditioning and regulating the curtains. People want to feel safe in their own homes, offices and stores. The primary motivation for the development of smart locks is to meet the needs of people.

Many automated advanced door locking system has been developed and its popularly used in many places like commercial buildings and organizations. Various control systems are being designed over the years to prevent unauthorized access. The main aim of providing locks for our home, school, office and buildings is for security of our lives and property. It is therefore important to have convenient way of achieving this. For this on the android we implemented an Bluetooth based door automation system. As a result, the price of implementation is lower and more accessible to the average user. The installation of the system is made simpler by using a wireless Bluetooth connection. It raises the level of security to stop the attacker from getting in without permission.

We surveyed many smart door locking systems. We found that these products are very expensive. We researched about smart door locks that use fingerprints, PIN and cards to open the door. There are few problems with these locks. Firstly the fingerprints and the PIN number can be easily accessed by hacking and the PIN numbers can be hacked and can also be cracked due to the mentality of the people to keep the PIN number in a format that is easy to remember like date of birth, mobile number and so on which can be easily cracked or can be found out through hacking. The door that uses cards also have issues like the loss or theft of cards that can be used by any intruder to bypass the respective property. Our smart door lock is made to deal with such issues by replacing the old fashioned keys and the use of cards, fingerprints or PIN number by using the Blynk app to open the door.

VI. Result And Discussion

The smart door locking system The smart door locking system will have all the smart lock features like giving the security to the person's house and office and also other organizations where the device will be installed. This door will be opened with the use of an app which will be installed on the user's device. The device will send an image of the person standing outside to the user using the ESP-32 Wifi module on the user's registered email id. The user can then see the notification and the image sent to him through the app and can open the door using the app.

VII. Conclusion

Smart door locking system using arduino is a modern successor of the conventional door locking system. The conclusion of the discussion of smart lock using arduino is the innovation created from the lock system with no more direct contact between the user and the lock. This system is very cost effective and easy to install. The use of the Arduino UNO microcontroller in this project allows for design simplicity, hence, the project can be achieved in lesser time. This system could be used to prevent houses, companies, institutions from stealing or losing the ordinary key. In this project we have made a

smart door locking system which is very basic as it comes to real world applications, but poses a wide range of possibilities for future. The benefits were easy and fast use. It has high security which protects our privacy and our property. It is expected in the future that these product will be relied on because they will replace the existing one and their features are much better and can be manufactured easily.

VIII. Future Scope

A rechargeable battery can be provided which can give power backup of 3-4hrs in case of power failure. It can also be implemented using cloud computing where user can control the lock irrespective of his location. Use of camera can also be done for surveillance. This system can be used in hotels, banks, motels, or any other place as an alternative lock for additional security.

IX. Acknowledgement

We would like to thank the faculty and our mentor of Thakur College of Engineering and Technology for giving us the opportunity to write and expand our views and knowledge on this topic.

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Wireless Charging with Electricity of Mobile Phones

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***Abstract*—Currently portable electronic devices are very popular these days and the portable devices are generally battery powered it means that every time it must be charged after some time and currently wired chargers are used for this purpose. The use of this portable electronic devices is increasing rapidly, as the demand increases for portable electronic devices the demand for longer battery life also increases simultaneously. These batteries always needed to recharged or replaced from time to time. It is very inconvenient to charge or change the battery from time to time, especially when there is no power outlet nearby. Instead of inserting a cell phone, personal digital assistant (PDA), camera, voice recorder, MP3 player or laptop to recharge it, it could receive power wireless method. The technology for wireless power transfer or transmission (WPT) is in vanguard of electronic development. WPT systems are generally designed to transmit power without the use of wires more efficiently than transmitting it with traditional method of using wires. There could be many large numbers of applications for wireless power transfer. Hence in this work a wireless battery charger had been proposed for mobile charging which is expected to eliminate the inconvenience with today's battery technology i.e., wired charging. The advantage of this device is that it can do wireless charging of the batteries which can save time and money in a long run for general people.**

Keywords— Electronic devices, Personal Digital Assistant (PDA), MP3 player, wireless power transfer or transmission (WPT), batteries, cell phones

I. INTRODUCTION

A mobile phone can be charged wirelessly through wireless charging technology, It is possible through the wireless transfer of power from a power source such as a charger to a load which would be (in this case) your mobile. The exchange of power without having to use wired connections is known as Wireless power transmission. This technology was developed in the late 19th and 20th centuries, the era which gave important innovations in electromagnetic research. The foundation of modern electrical power transport had been established on the basic principles of these advancements. Revival of related research was possible because of the improvements during the past 20 years. The application of Nikola Tesla's ideas and inventions such are the Tesla coil, the Magnifying Transmitter, and the Tesla turbine to name a few, attracted all sorts of people worldwide, which resulted in the feasibility of technological implementation merits examination. Various scientists gave their contribution to wireless power's development, the inventions from this time were more advanced than anything that had been made or seen earlier, developing the basic theories that yielded modern technology. Power can be transmitted wirelessly through conduction, induction, and radiation. There are various formulae to explain Electrical power transmission without using any physical conductors, each power transport has theories governing how electromagnetic waves carry from a transmitter to a receiver.

PROBLEM DEFINITION

Ideally, we humans want to consume technology effectively and efficiently to do our daily chores like charging our battery of our phones or toothbrushes or watches without noticing.

OVERVIEW

Wireless power transfer is a generic term for a number of different technologies for transmitting energy by means of electromagnetic fields. The technologies, listed in the table below, differ in the distance over which they can transfer power efficiently, whether the transmitter must be aimed (directed) at the receiver, and in the type of electromagnetic energy they use: time varying electric fields, magnetic fields, radio waves, microwaves, infrared or visible light waves. In general, a wireless power system consists of a "transmitter" device connected to a source of power such as a mains power line, which converts the power to a time-varying electromagnetic field, and one or more "receiver" devices which receive the power and convert it back to DC or AC electric current which is used by an electrical load. At the transmitter the input power is converted to an oscillating electromagnetic field by some type of "antenna" device. The word "antenna" is used loosely here; it may be a coil of wire which generates a magnetic field, a metal plate which generates an electric field, an antenna which

radiates radio waves, or a laser which generates light. A similar antenna or coupling device at the receiver converts the oscillating fields to an electric current. An important parameter that determines the type of waves is the frequency, which determines the wavelength. Wireless power uses the same fields and waves as wireless communication devices like radio, another familiar technology that involves electrical energy transmitted without wires by electromagnetic fields, used in cellphones, radio and television broadcasting, and WiFi. In radio communication the goal is the transmission of information, so the amount of power reaching the receiver is not so important, as long as it is sufficient that the information can be received intelligibly. In wireless communication technologies only tiny amounts of power reach the receiver. In contrast, with wireless power transfer the amount of energy received is the important thing, so the efficiency (fraction of transmitted energy that is received) is the more significant parameter. For this reason, wireless power technologies are likely to be more limited by distance than wireless communication technologies. Wireless power transfer may be used to power up wireless information transmitters or receivers. This type of communication is known as wireless powered communication (WPC). When the harvested power is used to supply the power of wireless information transmitters, the network is known as Simultaneous Wireless Information and Power Transfer (SWIPT); whereas when it is used to supply the power of wireless information receivers, it is known as a Wireless Powered Communication Network (WPCN).

II.PROPOSED FRAMEWORK

Field Regions- Electric and magnetic fields are created by charged particles in matter such as electrons. A stationary charge creates an electrostatic field in the space around it. A steady current of charges (direct current, DC) creates a static magnetic field around it. The above fields contain energy, but cannot carry power because they are static. However, time-varying fields can carry power. Accelerating electric charges, such as are found in an alternating current (AC) of electrons in a wire, create time-varying electric and magnetic fields in the space around them. These fields can exert oscillating forces on the electrons in a receiving "antenna", causing them to move back and forth. These represent alternating current which can be used to power a load. The oscillating electric and magnetic fields surrounding moving electric charges in an antenna device can be divided into two regions, depending on distance Drange from the antenna. The boundary between the regions is somewhat vaguely defined. The fields have different characteristics in these regions, and different technologies are used for transferring power: Near-field or nonradiative region – This means the area within about 1 wavelength (λ) of the antenna. In this region the oscillating electric and magnetic fields are separate and power can be transferred via electric fields by capacitive coupling (electrostatic induction) between metal electrodes, or via magnetic fields by inductive coupling (electromagnetic induction) between coils of wire. These fields are not radiative, meaning the energy stays within a short distance of the transmitter. If there is no receiving device or absorbing material within their limited range to "couple" to, no power leaves the transmitter. The range of these fields is short, and depends on the size and shape of the "antenna" devices, which are usually coils of wire. The fields, and thus the power transmitted, decrease exponentially with distance, so if the distance between the two "antennas" Drange is much larger than the diameter of the "antennas" Dant very little power will be received. Therefore, these techniques cannot be used for long range power transmission. Resonance, such as resonant inductive coupling, can increase the coupling between the antennas greatly, allowing efficient transmission at somewhat greater distances, although the fields still decrease exponentially. Therefore, the range of near-field devices is conventionally divided into two categories: Short range – up to about one antenna diameter: Drange ≤ Dant. This is the range over which ordinary non resonant capacitive or inductive coupling can transfer practical amounts of power. Mid-range – up to 10 times the antenna diameter: Drange ≤ 10 Dant. This is the range over which resonant capacitive or inductive coupling can transfer practical amounts of power.

Far-field or radiative region – Beyond about 1 wavelength (λ) of the antenna, the electric and magnetic fields are perpendicular to each other and propagate as an electromagnetic wave; examples are radio waves, microwaves, or light waves. This part of the energy is radiative, meaning it leaves the antenna whether or not there is a receiver to absorb it. The portion of energy which does not strike the receiving antenna is dissipated and lost to the system. The amount of power emitted as electromagnetic waves by an antenna depends on the ratio of the antenna's size Dant to the wavelength of the waves λ, which is determined by the frequency: $\lambda = c/f$. At low frequencies f where the antenna is much smaller than the size of the waves, Dant << λ, very little power is radiated. Therefore, the near-field devices above, which use lower frequencies, radiate almost none of their energy as electromagnetic radiation. Antennas about the same size as the wavelength Dant ≈ λ such as monopole or dipole antennas, radiate power efficiently, but the electromagnetic waves are radiated in all directions (omnidirectionally), so if the receiving antenna is far away, only a small amount of the radiation will hit it. Therefore, these can be used for short range, inefficient power transmission but not for long range transmission. However, unlike fields, electromagnetic radiation can be focused by reflection or refraction into beams. By using a high-gain antenna or optical system which concentrates

the radiation into a narrow beam aimed at the receiver, it can be used for long range power transmission. From the Rayleigh criterion, to produce the narrow beams necessary to focus a significant amount of the energy on a distant receiver, an antenna must be much larger than the wavelength of the waves used: Dant >> λ = c/f. Practical beam power devices require wavelengths in the centimetre region or below, corresponding to frequencies above 1 GHz, in the microwave range or above.

NEAR FIELD (NON-RADIATIVE) TECHNIQUES-

At large relative distance, the near-field components of electric and magnetic fields are approximately quasistatic oscillating dipole fields. These fields decrease with the cube of distance: (Drange/Dant) −3 Since power is proportional to the square of the field strength, the power transferred decreases as (Drange/Dant) −6. or 60 dB per decade. In other words, if far apart, doubling the distance between the two antennas causes the power received to decrease by a factor of 26 = 64. As a result, inductive and capacitive coupling can only be used for short-range power transfer, within a few times the diameter of the antenna device Dant. Unlike in a radiative system where the maximum radiation occurs when the dipole antennas are oriented transverse to the direction of propagation, with dipole fields the maximum coupling occurs when the dipoles are oriented longitudinally.

Inductive coupling:In inductive coupling (electromagnetic induction or inductive power transfer, IPT), power is transferred between coils of wire by a magnetic field. The transmitter and receiver coils together form a transformer (see diagram). An alternating current (AC) through the transmitter coil (L1) creates an oscillating magnetic field (B) by Ampere's law. The magnetic field passes through the receiving coil (L2), where it induces an alternating EMF (voltage) by Faraday's law of induction, which creates an alternating current in the receiver. The induced alternating current may either drive the load directly, or be rectified to direct current (DC) by a rectifier in the receiver, which drives the load. A few systems, such as electric toothbrush charging stands, work at 50/60 Hz so AC mains current is applied directly to the transmitter coil, but in most systems an electronic oscillator generates a higher frequency AC current which drives the coil, because transmission efficiency improves with frequency.

Resonant inductive coupling: Resonant inductive coupling (electrodynamic coupling, strongly coupled magnetic resonance) is a form of inductive coupling in which power is transferred by magnetic fields (B, green) between two resonant circuits (tuned circuits), one in the transmitter and one in the receiver (see diagram, right). Each resonant circuit consists of a coil of wire connected to a capacitor, or a self-resonant coil or other resonator with internal capacitance. The two are tuned to resonate at the same resonant frequency. The resonance between the coils can greatly increase coupling and power transfer, analogously to the way a vibrating tuning fork can induce sympathetic vibration in a distant fork tuned to the same pitch.

Capacitive coupling: Capacitive coupling also referred to as electric coupling, makes use of electric fields for the transmission of power between two electrodes (an anode and cathode) forming a capacitance for the transfer of power. In capacitive coupling (electrostatic induction), the conjugate of inductive coupling, energy is transmitted by electric fields between electrodes such as metal plates. The transmitter and receiver electrodes form a capacitor, with the intervening space as the dielectric. An alternating voltage generated by the transmitter is applied to the transmitting plate, and the oscillating electric field induces an alternating potential on the receiver plate by electrostatic induction, which causes an alternating current to flow in the load circuit. The amount of power transferred increases with the frequency, the square of the voltage, and the capacitance between the plates, which is proportional to the area of the smaller plate and (for short distances) inversely proportional to the separation.

FAR FIELD(RADIATIVE) TECHNIQUES-

Far field methods achieve longer ranges, often multiple kilometre ranges, where the distance is much greater than the diameter of the device(s). High-directivity antennas or well-collimated laser light produce a beam of energy that can be made to match the shape of the receiving area. The maximum directivity for antennas is physically limited by diffraction. In general, visible light (from lasers) and microwaves (from purpose-designed antennas) are the forms of electromagnetic radiation best suited to energy transfer. the distance from transmitter to receiver, the wavelength and the Rayleigh criterion or diffraction limit, used in standard radio frequency antenna design, which also applies to lasers. Airy's diffraction limit is also frequently used to determine an approximate spot size at an arbitrary distance from the aperture. Electromagnetic radiation experiences less diffraction at shorter wavelengths (higher frequencies); so, for example, a blue laser is diffracted less than a red one. The Rayleigh limit (also known as the Abbe diffraction limit), although originally applied to image resolution, can be viewed in reverse, and dictates that the irradiance (or intensity) of any electromagnetic wave (such as a microwave or laser beam) will be reduced as the beam diverges over distance at a minimum rate inversely proportional to the aperture size. The larger the ratio of a transmitting antenna's aperture or laser's exit aperture to the wavelength of radiation, the more can the radiation be concentrated in a compact beam Microwave power beaming can be more efficient [clarification needed] than lasers, and is less prone to atmospheric

attenuation caused by dust or aerosols such as fog. Here, the power levels are calculated by combining the above parameters together, and adding in the gains and losses due to the antenna characteristics and the transparency and dispersion of the medium through which the radiation passes. That process is known as calculating a link budget.

WORKING EXPLANATION:

For our project in order to wirelessly transmit electricity and power an electrical device, we follow the principle of electromagnetic induction.

We would like to not go deep into this subject. But the gist is that electromagnetic or magnetic induction is the production of an electromotive force across an electrical conductor in a changing magnetic field.

In our project there is two sets of coil one is transmitting electricity i.e. carrying current passes through coil to generates electromagnetic flux.

The other set of coils is receiving electricity i.e., electromagnetic flux is generated on transmitter coil is inducing electromagnetic flux onto the receiving coil and thus generating electricity wirelessly.

III. PROPOSED ARCHITECTUR & METHODOLOGY

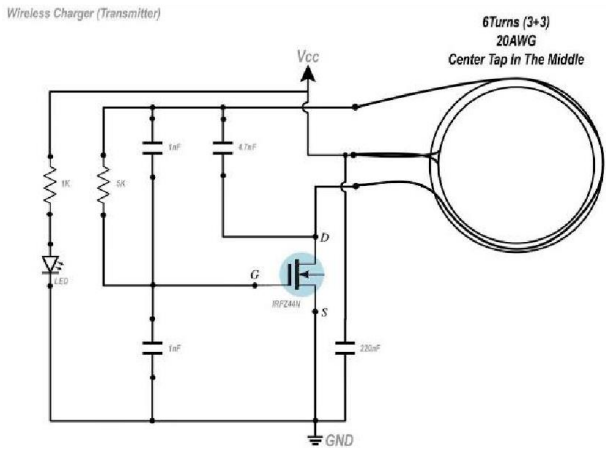


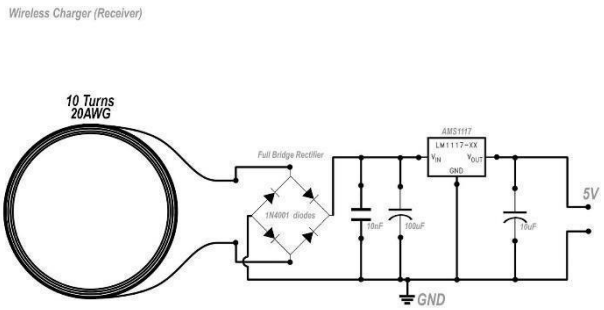
Figure 1:- transmitter circuit

1) In order to generate varying current, we used a LC tank.

2) When we supply current to the tank capacitor in the tank gets charged and when we current supply is stopped capacitor losses it's charge to the inductor and makes an oscillation.

3) And that oscillation is generated when the current is supplied at a pulse.

4) For the pulse to be generated we used pulse generating mosfet IRFz44N and to configure it we used two 1nF capacitor



1) The EMF generated on the transmitting coil when comes in the range of receiving coil EMF is induced.
2) The alternating current is generated through the coil which is rectified by the full bridge rectifier using four 1N4007 diode.
3) In order to minimising AC voltage spikes we used 10nf capacitor connected parallelly with the full bridge rectifier.
4) Voltage level when received via a EMF induced coil is low and fluctuating, in order to be used for our extensive use.
5) So we used a voltage regulator for a smooth i.e. nonfluctuating 5V output.
6) In order to configure the regulator we used 100µF and 10µF capacitor.

IV. FIELD SURVEY

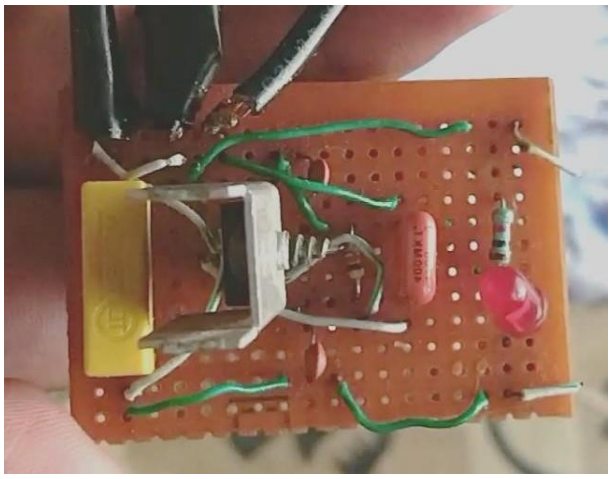
Advantages	Disadvantages
Convenience of not plugging our phone regularly.	Mosfet IRFz44N gets too hot over extensive timeof uses under 0.5A current power supply.
Our phone not gets hot and it will extend the battery life our phones.	Circuit is too bulky.
Multiple devices can be charged provided the suitable power supply.	Range of transmitting and receiving circuit is too low. And is inefficient.
Can trickle charge the devices for longer period of times.	Can't properly charge our recent era smartphones with big capacity of battery in it.

Table I : Advantages And Disadvantages

V. RESULTS

We have obtained the following results while we tested our hand made instruments.

1.Transmitter circuit

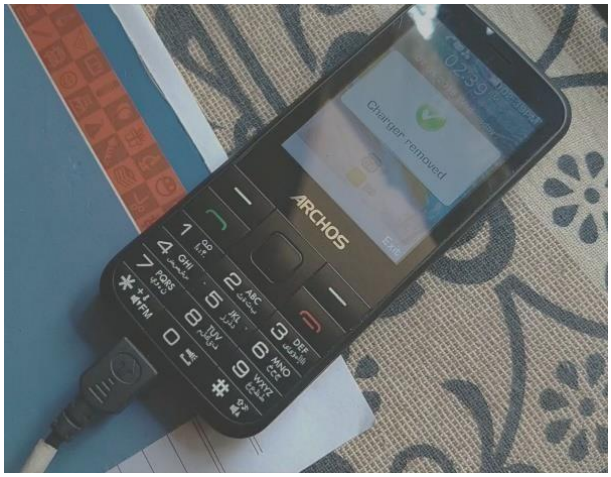


2. Receiver circuit

3. Both the coils coupled together to generate EMF to transfer electricity wirelessly

4. Showing device is charging

• Higher amp power supply can be used for charging at a less time.



VI. CONCLUSION

Several applications of wireless power transfer are apparent and obvious. Firstly, WPT could eliminate traditional charging systems in place today. Instead of plugging in a mobile phone or laptop via power cord to charge the battery, wireless power can be harnessed and implemented in a home such that a laptop and phone charge continuously and wirelessly without the need for plugging anything in. Higher level applications include charging of electric vehicles (EVs). As EVs become more and more prevalent on the roads, the feasibility of driving such a vehicle can be maximized via stationary, and even mobile, WPT systems. Future and theoretical applications include a potential solution to renewable energy for the planet, by means of satellites collecting sunlight and sending power back to earth through MPT.

ACKNOWLEDGMENT

The following work ‘Wireless Transmission of Electricity ‘cannot be created by a single person. The timely completion of the work has been possible due to the guidance of our mentor Dr. S. C. Patil who imparted his knowledge regarding the topic on us and with his continual motivation, this work was completed. We are also thankful to the Department HOD Dr. S. C. Patil for allowing us to use the lab equipment’s which were required for our project, and to our parents for providing us with all possible resources. We also thank our college ‘Thakur College of Engineering and Technology’ for providing us with a platform and the necessary facilities to make this project possible.

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Remote Controlled Rescue Robot for Disaster Relief

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***Abstract*—During emergency situations, and specially in urban disaster, many different people are deployed (policemen, firefighters and medical assistance). They need to cooperate to save lives, protect structural infrastructure, and evacuate victims to safety. In these situations, human rescuers must make quick decisions under stress, and try to get victims to safety often at their own risk. They must determine the location and status of victims and the stability of the structures as quickly as possible so that medics and firefighters can enter the disaster area and save victims. All of these tasks are performed mostly by human and trained dogs, often in very dangerous and risky situations. This is why since some years, mobile robots have been proposed to help them and to perform tasks that neither humans, dogs or any of the existing tools can do. For this project, we focused only on robots which will work in a disaster. These robots will assist firemen, police, and disaster agencies with reconnaissance, site evaluation, and human detection. The goal of this research is to develop mobile robot hardware (mechatronics and sensors) and software systems (user interfaces and navigation, planning and coordination module) to support these tasks. Compared to the other projects, these robots should have sufficient autonomy to maximize limited capabilities and attention of the human operator.**

Keywords- Human Detection , Rescue Robot , IOT Robot.

I. INTRODUCTION

In modern times, natural disasters such as earthquakes, building collapses or man-made disasters are common and cannot be stopped. They cause great damage to humans and material things. Whenever an earthquake occurs, people are often buried under detritus and it is difficult to detect their presence. In disaster areas it is very difficult for rescue teams to work as the area is too large for rescuers. In such scenarios a rescue robot can ease the work of the rescue team and make the rescue operation more efficient. The robot will have various sensors installed on it along with some means of communication with the rescue team. This mode of communication between the robot and the rescue team will be through internet. Thus the rescue team will be able to contact the robot and send instructions to it from large distances. The rescue team will get an idea of the affected area from the live video feed that the robot sends at the operating station.

II. RELATED WORK

To solve the problems faced by rescue teams many solutions have been proposed over the years by the researchers. Different systems have been developed using various techniques such as use of RF technology with PIR sensor[1], Pulse Rate[2], buzzer/alarm[4], live stream[6], ZigBee transceiver with PIR sensor[7], PLC systems[8], SMS through GSM technology[9], LCD display what GPS receiver[10]. Almost all the systems use PIR (Passive Infrared) sensor as common. But PIR sensors have limited detection range, hence a greater number of supporting sensors are required for the development. PIR sensors do not work properly without light or in dull light conditions. They are also affected by the climate change and high temperature. Zia Uddin, et. al. [1] has developed a PIR sensor based semi-autonomous mobile rescues robot which is able to find live human beings from an unreachable disaster area. Joystick & RF technology is used to control the semi-autonomous robot and communicate with the control station Ultrasonic sensor is used for obstacle detection and for navigating the robot. And it has a gas sensor used to detect gas leak inside the affected area. IP Camera is integrated to analyze the conditions which will assist human detection with the highest chance of success in such a situation. The first process is the use of a PIR sensor that detects humans & second is an IP camera which is to confirm the presence of humans in those areas. Because of the two levels human detection system the system is reliable for rescue missions. The microcontroller is programmed using C language and ARDUINO IDE. The system provides good results and it is cost effective. Since it has a joystick mechanism, hence it is handy to use. Murulidhara T C, et. al. [2] proposed the design and implementation of the Unmanned Vehicle using ARM7 microcontroller along with web camera, pulse sensor and temperature sensor to detect the affected human beings in disaster environment. IR sensor is included in the model to avoid obstacles in its navigation path. The vehicle navigates through the debris automatically to check the presence of human life. As soon as it detects the presence of humans, it checks the accident person's pulse rate, body temperature and sends this data along with GPS location information to the base station through ZigBee

Transceiver. ZigBee is used to send & receive data between robots and control units. The base station receives the longitudinal and latitudinal location of affected humans through ZigBee Transceiver and displays this information on monitor to speed-up the rescue operation. The hardware design consists of low cost, easily available & reliable components. Rahu Krishna K, et. al. [3] proposed an autonomous robotic vehicle that is able to move in the affected area and identifies living people. It has sensors that detect the presence of the human being and indicates the presence to the user. As the human body emits thermal radiation, which is received & manipulated with the aid of PIR sensor to detect human presence. Once the human is located, it immediately gives and audio & visual alerts to the authorities. The PIR sensor is assembled on a robot which can operate in the areas which are prone to earthquakes. The robot has a 3-wheel geared driver & DC motors attached for forward, reverse, left & right actions. The controlling device of the system is a Microcontroller to which RF receiver, PIR sensor & DC motors are connected. The remote control has control buttons interfaced to RF transmitter. Whenever a button pressed, the data related to that button transmitted through RF transmitter to microcontroller. The microcontroller processes this data and acts accordingly and sends required control signals to the robot's motor drivers. PIR sensor is constantly checked for human presence and if it gets any reading it sends to a controller. The controller alerts through buzzer if human presence is detected. Saravana Kumar K, et. al. [5] proposed a robot which is used to detect humans to overcome robbery and to enhance security measures. The robot has a receiver side and the transmitter side. The transmitter is an ATMEGA328 microcontroller PIR sensor that takes the input of a microcontroller, and an Obstacle sensor. The outputs are displayed on RF transmitter & L293D motor drive module, that is connected to DC motor. The DC motor is used for moving the robot in all directions. PIR sensor detects the presence of humans. The PIR sensor has limited range up to 12ft and has an angle of rotation 180 degree. At the receiver end is an ATMEGA328 microcontroller. Its input & output are buzzer and a RF receiver. After receiving the signal by the RF receiver, it notifies the Arduino. Arduino sends a signal to the buzzer, which makes the buzzer to sound continuous beeps. This beeping shows that there is a human to the rescue team. This system is capable of detecting the presence of humans in the range of 10-12ft successfully.

III. PROBLEM DEFINITION

The currently accessible robotic technologies like locomotive robots and self-guided vehicles like patrol robots, pathfinder robots, industrial carrying robots, etc., make human life comfortable and do well in the operations for which they were developed, but the current analytical robots that are available have bulky hardware and controllers mounted onto them, which makes them expensive and hectic to troubleshoot. Hence, to relieve humans from such burden new methods has to be devised and better progression by making the robot lightweight. This project deals with making a robot with a wireless mode of control and monitoring of individuals or areas with manual control techniques and building it in an optimal method that is cost-efficient and user friendly.

IV. PROPOSED SYSTEM

The system flow diagram of the proposed model is presented in Fig.1. It facilitates how the system will ideally work in actual.

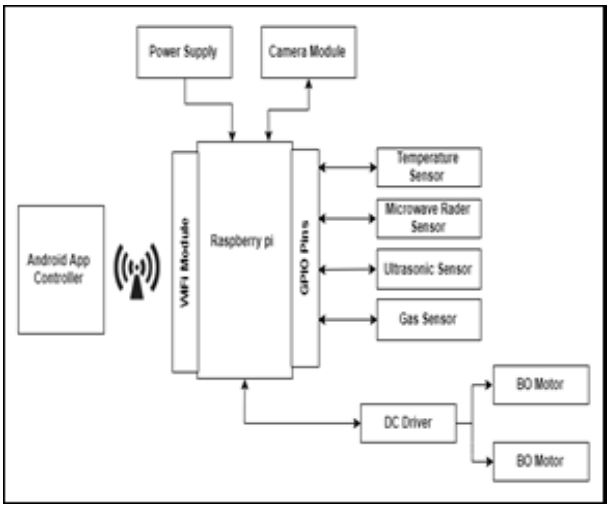

Fig.1 System Flow Diagram

The above fig 1 represent the System flow diagram of the proposed system. According to the diagram, the Raspberry Pi is assembled with set of sensors which include Temperature sensor, Microwave radar sensor, Gas sensor and Ultrasonic sensor. The raspberry pi is provided with a power supply and whole model is controlled using the controller which in this case is an android smartphone application. The android application and the robot are connected through wi-fi. The camera module is the most important component as the rescue team can get an idea of the affected area from the live video feed.

Raspberry Pi:

The raspberry pi is a single-board computer based on Broadcom BCM 2711 system on chip. It has a 1.5 GHz CPU on board. It uses a 64-bit quad-core cortex A72 ARMv8 architecture-based CPU. The raspberry pi version features 1GB of RAM. It uses an SD card to store the OS. It has a USB port through which a USB microphone is connected and speech input is given. It has a CSI port through which Pi camera is connected. The Raspberry PI features a 3.5 mm universal headphone jack for audio out.

Microwave-radar Sensor:

Microwave Radar sensors have increased detection range and can work properly in dark environments also. A microwave radar sensor works by emitting microwave signals. These signals return to the sensor at constant intervals. If it detects motion, the readings of these signals change. As soon as the microwave radar sensor knows about the change in return time of the signal, it sends the message to the user that human is detected while considering other parameters.

Ultrasonic Sensor:

Ultrasonic sensor is an instrument that is used to measure the distance of objects that come in its part. It emits sound waves which are reflected back from the objects. It calculates its distance by measuring the laps between sending and receiving signals.

MQ6 Sensor:

The MQ6 is capable of detecting gas concentrations varying from 200 to 10000 parts per million. It is an analog resistance sensor for output. This sensor has a high sensitivity and gives fast response.

DTH11 Sensor:

DTH11 is a humidity measuring sensor. It is a substrate that holds moisture with the help of electrodes on its surface. It converts the signals from electrodes and sends it directly to raspberry pi.

V. IMPLEMENTATION

The proposed system is a Microwave Radar sensor based human detection robot which can detect live human being from an unreachable point of the disaster area. The robot is assembled with some set of sensors which include Microwave radar sensor, Ultrasonic sensor, Temperature sensor, Gas sensor etc. Android technology is used to control the robot and communicate with control point. Ultrasonic sensor is used for obstacle detection and it decides the navigation path of robot & gas sensor is used to detect gas leak inside the building. Camera is also integrated in the model to observe and analyze current scenario through live streaming on mobile. It will facilitate human detection in reliable manner with highest probability of success rate in this kind of situation.

Microwave Radar sensor has increased detection range and can work properly in dark environment also. A microwave radar sensor works by continuously sending out microwave signals. These signals return to the sensor in consistent intervals. If motion occurs, the timing of these signal changes. As soon as the microwave radar sensor knows about the change in return time of the signal, it sends the message to the user that human is detected while considering other parameters also. The proposed system is also lashed with live streaming feature which will facilitate the operation to a greater extent of success. The proposed system will give better results as compared to all previous solutions. It will greater performance measures and high accuracy. The control mechanism is there for the navigation of the robot. And the readings of the current scenario are displayed which includes current temperature, gas detection, distance etc

VI. SOFTWARE USED

1. Arduino IDE

The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software

2. Blynk app

Blynk App - allows to you create amazing interfaces for your projects using various widgets we provide. Blynk Server - responsible for all the communications between the smartphone and hardware. You can use our Blynk Cloud or run your private Blynk server locally.

VII. EXPECTED OUTCOME

The expected rc model, should be able to detect human presence in the given radar, by motion and temperature sensors. The model will be controlled by an android and, the user will have visuals of the models. environment. This project deals with making a robot with a wireless mode of control and monitoring of individuals or areas with manual control techniques and building it in an optimal method that is cost- efficient and user friendly.

VIII. CONCLUSION

From the research, it can be concluded that an android smartphone can be used to perform the task of controlling the movement of the robots from one position to another position. The robot is set to be a cost-efficient alternative to many surveillance applications since it is based on android. The mobile robotic vehicle will accomplish missions such as navigating the hazardous environments safely for surveillance purposes of areas of special interest to humans which are strenuous for a human being in some special scenario

IX. FUTURE SCOPE

For the future of this project other modules can be introduced into this system. Further, cameras and AI can also be used to completely control the RC robot. With the help of ultrasonic sensor systems, it is able to avoid collisions which enhance the working capability of the robot in extreme conditions. The system is helpful in reducing the risk of life of a rescuer and it also eliminates

the physical presence of rescuers at the affected site. The rescuer will only have to operate the robot using an android app controller. Rescuer will also be able to see the live streaming of the current scenario in the same app through the camera module. The system gives positive results as soon as it detects a living human in its working range. The system gives better and reliable results. Since the system needs lots of power supply instead of using batteries it can have solar power source. High pixel camera can be used for more clear and proper streaming.

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Automotive Battery Management System in EV

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***Abstract*— Consumption of fossil fuels is growing rapidly, which is a warning to the world about unconventional energy sources and their reliability in the future. It has transformed research into complete and hybrid electric vehicles, leading to the development of an efficient battery management system (BMS). The system should guarantee many critical features such as charge control, battery health and monitoring, runtime information, cell balancing and power prediction algorithms. Optimization of the whole system results in a more efficient and safer vehicle to meet the requirements of each road. The goal is to develop software simulations to display the entire system, some of which include an estimated algorithm for temperature, voltage and current levels, as well as a battery level indicator, charge status and health display status. Odi aggression. BMS is verified using real life scenarios and data.**

Keywords*— BMS, SOC, SOH, Capacity, Impedance, SOE, EV, cell balancing algorithm

I.INTRODUCTION

From the beginning of the 21st century motor vehicles production has increased exponentially. The amount of CO2 is significantly increasing which proves the non-reliability of conventional sources of energy.

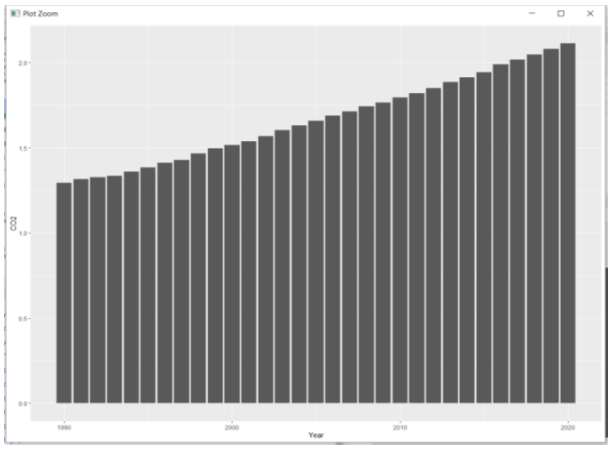


Fig 1. CO2 concentration variation recorded since 1990

This gave revival to the research left by William Morrison to be picked up again in 1990s and quickly accelerated in 2010 since then a lot of new concepts related to the same have come to limelight and made us ponder if the switch to electric power is more or less reliable. The electric vehicle has different types like the Full hybrid EVs or Plug-in EVs which have batteries that are solar powered. But this has certain limitations like high cost, placement of panels, maintenance, more applicable in tropical regions, etc. Hence, the preference is given to normal EVs at the time. Many models have come forward in India like the TATA Tigor which have escalated the requirement of electrical and electronics-based engineers as the work has to be done on battery power management [2]. This brings Battery Management System or BMS into the picture. In case of an EV there are 3 inputs on a basic level given to the BMS - voltage, current, temperature. The output in response is the working of the respective part and along with parameters like SOC, SOH. The expectation from the system is that not only should it provide the necessary power but also keep the batteries long lasting. The Battery Management System (BMS) is an electronic system that protects a rechargeable battery (cell or battery pack) from operating outside its safe operating area, monitors its condition, calculates secondary data, regulates its environment, verifies it and, among other things, 1]. Accurate estimation of the charge status (SOC) of a Li-ion battery is a very challenging task because the Li-ion battery is a highly time-varying, non-linear and complex electrochemical system [11]. BMS also controls battery recharge by redirecting the recovered power to the battery pack. If we want to make the EV reliable, we need to be able to control the charge state of the battery, which tells us whether we need to stop the car and recharge, the health status of the battery, whether the battery is still good or not. Or. If we have to buy a new one and put it in a well-defined range of battery temperature, safe values. Furthermore, due to over-discharge or prolonged storage of cells, the cell voltage drops below its lower limit, typically 2.5 V [12]. In EV, the battery management system (BMS) controls the battery status and usage. Our research in this paper focuses on concepts related to construction systems and understands everything to develop efficient and secure systems to operate.

II.LITERATURE REVIEW

The development on the topic is mainly through extensive research analysis and hence many papers have been considered. Most of them have been focused on the increase in the number of sensors for the safety of vehicles as that is the major concern of people when

buying. The development of the model has to be done while keeping in mind a few factors like voltage, current, temperature, impedance, capacity, SOC,SOH,SOE, SOL, etc. These are very important to ensure the maintenance of the vehicle and hence have a longer lifespan. This gives assurance of safety and reliability. The research of one of the papers suggested for the development of a precaution algorithm which takes into account the previously recorded data during testing of the vehicle where it was subjected to water, speed breakers, and different other conditions for testing, this can be used to form algorithm which will be pre-informing the driver if the similar observation is made, what will be its effect and how to tackle or solve it [9]. This would help for the safety factor. The use of CANBUS interface for the same was under emphasis as it provides for a low cost, less complex interface between the Application controller and BMS which facilitates the communication and hence the efficiency. The various power optimization algorithms were dealt with in one paper which emphasized on the cell balancing techniques and also covered the charge and discharge process to make it faster and more industrialized.

III. BATTERY MANAGEMENT SYSTEM - METHODOLOGY

Any electronic system that operates on a rechargeable battery is called to protect it from operation outside its safe operating area, monitor its condition, calculate secondary data, report that data, control its environment, verify and / or balance it. Battery management system.

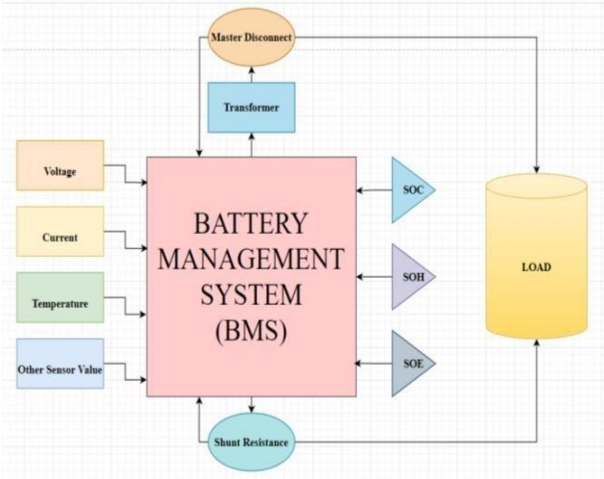


Fig 2. Battery Management System block diagram

The system is developed keeping in mind the achieving of 2 aims – safety and reliability of the EV. The maintenance of the same is done by considering the amount and effect of input and output parameters. The input parameters include voltage, temperature, current and sensor reading. The output to the same is State of Charge (SOC), State of Health (SOH), Safety Envelope (SOE) and faults detected. The SOC indicates the current battery level status, SOH indicates the battery efficiency degradation from initial value, SOE tells the safety limit between charge and discharge and faults are the status signals. The BMS performs the function of monitoring the voltage of each individual cell and collectively, followed by measurement of current through the introduction of shunt resistance in the flow path. It consists of a master disconnect which allows it to disconnect the circuit to load and connect it to the charge station when plugged in. The external terminals provide for load addition like the motor for wheels in case of EV. There is an additional communication interface used to update the BMS with the performance and behavior of EV.

A. Battery Pack

Alessandro Volta was the first to give a model of a true battery. Since then, there have been a lot of changes in the shape and design of the battery. In case of an Electric Vehicle there are 3 types of batteries which are considered for the system. These are:

1. Li ion batteries
2. Lead acid batteries
3. Nickel metal hybrid batteries

The lead acid batteries are usually not considered for the work as cost and maintenance of the same is very high.

The Lead acid batteries are used for storage of charge or as secondary batteries in fuel run cars. The batteries consist of Sulphuric acid and 2 electrodes of lead oxide and pure lead to facilitate charge flow, but such structure is very risky for EV.

The most used pack is the Li-ion battery pack which is arranged in 2 types of formats. One is cylindrical cells aligned vertically and other is prismatic cells. The advantages of using Li-ion battery packs are the low-cost, High-energy density, less charge time, long range, low self- charge, i.e., the self-battery drain occurring automatically is low [10]. Also, the main factor of low maintenance is the key for the use of it.

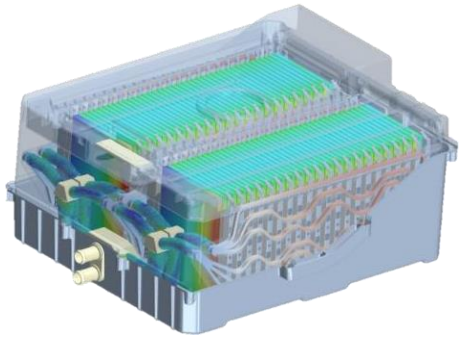


Fig 3. Battery pack of 11.4 volts rated Li ion cells for EV

For the calculation of the total capacity o-f pack the following parameters are considered – speed, current withdrawn, current loss. For understanding let us consider the speed of a vehicle to be 20kmph and the current drawn from it measured through a multimeter is 5A.The assumed current loss(A.C.L) is 5% with a range of 200 km.

Now,

Table I Li Ion Cell Capacity Calculation Variables

Sr.No	Measurement Considerations	
	Quantity	Value
1	Speed(S)	20kmph
2	Current(I)	5A
3	A.C.L	5%

Effective Current (EC) = I + A.C.L of I (1)

Since we have the EC and the voltage of each cell is 72 volts, the power is calculated,

Power = V x I (2)

Table Ii Individual Cell Power Rating Calculation

Quantity	Value	Units
Voltage	72	Volts
Current	5.25	Ampere
Power	3.78	Watts

Now, to calculate the T.F

T.F = total range / total speed (3)

Hence, Power required is

Power Required (P.R) = T.F x Power (4)

Now since the efficiency of pack or the SOH is 85% Hence,

Pack Capacity = P.R / efficiency (5)

Table Iii Power Required For Range Of 200 Km

Quantity	Value	Units
Range	200	km
Speed	20	kmph
Times Factor	10	N/A
Power Required	3780	Watts
Peak Capacity	4.447	Kilo Watts

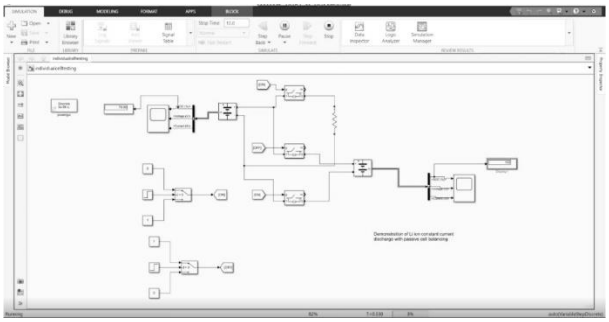


Fig 4. Li ion Battery Pack power rating simulation

B.SOC

The SOC stands for the state of charge of BMS in an EV. The definition of the same is the capacity remaining of the pack w.r.t the total capacity of the pack now. In terms of a formula, it is represented as,

SOC = Current Rating or Capacity / Total Rating or Capacity

For example, if the SOC of a pack or cell is 70% it means that if the total capacity of the cell is 100Ah then 30Ah has been used hence 70Ah is remaining for use. The SOC has 2 parts associated with it – SOC for capacity and SOC for Energy which is used in maximum EV. The SOC for a vehicle is plotted at 50% in the below graph of voltage vs Ah discharge.

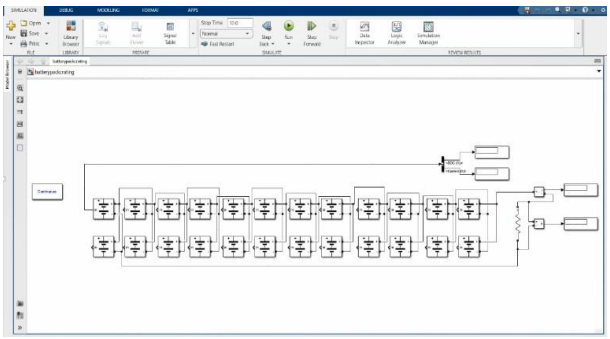


Fig 5. Li ion Battery Pack of 12 cells SOC measurement

For the calculation of SOC there are different methods but most importantly a few factors have to be considered before performing the process. The 3 types of methods to find SOC are – OCV method, Kalman Filter, Neural network.

1.In the first method of OCV we have to calculate the current which is measured across the shunt resistance connected to the BMS in EV which will have some amount of drift hence a little error. Due to this we use a factor known as OCV which is open cell voltage to compare integration of actual voltage difference or electric potential between two cells when disconnected from a cell. The calculation of the same is through the

area under curve, which is given by integration, hence the formula becomes

SOC(t) = SOC(t-1) + (6)

Where,

SOC(t) – SOC at that time SOC(t-1) – SOC initial value Un – nominal capacity

i(t) – current at t

2.The second method is the Kalman filter method where we observe for state estimation which contains a model of the system under observation and uses a recursive algorithm which predicts the future state and current of the system.

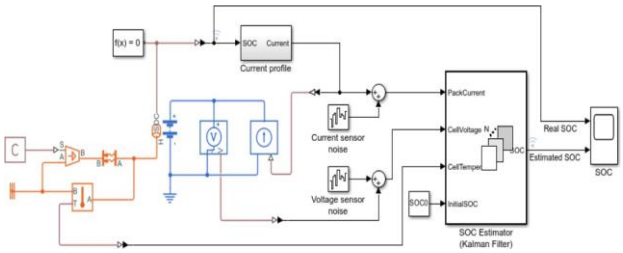


Fig 6. Li ion cell SOC estimation using Kalman Filter

3.The third system used for the calculation of SOC is the neural network which considers a large amount of data and using that the machine learning algorithm is deployed which learns patterns and predicts the SOC value according to different conditions.

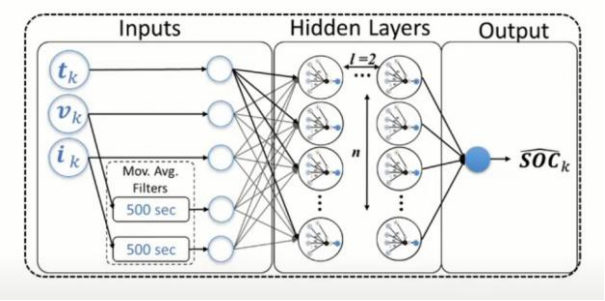


Fig 7. Existing deep learning neural network method for SOC estimation

Among these different methods the most preferred is the OCV method because it is the most efficient and easy to calculate as compared to other methods. The table below provides the SOC value calculated with all methods out of which OCV method comes closest to the real time monitoring value.

Table Iv Soc Estimation Methods Comparison

Sr. No	SOC estimation methods			
1.	OCV method for determination			
	Voltage	Time	Battery Capacity	SOC(%)
	12 volts	3 hours	500Ah	88%
2.	Kalman Filter			
	Voltage	Time	Battery Capacity	SOC(%)
	12 volts	3 hours	500Ah	87.53%
3.	Neural Network			
	Voltage	Time	Battery Capacity	SOC(%)
	12 volts	3 hours	500Ah	86.34%

C.SOH

SOH for an EV BMS is the state of health of the system. It is defined as the Total capacity life today w.r.t Capacity at the beginning of life

SOH = Total Capacity now (Ah) / Beginning of Life Capacity (Ah) (7)

In the case of SOH, we observe two kinds of measurements obtained which are – State of Health in terms of capacity (SOHc) and State of Health in terms of impedance (SOHi). When we consider the SOH measurement it is observed that in case of SOHc there is a decrease in the capacity as the number of charge and discharge cycles increases. This means that over a period of time for the EV the charging and use will affect the circuit components especially the impedance. The graph of SOHc vs Cycles is observed as the following

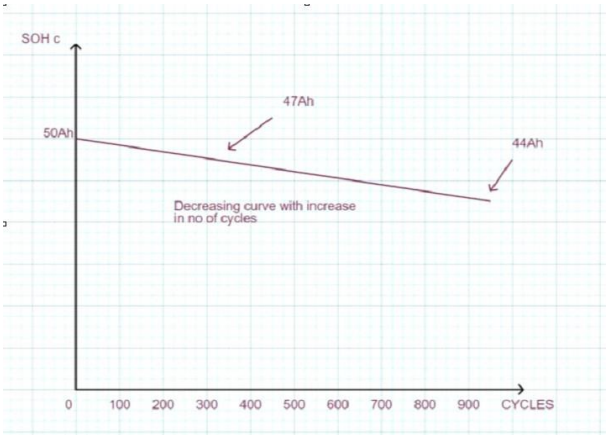


Fig 8. SOHc of 11.4V rated Li ion cell vs charge and discharge cycles of battery pack

The SOHi is the impedance factor considered which has to be considered because more charge and discharge cycles cause an increase in the voltage drops across the resistor and hence the resistance increases which also triggers the increase in thermal output. This might

become a possible cause of fire. The graph of SOHi vs cycles is as follows

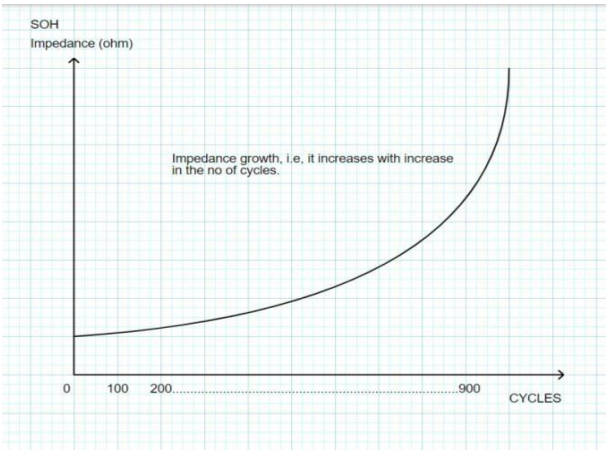


Fig 9. SOHi of 11.4V rated Li ion cell vs charge and discharge cycles of battery pack

The SOH value is used to calculate the estimated range for an EV which is also used to estimate the SOC. The following factors are considered for the same – Beginning of life(BOL) capacity, Total capacity now. For example, consider an EV with BOL capacity = 100% and Capacity now = 80%.

Hence, If the BOL range initially was 200 km

Now the range = BOL range x Capacity now(8)

Table V Soh Application In Determination Of Current Vehicle Range Capacity

Quantity	Value	Units
BOL Range	200	km
Cell BOL Capacity	80%	N/A
Current Range	160	km

To know the range remaining we have to consider the SOC as well, let us say it is 70%

Hence,

Range remaining = now range x SOC now (9)

Table Vi Remaining Li Ion Cells Range Determined Using Real Time Soc Of Battery Pack

Quantity	Value	Units
Current Range	160	km
SOC of Li ion cell	70%	N/A
Remaining Range	112	km

The SOH also helps to determine the cooling system performance where the max speed is not reached as the thermal protection is there to prevent the same as may lead to a fire. Initially maybe it had been 100% so acting 10 min after attaining the speed but now since SOH is 50% the time may lower to 5 min

D. Temperature

The BMS has the necessary sensors to monitor certain factors such as moisture, motion and most importantly Temperature. The maintenance of voltage and temperature of each cell is through individual monitoring and pack monitoring. The limit for the temperature allowance is defined through the graph where a safety envelope is made to prevent the same. If the temperature goes to OT which is the over temperature condition it may lead to a thermal runaway [7]. Similarly, the lesser temperature limit will lead to UT which is under temperature condition that leads to the dendritic growth which are micro fragments that may lead to short circuit and not permitting the charge/discharge cycles. Hence, there is a master disconnect provided for the same which disconnects the circuit in either of the cases. The graph depicting the change is as follows-

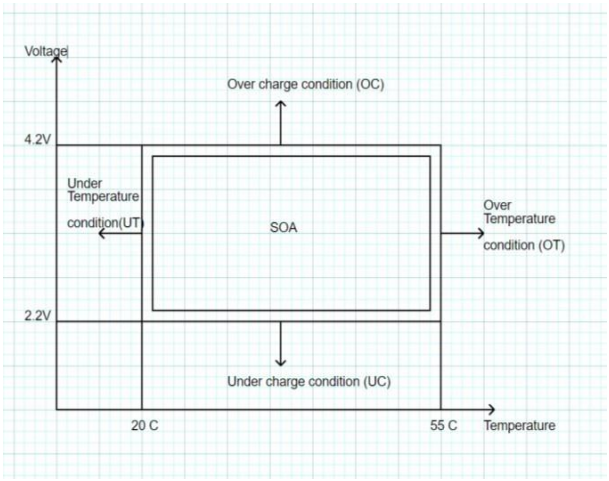


Fig 10. Ideal voltage vs temperature graph for defining safe operating area values for Li ion battery pack

E. SOE

In case of a BMS one of the important parameters to be considered is the safety envelope or the SOE which provides us with the maximum limit. The SOE is defined as the maximum charge or discharge value of current permissible for a battery pack at any given time. The value for the same is specific to each cell considering the previous data available. The curve for the charge and discharge values observed is plotted which helps in determining the region in which the operation of the same is safe.

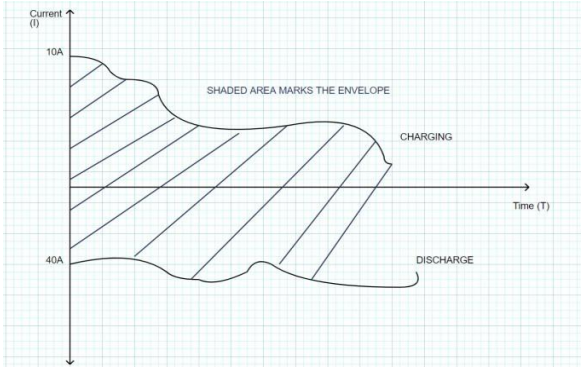


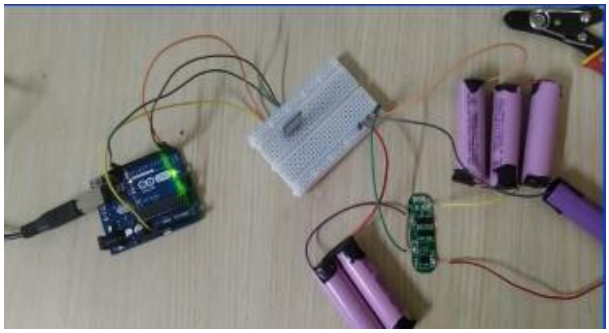
Fig 11. Current vs Time graph defining Safety Envelope

Region Over time the discharge value increases since the charge value decreases. The actual current value is to be within the region of max charge and discharge such that if the vehicle is avoiding all kinds of faults. This region forms an envelope and hence is known as the Safety Envelope (SOE). If the value of current exceeds the limit it is terminated by the master disconnect of BMS. The application controller plays a major role here by managing the current flow in and out of the battery within the envelope. The major benefit of this is that faults are avoided for special condition roads and prevention of a complete shutdown is observed while working on EV. There is a significant increase in the life span of the battery pack, also the SOE algorithm doesn't just consider the max and min charge currents which would allow it to stay within the envelope but also calculates expected degradation which is going to occur because of the charge and discharge period.

F. Cell Algorithms

Battery characteristics such as voltage, current and temperature are essential data points that can be processed to obtain specific metrics. For example, an electric car can use battery voltage to calculate the distance it can travel before its battery runs out. Many such calculations are performed by a battery management system, for which algorithms are designed [8]. There are two types: cell balancing and cell communication.

1. Cell Balancing Algorithm: One battery cell can have a maximum voltage of 3.7V and another can have a



maximum voltage of 4.2V. That cell is also pre-discharged. As a result, the full potential of the pack may not be realized. In such cases, the cell balancing algorithm comes to the rescue. There are two methods used to balance cells: active and passive cell balancing [2]. The active balancing process uses the strong cells to charge the weak cells to equalize their capabilities. Passive balancing works by connecting strong cells to the load and releasing surplus voltage..

2. Communication Algorithms: Different ECUs in an electric car require battery specifications to function properly. For example, the BMS communicates with the EV motor controller to ensure that current is drawn in an optimal manner. Similarly, the BMS interfaces with an external charging device to transmit the needed current and output voltage data. It also determines when charging begins and stops. If there is an out-of-spec issue, the BMS disconnects the connection and stops charging. CAN, J1939, CHAdeMO, Bharat EV standards, and other communication protocols are used to allow this connectivity.

IV. RESULT AND DISCUSSION

The Battery Management System of an EV performs the basic function of managing the power available in an efficient way to make sure that the working of the vehicle occurs in a proper way. Certain parameters have to be considered while developing an efficient BMS.

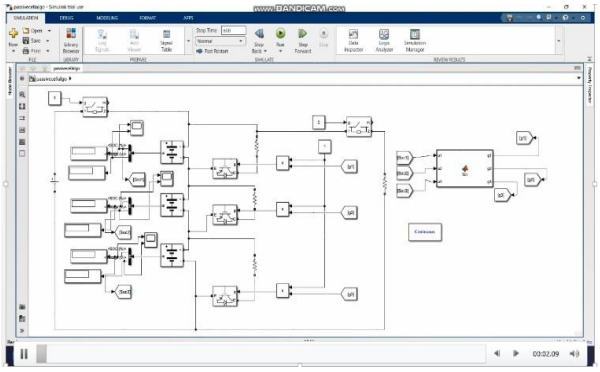


Fig 12. Battery Management System with passive cell balancing algorithm implemented on prototype model

They include the Li-ion battery pack, SOC, SOH, SOE, temperature dependence, cell algorithms. The Li-ion battery pack is used to provide the energy for work and its capacity is calculated which is range and speed specific. SOC and SOH gives an idea about how much more traveling range is coverable by the EV depending upon the health from the beginning of life and the state of charge of each cell and pack. The SOE defines the limit parameters which cut off or shut down the EV to prevent any faults converting to unwanted accidents

Fig 13. Battery power charge discharge cycle observation

The deployment of various algorithms is done to make sure that the output of each cell is the same, this is the cell balancing algorithm. The Cell communication algorithm ensures that the state of each working part is updated to each other to work in coordination with each other.

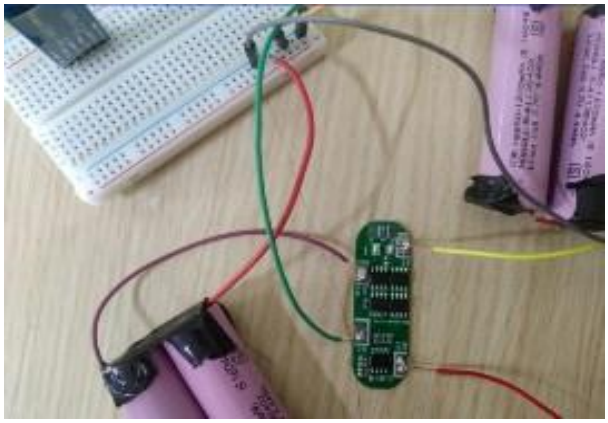


Fig 14. BMS module connected with Li-ion cells

V. CONCLUSION

Research puts forward all the parameters that can be put forward for use when developing a system model. Important factors to consider are proper maintenance of the cells to meet the requirements of low maintenance and battery pack design. Various sensors are used to detect temperature, speed, humidity and many other factors that interfere with EV performance. This current paper focuses on the study of BMS and optimizing the power performance of electric vehicles. In addition, much of the goal of reducing greenhouse gasses can be achieved by using battery management systems in EVs.

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Device for Segregation of Macroplastics from Sand (Silica)

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***Abstract*—In the last decade, beach cleanups have grown into a global phenomenon, with volunteers gathering at regular intervals for the task of cleaning up plastic trash. Now, new research suggests that beach cleanups are not competent enough for the cleanup of entire plastic pollution, much of which lies below the sand's surface. The plastic eventually breaks down into smaller and smaller particles until it forms macroplastics. Even after manual beach cleanups, these macroplastics remain in the sand. When plastic keeps piling up, it creates an insulation layer – it rapidly raises the temperature to a point where it is likely unsuitable for most animals. Researchers took daily temperature readings of a beach and found that the plastic had increased daily maximum temperatures by 2.45 degrees Celsius. This paper discusses a possible solution to separate the macro-plastics that are almost impossible to be cleaned up manually. IoT and embedded systems are used to create the mechanism for the project.**

Keywords—Macroplastics, Sand, IoT, Embedded Systems, beach cleanups

I. INTRODUCTION

There are decades worth of plastic deposits all over the world in the oceans which are eventually piled from the salt waters to the sandy beaches all over the world. Plastic takes thousands of years to disintegrate in the environment completely which is a posing threat to several species of living things including humans. Smaller plastics are deposited and amalgamated in the environment whereas the chunks of larger plastic deposits tend to break down further in smaller pieces which are then termed as 'macro-plastics'. These smaller fragments of plastics are then ingested by fishes and other marine animals. The drinking water used by humans also contains a minute amount of these polymers. Consumption of these macro-plastics can lead to several physical ailments and can cause a severe decline in the population of marine life in the upcoming years.[1]

Over a few years concerns have been raised on this major social issue which has caused awareness among many people who volunteer and gather for beach clean-ups but the downside has been the humongous task of cleaning done manually by people. During beach clean-ups, bigger plastic pieces are collected by fellow cleaners/volunteers but the particles mixed in the sand are neglected as they require a lot more time. Also, since the particles mixed with sand are smaller in size, it becomes an arduous task to manually separate them from the sand. Hence, this device can help in clearing the macro-plastics from the sand. This will lead to a much cleaner environment on the beaches and sparse chances of macro-plastics contaminating the sand.

II. LITERATURE REVIEW

"Macro-plastics in sediments: A review of techniques, occurrence, and effects", according to this paper, the micrometer range is used for defining the size range for macro-plastics. These are deposited by fragmentation of larger particles with the infestation of UV radiation in the marine ecosystem. Major sources of these macro-plastics are garments, food-grade plastic bags, etc. Various publications have been involved in raising their voices against this brutal truth for decades and even the surveyors have found approximately 20,000 to 100,00 pellets per meter on average on a beach.[2]

From the reference of the paper, "Separation and quantification of Macro-plastics from Beach and Sediment samples using the Bauta macro-plastic sediment separator", we infer that for the separation of macro-plastics from sand, density separation method is utilized by which the lighter plastic materials float on the surface of density 0.92-0.97 g/mL on a solution made by concentrating $ZnCl_2$ and $CaCl_2$ with an average density of 1.57g/mL. The samples of sand were collected from a nearby beach for testing in a laboratory. The efficiency of this method for recovering plastic pellets comes to around $93 \pm 0.02\%$.

The inference from the paper, "Low-Cost Autonomous Robot Cleaner using Mapping Algorithm based on Internet of Things (IoT)," states the development of a

low-cost autonomous module that will use an ultrasonic sensor for the detection of trash, and by mapping algorithm, it can be further utilized for cleaning homes. The market for cleaner robots is estimated to increase up to 16.21% from 2018 to 2023 which sums up to approximately 4.34 billion dollars. RFID tags and load sensor technology are used for the treatment of waste.[3]

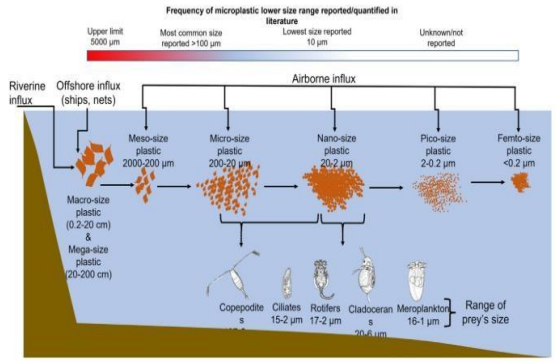

Fig. 1. Distribution of Plastic Fragmentation

Current and new proposed size class nomenclature for microplastics, as well as their respective proposed size range, and several organisms of equivalent size in the environment.

Current size categories	Size range	Proposed size categories	Size Range	Organism of equivalent size
Nanoplastic	0.001–1 µm	Femto-size plastics	0.02–0.2 µm	Virus
Microplastic	1–1000 µm	Pico-size plastics	0.2–2 µm	Bacteria
		Nano-size plastics	2–20 µm	Flagellates
		Micro-size plastics	20–200 µm	Diatoms, dinoflagellates, ciliates, daphnids
		Meso-size plastics	200–2000 µm	Amphipods, appendicularians, chetognatos, copepods, thaliaceans
Mesoplastic	1–10 mm	Macro-size plastics	0.2–20 cm	Euphausiids, heteropods, jellyfish, larval fish, mysids, pteropods, solitary salps
Macroplastic	> 1 cm	Mega-size plastics	20–200 cm	Jellyfish, colonial salps

Fig. 2. Nomenclature for the sizing of plastics

III. RESERCH METHODOLOGY

A. Block Diagram:

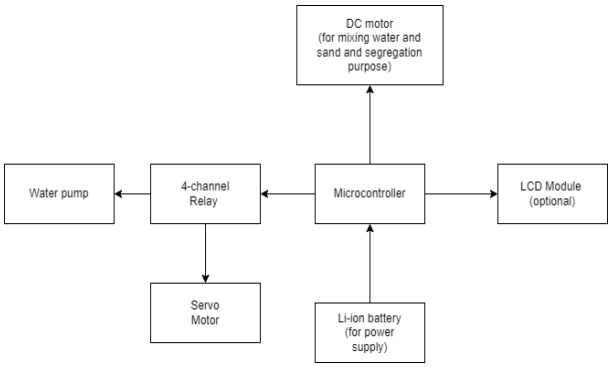

Fig. 3. Block diagram of the circuit

B. Flowchart:

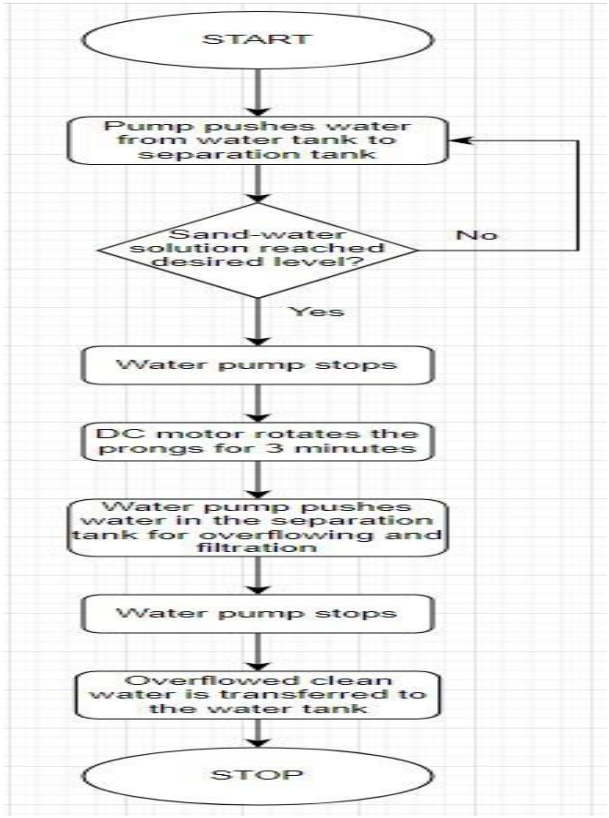

Fig. 4. Flowchart of the working of circuit

C. Components:

a) Arduino UNO
b) 3.7 Li-ion Battery
c) 4-channelnel relay
d) DC motor
e) Water Pump

D. Construction:

A water pump is attached to a pipe that connects the water tank to the separation tank. The separation tank consists of a DC motor. The motor shaft is attached to two prongs that would be suspended into the tank. The outer circumference of the tank contains a strainer and a collector.

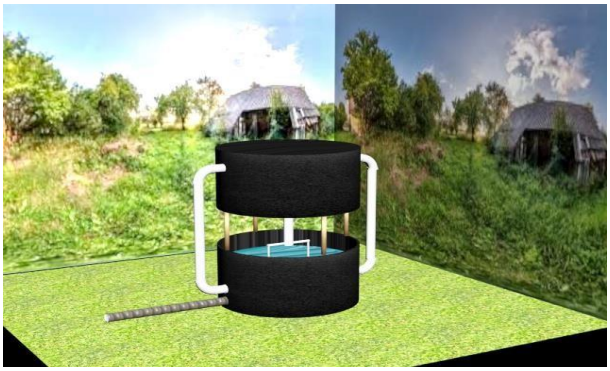

Fig 5. 3D model of the Separation tank (Front View)

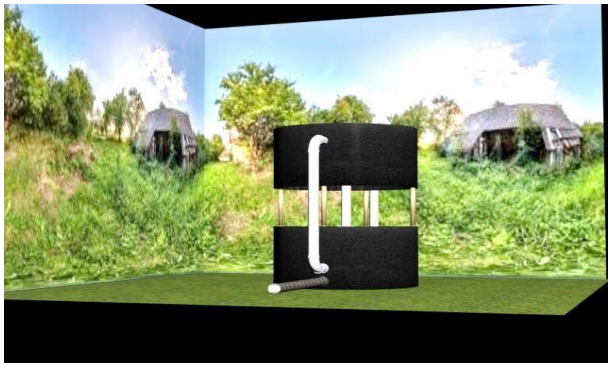

Fig 6. 3D model of the Separation tank (Side View)

E. Working:

The sand is accumulated in a separation tank, where water is added from a water tank via a water pump. On reaching the desired level, the water pump stops. This creates a solution of water and silica (sand). A DC motor is present in the tank, and two prongs are attached to the shaft of the DC motor. The DC motor rotates its prongs in the solution. This is a filtration technique that leads to settling down of pure sand. The macro-plastics start floating on the surface. The macro-plastics are then overflowed out of the container into the strainer where the macro-plastics get separated and the excess water is supplied via a pipe into the water tank. This water can be reused for the next batch of impure sand. All the electrical components i.e sensors and actuators are connected to a battery pack that is properly insulated.

IV. RESULT AND DISCUSSION

Vacuum Cleaner is attached with the device that enables collecting impure sand for filtration with ease. Manual Cleaning requires a lot of handwork with lesser efficiency as macroplastics are left behind in the soil, which is why this is an attempt to create a device that will clean with much more efficiency by filtering the sand to remove minute particles of plastic. A portable and user-friendly device is created to segregate macro plastics from silica. This alternate solution is also cheaper and accessible, which doesn't require giant companies for manufacturing and makes it easier for even small-scale NGOs and organizations to automate the process of sand-cleaning.

V. FUTURE SCOPE

This device can be scaled further to cover a larger geographical area with better efficiency for separation of macro-plastics from soil.

Mixing solution can be modified by mixing a certain percentage of a chemical with water which is not hazardous to the environment but can bring out maximum efficiency in separating the macroplastics.

This device can also be integrated with a mobile application for remote access to the device or checking the battery percentage before cleaning and for keeping the record of cleaning done which can be further analysed to study about different types of macro-plastics available on the beach.

VI. CONCLUSION

The final outcome of this project is to create an automated device for segregation of macro plastics from sand and dispose of the debris after the process is done. The water which will be used in the segregation process will be reused after every cycle to improve the efficiency of the device. An LCD module can be connected to the device to display the percentage of water in the tank, the battery percentage and several other parameters to ensure maximum efficiency of the device.

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The Faraday's Bridge

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Abstract:- **Energy Source Harvesting and Reuse: Energy Simply put, harvesting is the process of storing and reusing used energy. It includes preserving wasted energy and using it as a source of electricity to power various equipment. We transform wasted and unneeded energy into various forms that can be used as a power source because energy cannot be destroyed. We build a sustainable and energy-efficient loop that collects, converts, and reuses energy by employing our mechanism by developing a self-powered source of energy, reducing the burden on conventional energy sources.**

Keywords—Faraday's law', Magnetic Field, Bridge , AI.

I. INTRODUCTION

Faraday's Law of Electromagnetic Induction: Faraday's law of electromagnetic induction states that a variation in the magnetic field generates an electromotive force (EMF), which in turn generates a current in a conductor. This law is represented mathematically as:

$$\Delta\Phi = -N d\Phi/dt$$

Where: ΔΦ represents the induced EMF (Voltage), N stands for the number of turns in the coil,

Φ represents the magnetic flux (Weber), and t represents time (seconds).

The derivation of Faraday's law starts with considering a coil with N turns and an area A, which carries a current I. The magnetic field generated by the coil can be expressed as:

$$B = \mu_0 * n * I$$

Where:

B represents the magnetic field (Tesla),μ_0 is the permeability of free space (4π x 10^-7 H/m), and n represents the number of turns per unit length. The magnetic flux, Φ, through the coil can then be determined by the equation:

$$\Phi = B * A$$

Where A represents the area of the coil (square meters).Since the magnetic field and magnetic flux change with time, the induced EMF in the coil can be calculated using Lenz's law. This principle states that the direction of the induced EMF opposes the change in magnetic flux that produced it. By combining the aforementioned equations, Faraday's law of electromagnetic induction can be derived, From the above equation it is seen that Induced EMF is directly proportional to number of turns in the coil and also the area of the coil ,In order to increase the current we have to increase the number of turns of coil and the area to gain more energy.

Lenz's Law

The German physicist Heinrich Friedrich Lenz deduced a rule known as Lenz's law that describes the polarity of the induced emf Lenz's law states that "The polarity of induced emf is such that it tends to produce a current which opposes the change in magnetic flux that produced it."The negative sign in the formula(EMF = NdΦ/dt) represents this effect. Thus, the negative sign indicates that the direction of the induced emf and the change in the direction of magnetic fields have opposite signs. To overcome this, we have to keep the rotation of magnets in one direction, quick shaft mechanism is used in the design which moves the magnet only in one direction, thus the problem is resolved.

Quick shaft Mechanism: A circular disc (bull gear) is used in it the speed of rotation depends on the point where you attach the rod for movement it converts the Reciprocating motion into circular motion.

Gears : The gears have to be made of a proper diameters the main movement of the mechanism is increased by the proper sequential arrangement of the gear .The teeths of the gear is customized according to the sizes and they are derived by an formula

Springs: The spring constant, also known as the spring rate, is a measure of the stiffness of a spring and determines the amount of force required to compress or extend a spring by a given amount. The spring constant is an important factor in designing a spring for use in a particular application. The formula for calculating the spring constant is given by:

$$k = F/x \text{ where:}$$

k = spring constant (N/m)

F = force applied to the spring

x = displacement of the spring (m)

The spring constant is therefore the ratio of the force applied to the spring to the displacement of the spring. The units of the spring constant are N/m, which means that it takes a force of 1 N to compress or extend the spring by 1 meter. The addition of more infrastructure than is necessary, such as skywalks and pedestrian roads, has proven wasteful in reducing Mumbai's traffic. It was necessary to think about this subject. After considerable thought, "the faraday's bridge," a clever, environmentally friendly answer to all of our issues, is finally developed.

A method that will contribute to the creation of free electricity, the production of flower pots made from recycled plastic and polymers, and the encouragement of the ordinary man that walking is the new fashionable, environmentally friendly, and sensible method of commuting.

b. Definition of the problem:

Generation of renewable Energy

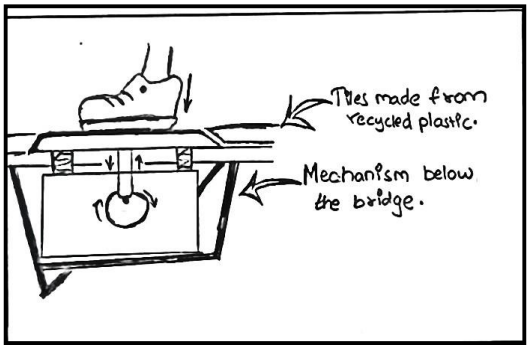
The sun, wind, and water are all used to produce electricity. But they are secondary sources. Direct sources of transforming energy into electricity include chemical energy, electromagnetic induction, and static energy. It also includes nuclear energy, direct temperature conversion, and the photoelectric process, which turns light into electrical energy.

No of turns	Area	Output
20	5*5	1.2V
50	5*5	4.2V

Burning fossil fuels to produce steam, which is then utilized to power a steam turbine, which in turn powers an electrical generator, is how most electricity is produced today. Additionally, smoke and other harmful compounds are released into the atmosphere by fossil fuels. In a number of industrialized nations, nuclear energy is used to produce power. Although it is not overly expensive, it can occasionally be highly harmful. Dangerous leaks are always a possibility. Therefore, our initial efforts are to produce sustainable energy via electromagnetic induction. Every footfall on the modified skywalk presses on the surface to produce power.

1) Plastic waste management and traffic diversion. Plastic is almost irreplaceable in many applications due to its low cost, strength, lightweight, and corrosion resistance. While plastic is long-lasting, it may also trap garbage in our environment for generations if not properly managed. As a result, effort is to recycle plastic garbage. This plastic debris will either be utilized to make a plant mold or toys etc. Since our skywalk will be a point of interest for the public, with lights and scientific ideas to pull people in, we also hope to reduce traffic on the highways on a larger scale.

C. Objective:



1) In the design we have verified the faraday's law of magnetic induction and the spring customization according to the necessity .

2) Quick shaft mechanism is used to increase the speed the of the gears the pin at the revolving point is set at the edge.

3) Number of turns of the coil and area of the coil was increased to get the output at full efficiency , magnet of high grade is used to generate a strong magnetic field since it is directly proportional to emf .

II. OUTPUT OF PROTOTYPE:

The initial goal is to leverage the steps of the expanding population to generate electrical energy, which may be done by simply walking across "The Faraday's Bridge." Although our country's population has numerous drawbacks, we may use it to our advantage through our proposal. We are supplying the lights, fans, and other amenities nearby using the electricity generated by our bridge.

We actually save money on the electricity bill by doing this. Therefore, this can potentially result in a future decrease in ticket prices. Making a dustbin is another thing we'll do to recycle human garbage made of plastic. Toys, pots, and the tile's surface are being made from the melted plastic garbage.

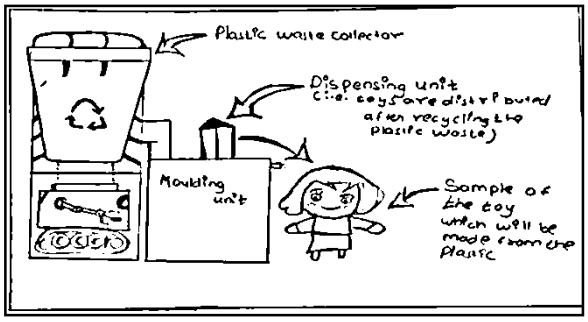
Hardware:

The lower mechanism will be managed by a "AI" to retain data on the current generated and the plastic recycled from the bridge, while the upper mechanism, which is a trashcan and a robot, will be controlled by a human.

A.I. : The AI will be in charge of the entire system. Its main goal will be to maintain data on the electricity-generating tiles and ensure that they are producing power. If there is any breakage at a part or anything else, it will also check the dustbin that collects plastic waste that will be recycled. Using the camera access on the bridge, it will look there and send a signal.

SMART DUSTBIN: The smart dustbin will convert the plastic waste into usable toys and pots if there are extra

plastic stored it will convert them into pellets which will be sold out and revenue can be created from it the dustbin will have a furnace that will melt the plastic at night time which will get started when the proximity of people on the bridge will be less once the furnace will be started the dustbin lid will not be open as a primary command.



List of components:

NAME	QUANTITY
Wooden plank	4 (25*25)
Circular disc (recycled plastic	Diameter 7cm
Copper coils	4 coils
Magnets Neodinym	9(N52)
Springs	Inner circle(2d), outer circle diameter(3d)
BMS	1
Lithium battery	5
Shaft aluminum hollow	1.5cm diameter

III. METHODOLOGY

We will construct "The Faraday's Bridge," which will create electricity by converting the mechanical energy produced by people walking on these tiles of the bridge into electrical energy, as was already indicated. The issue at hand is how we will construct the mechanism. For the most part, we are creating a rectangle tile with two sturdy springs attached to the corners. Then, we attach a cog to the tile's base so that when it is pressed down, it rotates the gears. Gears are utilized because they can increase rotational speed, which causes the coil to rotate more quickly and reduces the magnetic fluxes produced by the neodymium magnets. Lithium-ion batteries are used to store the electrical current that is produced as a result.

In order to make the plastic reusable, we are creating a dustbin that will transform waste plastic into the necessary shape and increase its strength by mixing a chemical after melting the plastic. The molten plastic will then be sent to the molds of toys and flowerpots. Additionally, we regulate or recycle the plastic waste dumped by pedestrians on the bridge and use it for repairing the tiles of the bridge, which are made of plastic so they can be repaired using robots.

There are many people that travel using bridges today. Since millions of people commute on footways and over bridges, we wondered if we could exploit these beneficial infrastructure features to generate electricity. Where our project enters the picture in this situation. We came up with "the faraday's bridge," a clever, environmentally friendly answer to all of your issues. In this project, we innovated around movable tiles that, when people step on them, the tile will fall due to their weight. At that point, we were taking use of Faraday's law of induction, which states that current is induced in a coil when a magnet is moved, or vice versa. This law is frequently used to convert energy into electrical energy.

Although we are used to learning this in our college textbooks, we currently use it a lot to obtain electricity. There are numerous ways to use this to supply energy, but they are quite expensive because installing such parts is pricey. However, compared to other modules, our project is far less expensive. By providing free toys to attract kids, we may reduce the amount of plastic garbage produced while simultaneously encouraging those kids to bring their families the next time the toys are offered, which generates more electricity. Second, we tend to make free plant pots as well, which helps to balance the number of gases and dioxide in the atmosphere. Our project is exclusive and different. Nothing like this is ever done before. we will use this for the betterment of humanity and our environment.

Plastic Recycling: Using recycled plastic to make small tiles is an innovative solution to both reduce plastic waste and improve bridge infrastructure. Plastic waste can be collected, processed, and then used as a binding agent to create a strong and durable material that can be used to create tiles.

The process of using recycled plastic for tiles making involves shredding plastic waste into small pieces, melting it down, and mixing it with bitumen, a substance commonly used in road construction. The melted plastic-bitumen mixture is then poured and spread over a road surface and allowed to cool and solidify, forming a strong and durable surface.

Improved bridge safety: Plastic tiles have a skid-resistant surface, which can reduce the risk of accidents, particularly in wet conditions.

Lower greenhouse gas emissions: The process of producing roads made with recycled plastic generates fewer greenhouse gas emissions compared to the production of traditional roads.

IV. FUTURE SCOPE OF TECHNOLOGY:

We can establish an on-demand source of energy that can be used anytime necessary by adjusting our technique in areas with high populations. We are able to develop a

digital currency system that is based on the distance traveled. Our steps translate into money. For instance, if we walk a specific distance, we can generate energy for a store, which can then use the energy and give us minor discounts in exchange.

maintenance practices significantly reduced the expenses associated with lighting and maintaining the bridges. This not only led to cost savings but also had a positive impact on the environment by reducing energy consumption. The recycling program for plastic waste was successful in diverting a significant amount of waste from landfills and reducing pollution. By educating the public on the proper disposal of plastic waste and giving them toys made from recycled plastic, the project also helped to raise awareness of the issue and promote environmental stewardship. This project will not only reduce the carbon footprint of the bridges but also provided a model for other communities to follow in the move toward clean energy.

Result and outcome: The results obtained from the paper was The first design the prototype was of small dimensions that is 6 cm diameter circular disc size on which number of turns where 20 the current should be 0.5A but the output obtained was 0.2

1) The second result was where we changed the shape of the coil in square shape dimension of 5*5 where the area was 25cm and the output was 1.2v

2) The third experiment where the area of a square was 25cm and the number of turns was 50 due to number of turns high we got output in the range of 3-4 v

The result of the paper was it showed that the implementation of energy-efficient lighting systems and maintenance practices significantly reduced the expenses associated with lighting and maintaining the bridges. This not only led to cost savings but also had a positive impact on the environment by reducing energy consumption. The recycling program for plastic waste was successful in diverting a significant amount of waste from landfills and reducing pollution. By educating the public on the proper disposal of plastic waste and giving them toys made from recycled plastic, the project also helped to raise awareness of the issue and promote environmental stewardship. This project will not only reduce the carbon footprint of the bridges but also provided a model for other communities to follow in the move toward clean energy.

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Building of Higher Skills with the Strong Formation of Lower Order Skills development using RBT techniques

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***Abstract* — This research experience report provides an overview of research work conducted on how the Peer Instructional (PI) constructive methodology enhances the student's critical thinking skills from lower order to higher order based on the learning taxonomies like Revised Blooms Taxonomy (RBT). The research design adopted is quasi-experimental, two equivalent groups, post-test, same-topic design. In this report we mainly highlight, how the assessment of student's cognitive levels of thinking was carried out at different levels. We report on how the cognitive level of the assessment aligns with that of the learning outcomes (LOs) of the selected topics were carried. The cognitive levels of the LOs were estimated the following the ABCD model. We analyze and identify whether the LOs are aligned with cognitive levels of assessment questions (aligned with Bloom's Taxonomy action verbs), wherein, the multiple choice-questions and problem solving method were used to assess lower and higher order thinking skills of students respectively. The perception survey of students was carried out to understand their perceptions of learning and engagement to further triangulate the teaching-learning process.**

Keywords— Blooms Taxonomy, RBT levels, higher order skills, holistic development, learning objective.

I. INTRODUCTION

Traditional lecturing, a one-sided teacher-centric lecturing of the curriculum contents, has been predominantly dominated in the higher education over millennium and continues to have strong advocates [1-2]. It has been considered as an easy method by several instructors, as a significant amount of syllabus could be disseminated to a large group of students. However, there is crucial requirement to transcend from the teacher-centric traditional methodology into the student-centered instructional strategies that would actively engage the students [3]. Higher educational reforms strongly emphasis on the systematic implementation of an evidence based active – learning instructional methodologies in STEM (science, technology, engineering, mathematics) courses to promote the student- centric collaborative learning environments in the academics as well as to address problem related to an effective learning and engagement of students (4). Recently, Freeman et al. [5] did a comprehensive meta-analysis of 225 studies on undergraduate STEM education, wherein, they have showed evidences that the students in classes with traditional lecturing were 1.5 times more likely to fail than that of the students in classes taught with active learning. Further their data indicate that (i) active learning increases in achievement hold across all of the STEM disciplines and occur in all class sizes, course types, and course levels and (ii) active learning is particularly beneficial in small classes. Harlow et al. [6] have revealed the importance aspects of students behavior and attitude toward the physics learning. Furthermore, the authors have reported that the behaviors, attitudes, beliefs and expectations of the students would be positively altered with an active teaching-learning strategies. Researchers have suggested to do critical discussions on the difficult concepts or the problems during the in-class activity and to give brief writing assignments and tests to the students based on the self-covered topics [5-6]. It has been found that active learning improved students content achievement even when the content is reduced. Research had proved that the reduced lecture time and reduced lecture information density enhances learning. Hence, lesser lecture time in the classroom and lower density content should not lead to lower expectations of the students or instructor. According to the constructivist teaching learning theory, the active learning methods encompasses several research based pedagogical strategies that are designed to engage the students in higher order thinking such as analyzing and reflecting on experiences, reasoning out or justifying the concept based on the prior knowledge, thus going beyond passive listening, memorizing or copying of lecture notes or [7-9]. Wide range of interactive-based teaching learning approaches and models have been developed and reported elsewhere such as collaborative learning methods like peer-led team learning [7], reciprocal teaching [8], peer tutoring [9], peer instruction [10], cooperative problem solving [11], flipped classroom [12], inquiry based learning [13], etc. All these methods show that learning can be improved through interactive methods, thus helping students gain a deeper understanding of what they are learning in STEM (science, technology, engineering, and mathematics) courses.

One of the active learning methods, the peer instruction (PI) is an interactive student centered instructional strategy that engages students through a structured questioning process done as a formative feedback [14]. The basic goals of PI method are to exploit student interaction to enhance their understanding of concepts and to learn from each other. Furthermore, during the PI strategy, the students gets collaboratively engaged in constructing knowledge along with peers, which help students develop more advanced critical thinking skills that can never be achieved in traditional lecturing. The PI method initially developed by the Harvard physicist Eric Mazur [10] is implemented in the following sequence: First, the students vote individually on the correct answers for the given multiple-choice questions (MCQs) using a classroom response system called "clickers". If the percentage of correct answers are less, then the teacher allows the students to discuss the questions with their peers for about 2 to 3 min; they then vote individually again on the same questions. The sequence generally ends with a whole- class discussion in which the instructor provides explanations about the concepts. Although this is the most generally recommended way of using the PI method as suggested by Mazur, PI has been slightly modified by different instructors. Dancy and Henderson [15] have revealed that only less than 12.8 % of the instructors implement the PI strategy as it was originally designed by Eric Mazur [10]. Whereas, high level of modifications is currently being made by the instructors due to the external constraints encountered, while attempting to integrate these research based instructional strategies in the classroom structure. However, report by Andrews et al. [16] showed that any modification of evidence-based instructional practices has been associated with reduced learning gains. Recently Nuri et al. [17] have reported additional perspective of PI based on the statistical meta-analysis to determine the effectiveness of analyzing as well as reflecting skills of PI as compared to traditional lecture method based on culture of countries. They have referred to number of studies which depicted that PI is most effective in enhancing skills in collectivist and individualist countries as compared to those countries which encourage individual learning.

There have been several reports evaluating the efficacy of PI as an instructional strategy in the various disciplines such as natural sciences including chemistry, biology and physics, medical sciences [18-20]. All these reports suggest that the collaborative learning environment in PI enables to promote a deeper learning of concepts of fundamental sciences as well as student retention, perception of learning, engagement, etc. However, to our knowledge, limited studies have been reported on using the PI implementation to achieve the critical thinking skills in basic science courses for an undergraduate engineering curriculum [18]. Furthermore, it is reported [20] that the quality of good learning should be followed by a good assessment strategy as well, because the information from the assessment is useful for improving the quality of learning and an appropriate assessment method of learning [20]. Thus, the present study aims to determine the development of student's critical thinking skills [21] through the implementation of peer instructional strategy and the critical thinking assessment instrument in the basic engineering physics course. The following are the research questions addressed: whether the implementation of PI instructional strategy promote (i) the learning effectiveness in an engineering physics course of the undergraduate engineering students and (ii) enhances the student's critical thinking skills from lower order to higher order based on the Blooms revised taxonomy (BT).

II. RESEARCH DESIGN

(a) Course Format and participants

This study was conducted in an all subjects undergraduate engineering Bachelor of Engineering or Technology program at TCET, Mumbai. Almost all subject courses had totally six modules. The study was conducted in all modules of all subjects. These topics have numerous engineering applications. It gives scope for the students to apply and integrate their thinking skills by way of group activity, problem solving and discussions with peers. The total number of students in each CG and EG sections were N = 66.

(b) Research design

The research design adopted here is quasi-experimental design. The research was conducted on two equivalent groups: control and experimental group, post-test, same-topic research design. The effectiveness of PI intervention is measured by comparing the post-test marks of subjects taught with these two different instructional strategies. The effectiveness of the PI intervention is measured by comparing the post-test marks taught with these two different instructional strategies. Same instructor taught the course. The teaching content, text books and learning materials were same for both the groups. Duration of each class was 60 minutes. Sufficient and relevant instructional materials were provided to all students. All students have an access to TCET ERP PORTAL and G-suit with their own user login (student's PIN numbers) and password, in order to access resource material and attempt the assessment tests.

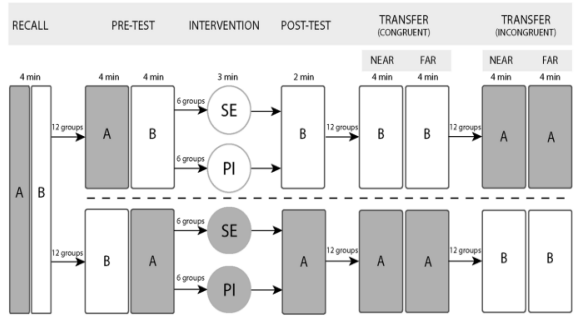

Figure 1: Study design

(c) Proposed methodology

The proposed methodology has been divided into following steps:

Step 1: Writing a learning objective and outcomes as per Audience-Behavior-Condition and Degree (ABCD) model [19, 20, 21].
Step 2: Mapping of keyword present in "Behavior" part of learning outcome with that of the revised Bloom's taxonomy's table of action verb.
Step-3: Implementation of quasi-experimental research design.
Step-4: Creation of the assessments test items, each one aligned with that of learning outcomes.
Step-5: Data collection and analysis of student learning effectiveness.

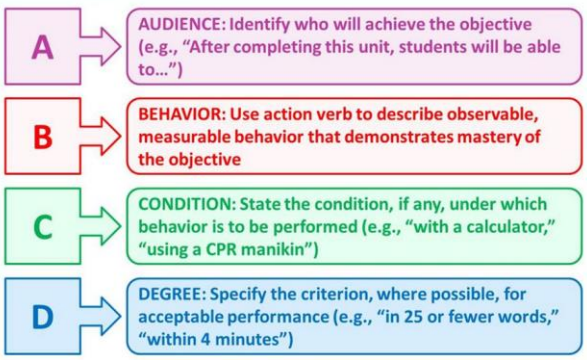

Figure 2: Audience-Behavior-Condition and Degree

III. IMPLEMENTATION

(a) Framing the learning outcomes and identifying the cognitive levels as per Blooms Taxonomy-Revised

The selected contents to be taught were divided into several sub-topics. For all the selected sub-topics that were taught, specific, well-defined learning outcome (LO) statements were generated. Learning outcomes (LO) are the measureable statement(s) of the knowledge, skills, attitudes, and values that students are intended to acquire after the successful completion of the course. Hence, utmost care was taken to write LOs precisely and completely without any ambiguity and having only one measureable action verb. These LO acts as a guideline for selecting or designing the instructional materials, course content, and teaching methodology. Further, the cognitive level alignment between the LOs statements and the assessment questions were checked. By cognitive level we refer to the six identified levels within the cognitive domain as per Bloom [22,25], which ranges from the simple recall or recognition of facts, as the lowest level, through increasingly more complex and abstract mental levels, to the highest order which is classified as creating or synthesis. Mastering lower cognitive levels is a prerequisite before the students are able to move to higher cognitive levels. Before implementation, alignment of the learning outcomes, instructional contents and assessments in a sequential order of cognitive skills were done. Furthermore, it also facilitated the instructors to easily check whether the specific LOs have been achieved by the students.

In order to verify that the instructors validated all the learning outcomes using the audience-behavior-condition- degree (ABCD) model [22-24]. The last three components that help instructors to understand the intent when writing an LOs are performance, conditions and criterion. The performance component in an objective always states what a learner is expected to be able to do. Conditions component describes the conditions under which a student is able to perform or execute the given task. And criterion component clarifies how well the student must perform the task, in order for the performance to be acceptable. When framing the LOs, check has been performed whether the complexity level of each of the LO statement starts from the lowest and moves up to the higher order of thinking skills. To do this the keyword (action verb) present in the "behavior" part of LO was mapped with Bloom's Taxonomy revised (BT) table of action verb [25,23, 24]. This helped us to identify the cognitive level of action verb used in LO statement. Generally, BT keywords are used to specify the cognitive level for a given question or learning objective. However, there are reports [22, 27] strongly emphasizing that only keywords in LOs may not always accurately predict the actual cognitive level required to solve the problem.

(b) Conducting PI in an engineering course

Before the start of the lecture, the LOs were explained to all students, in order to specify them what skill they were expected to learn or to be able to do at the end of the teaching. The PI research design required the students to prepare the lecture contents via the flipped classroom method, wherein the students go through the conceptual contents in the form of recorded screencast and the you-tube animated videos or directed reading of specific topics that were released in the TCET ERP portal, to acquire the basic knowledge prior to the in-class PI

activity. To test if all the students had gone through the flipped content or not, the access activity report were checked and the instructor would randomly ask a student to give his/her solutions based on flipped content. Adopting flipped classroom allowed the instructor more class time to organize collaborative-student- centered learning activities such as the PI. During in-class PI implementation, the instructor engaged the students by asking several higher order multiple choice questions, encouraged an active peer/peer discussion. Further, the instructor took a regular feedback on peer learning process, clarified any doubts to effectively enhance their critical thinking skills and by assisting the students to present their results to the class for review by the instructors and peers.

During the in-class lecturing, the instructor taught the contents using the blackboard, PPT slides, you-tube animated videos, while the students will observe individually. Instructor poses questions and provides sample problems to solve to an individual student. Students solves the problem individually without any peer intervention. Later, any conceptual doubts are clarified by way of one to one interaction between instructor and individual students. As opposed to PI methodology, traditional lecturing was confined to individual student's thinking and understanding Generally, the students are observed to remain passive during the classroom lecturing. It has been reported that engagement of low performers is a major challenge in these active learning methods [4-7]. In an effort to improve the engagement levels of the low-performers during PI, the students were grouped with the good performers, such that they get involved actively during the in-class PI activity. Throughout the semester, the low performing students were frequently reminded about the PI strategies and its importance to achieve success in the subject. Aimed to keep them focused on an effective discussion with their peers, the low performers were encouraged to understand the simpler problems first before attempting the higher order problems of complex concepts. The instructor repeatedly intervened and assisted the discussions of such groups until an improvement in engagement of low performers were observed.

(c) Creating assessments aligned with learning outcomes

Assessment of the student's conceptual understanding were carried out at different cognitive levels of complexity starting from the lower order thinking (LOT) to higher order thinking (HOT) skills. Both LOT and HOT skill assessment items were set at an increasing cognitive levels of knowledge and skill in accordance with the revised Bloom's taxonomy [25]. To assess the LOT skills, three different multiple choice question (MCQ) based tests were designed, each test for remember, understand and apply cognitive levels (no of test items = 10; duration of test = 30 minutes). The test was administered and graded through the online Google Classroom. During the validation of questionnaire, each of the test item was checked for clarity of statement, completeness of data or representations in diagrams. Check has been performed to see whether each of the assessment test items designed also aligns with that of the cognitive level of corresponding LOs. Different category of test items was designed, with increasing difficulty levels as a measuring factor.

The MCQ test item shown was administered to assess the apply cognitive level of students as per the revised Blooms Taxonomy (Revised). The learner needs to first apply Brewster's law (assessment as aligned with LO-1) for light incident upon a dielectric medium, wherein, he needs to ensure the state the polarisation upon reflection at polarising angle. Further he/she had to analyze the intensity variations upon a full rotation of Nicol's prism (assessment as aligned with LO-2). Here, the students are expected to apply what they learned about the working of Nicol Prism as a polariser. Thus, with the apply-level cognitive skill test, the instructor could assess the student's ability of applying conceptual knowledge to a certain scenario. To assess the higher-order cognitive skills (HOT) like analyze and evaluate levels, descriptive problems solving skill test (in-class) was administered.

We could see that how one of the problem solving skill (PSS) test question (to assess evaluate cognitive level) has been aligned with that of the LO. The learner is expected to first use Malus law in optics to a more complex situation, wherein, the light being transmitted through series of polarisers each oriented with different optic axis. Then, estimate the rotation angles of one of the intermittent polariser, using the definite criteria, for which the output intensity through it gets eliminated completely. Furthermore, the students need to provide an appropriate justification for their solution. Thus, the HOT skill tests assessed the student's ability to solve complex problems utilizing the given data and to compare, contrast or justify their solutions by blending their basic knowledge. However, due to limitation in assessment design, the highest cognitive level of Blooms Taxonomy (Create level) could not be assessed in present study. The field experts reviewed the validity of both the LOT and HOT skill test questionnaire as stated above. Then, it was pilot tested on some randomly selected students. Relevant modifications on the test questionnaire were subsequently made based on the suggestions concerning the duration of the test, clarity and difficulty levels of the questionnaire.

IV. DISCUSSION

(a) Data collection and analysis of student learning effectiveness

Online Google Classroom (GC) was used as a technological tool for providing LOT MCQs test assessments, allowing data collection and analysis via online. GC also acted as an effective tool for the instructors to follow-up these out-of- class assignments to insure that every student has completed the task, which greatly reduces the amount of hand grading. The research data thus collected from the MCQ and PSS tests were analysed for estimating the learning effectiveness with and without PI. The HOT skill test solutions were evaluated using the rubric (adapted from ref [28]) to avoid any kind of any unconcious bias. The rubric provided in the Ref [28] identifies five general problem-solving criteria as refered in Table-II. The authors of [28] had reported the evidence for validity, reliability and utility of the instrument. Students received a small amount of credit (marks) for attempting the test, whether or not the answers were correct.

Same test duration and questionnaire were designed and administered for all the students. Our study indicated that as compared to the LOT skill test, the PI had facilitated the students to improve their performance in the HOT based problem solving skill test. The students solved problems systematically with the better cognitive strategies as well as the logical progression. Our results revealed that compared to traditional lecturing, the PI implementation has dominantly enhanced the HOT skills than the LOT skills as well as engagement and motivational levels.

(b) Student's perception survey analysis

The student perception survey was collected via online to address our research question. The survey questionnaire had 4 Likert scale questions with 5 points: Strongly disagree /disagree /Neutral /agree /Strongly agree. The frequency distribution of the Likert scale options selected by students were number 1 to 5 was observed. Perception survey about cognitive level alignment of LOs and assessment test items were taken. All students agreed that there LOs-Instructional contents-assessment were aligned.

V. CONCLUSION

The present study is an attempt to provide an active learning environment for the undergraduate engineering students to develop problem-solving skills to enhance their thinking skills to higher cognitive levels. Our study infers that our students have acquired these kinds of attributes and skills, through active engagement to a measurable extent and they could reflect on the practice of learning through the perception surveys. Our studies showed students indicated a significant increase in both "confidence" and "skill" in problem solving. Moreover, the students enjoyed becoming part of the learning process through these new techniques of teaching.

Further extension of the study will be carried out by considering the experimental group and control group, wherein, the instructor plans to measure the students learning effectiveness and enhancement of thinking skills by adopting PI and comparing it with other active learning instructional approaches. Further assessment will be done by way of standardized pre-test and post-test research design to calculate learning gains, considering the possible effect due to several other confounding variables

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Sunlight Assessment Using Dual-Axis Solar Tracker

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***Abstract* — Solar energy is a clean and renewable source of power that is increasingly being utilized to meet the world's energy needs. Solar panels are one of the most popular ways of harnessing solar energy, with the potential to generate electricity both in standalone systems and as part of larger solar arrays that feed into the grid. To maximize the conversion of solar energy into electrical power, it is important to ensure that the solar panels are positioned perpendicular to the sun's rays. As the sun moves across the sky throughout the day, it is important to track its location and adjust the solar panel's position accordingly. This is where an automatic solar panel tracking system comes in. The goal of this project is to design an automatic solar panel tracking system that can locate the position of the sun and move the panel so that it is always positioned perpendicular to the sun. This will allow for maximum energy conversion and, in turn, more efficient use of renewable solar energy. The system will be equipped with light sensors, microcontrollers, gear motors, and of course, the solar panel itself. The light sensors will be used to detect the position of the sun, and the microcontroller will then move the panel via the gear motor system to keep it aligned with the sun. With this automatic solar panel tracking system in place, it is expected that energy generation will increase by up to 40% compared to traditional systems. By making the most of the solar energy available and reducing reliance on non-renewable energy sources, this system has the potential to make a significant contribution to sustainable energy use.**
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I. INTRODUCTION

With non-renewable energy resources dwindling, the use of renewable resources for electricity generation is increasing. Solar panels have become increasingly popular as a source of renewable energy for households. These panels absorb energy from the sun and convert it into electrical energy, which can either be stored in batteries or used directly as an alternative to grid supply. The stored energy can be used in a variety of applications.

The position of the sun changes throughout the day due to the Earth's rotation, which means that solar panels need to be continuously adjusted to receive maximum solar energy. To optimize the solar energy conversion, it is important to ensure that the solar panel is always facing the sun. This can be achieved by continuously rotating the solar panel in the direction of the sun.

This article focuses on the design of a circuit that rotates the solar panel to ensure that it is always facing the sun for maximum energy conversion. By making use of this circuit, households can ensure that they are generating as much solar energy as possible and reducing their dependence on non-renewable energy sources.

II. REVIEW OF LITERATURE

A. Design and Implementation of a Sun Tracker with a Dual-Axis Single Motor for an Optical Sensor-Based Photo voltaic System

The author expounds upon various methods for implementing solar tracking, including single-axis schemes and dual-axis structures, which offer increased precision for high-accuracy systems. The proposed approach constitutes a novel innovation. According to the research paper, a new dual-axis solar tracking PV system has been designed, which utilizes feedback control theory, a four-quadrant light dependent resistor (LDR) sensor, and straightforward electronic circuits to provide a robust system performance. This innovative system employs a unique dual-axis AC motor and a standalone PV inverter to accomplish the task of solar tracking.

B. Design and Implementation of an Automated Sun Tracking Solar Panel without Light Sensors

The author highlights the inefficiency of solar energy systems that do not track the sun as it moves, leading to a significant loss of solar energy during sunrise and sunset. To address this issue, a dual-axis solar tracking system has been designed using two stepper motors that track the highest points of sunlight energy. The system incorporates an RTC-based solar panel tracking approach to effectively track the sun. The project's objective was to create a solar panel tracking system that could follow the sun's path. This was accomplished by utilizing the electrical characteristic of the panel, specifically the open-circuit voltage, to detect the amount of sunlight reaching the panel. The system employs a

step-by-step approach to reposition the panel based on the elapsed time, ensuring efficient solar energy capture.

C. Review on Sun Tracking Technology in solar PV system

The author provides a concise introduction to solar PV cells and the materials utilized in their construction. Furthermore, the types of solar PV systems and solar tracking systems are discussed. The primary focus of the paper is on the design and performance analysis of various dual axis tracking solar systems that have been proposed in recent years. The author conducts a comprehensive review of the performance analysis of dual-axis solar tracking systems. This study offers an overview of the advancements in solar tracking system technology worldwide, with a specific emphasis on the performance analysis of dual-axis solar tracking systems featuring different designs and techniques that have evolved in recent years.

D. Micro-Digital Sun Sensor: An Imaging Sensor for Space Applications

The author describes the Micro-Digital Sun Sensor as an attitude sensor that detects the relative position of micro-satellites to the sun in space. The sensor is composed of a solar cell power supply, an RF communication block, and an imaging chip called APS+. It is characterized by its low power consumption, making it ideal for space applications. The sensor operates based on the principle that the sun is a point light source. A thin membrane is placed over the chip surface, which blocks the sunlight, except for a small pinhole. As a result, the sunlight passes through the pinhole, creating a sunspot on the image sensor array of the sensor, which is mounted on the satellite.

E. A highly accurate Wireless Digital Sun Sensor based on Profile Detecting and Detector Multiplexing Technologies

The author proposes a high-accuracy wireless digital sun sensor technology based on profile detection, which can convert a two-dimensional image into two linear profile outputs, achieving a high update rate with low power consumption. To improve the accuracy of the sun sensor within a large Field of View (FOV), a multiple spot recovery approach was introduced using an asymmetric mask pattern design principle to fit the multiplexing image detector method. Additionally, a FOV determination principle based on the concept of FOV region was proposed to aid in both sub-FOV analysis and overall FOV determination.

III. PROPOSED METHODOLOGY

A. Description of Solar Cell

When light influences atoms in a semiconductor, it causes them to become excited, leading to the formation of extra electron-hole pairs in both the n and p regions of the crystal. These extra electrons and holes begin to move in different directions, including towards the p-n junction. Due to the potential barrier of the p-n junction, the excess carriers are separated and prevented from diffusing towards the core.

This separation of excess carriers results in the accumulation of excess electrons in the n region and excess holes in the p region of the photo module, leading to space charge compensation that is concentrated at the p-n junction. This creates an electric field that is oppositely directed to the existing field. When light forms this electric field, it positively charges the left layer of p-type and negatively charges the right layer of n-type, leading to the creation of a photo EMF (electromotive force) between the regions of the plate.

The number of extra carriers formed at the p-n junction, and consequently the amount of photo EMF generated, depends on the intensity of the light and the load resistance connected to the external circuit of the photo module. Thus, the photo EMF can be used to generate electricity in a photo module, which can be used to power electronic devices or stored in batteries for later use.

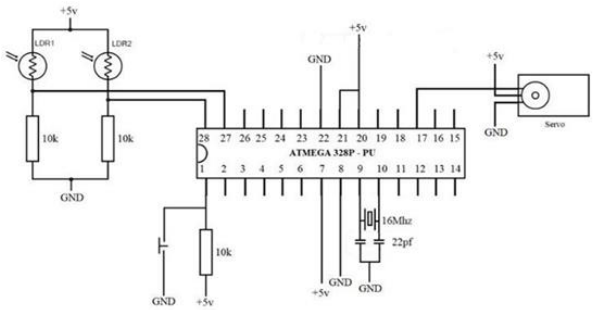

Fig. 3.1.1: Sun Tracking Solar Panel Circuit Diagram

B. Principle of Sun Tracking Solar Panel

To design an efficient solar panel tracking system, various components such as Arduino Uno microcontroller, LDR, solar panel and servomotor are used. The Arduino Uno Board, equipped with ATmega328 microcontroller, is an open-source electronic platform that enables easy hardware and software usage. Servomotors, which have a closed loop servo mechanism, are utilized as a high-performance alternative to any motor. A Light Dependent Resistor (LDR) circuit is used to track the position of the sun. This circuit consists of four LDRs, positioned at the top, right, left and bottom, and connected to Arduino Analog-pins AO to A3 as input for the system. The analog values received by the LDRs are converted into digital signals

with the help of the in-built analog to digital converter. The Pulse Width Modulation (PWM) value is then used to move the servomotor, which tilts the solar panel towards the position of maximum sunlight, based on the programmed instructions.

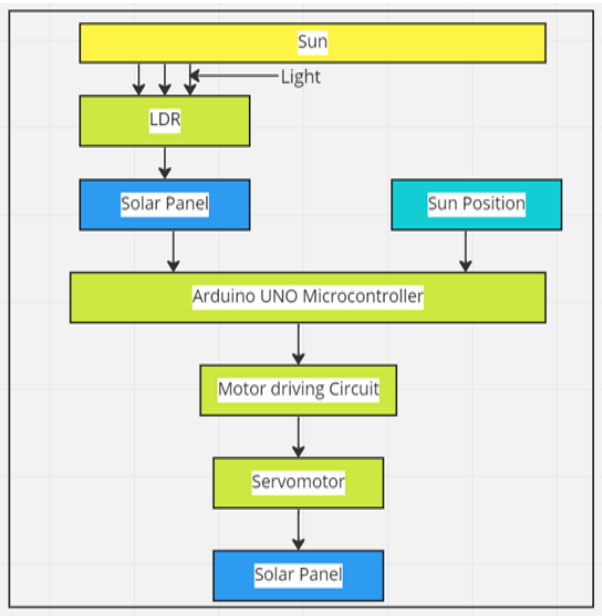

Fig. 3.2.1: Block Diagram of Proposed Methodology
(Source: www.electronicshub.com)

Altitude angle and azimuth angle are two parameters used to track the position of the sun and move a solar panel in the direction of maximum sunlight. The declination angle of the sun is another important parameter, representing the angle between the equator and a line drawn from the centre of the earth to the centre of the sun. This angle varies seasonally due to the tilt of the earth's axis and its rotation around the sun. The hour angle is the angular distance the earth has rotated in a day and is used to determine the exact position of the sun in every month and at any time during the day. These parameters are important for designing a dual-axis solar photovoltaic panel that can always point its solar array towards the sun, regardless of its position in the sky.

By utilizing the altitude angle and azimuth angle as a reference, the position of the sun can be tracked, and the solar panel can be adjusted accordingly. With the use of astronomical data as a reference, a dual-axis solar photovoltaic panel has the ability to constantly position the solar array towards the sun. This technology can be implemented in various regions with other modifications to optimize the efficiency of the system.

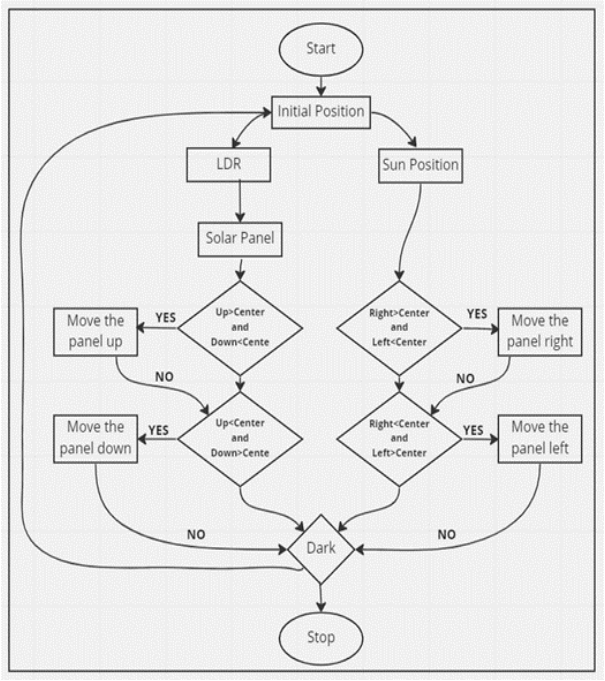

Fig. 3.2.2: Flowchart of Proposed Methodology

Fig. 3.2.2 shows the flow chart for the software part of the proposed system. The flowchart starts with setting the initial position of the sun. Then, the LDR is used to detect the sunlight, and a threshold level is set to ensure that only the sunlight's intensity above that level will be processed. If the light intensity is greater than the threshold value, the system proceeds to the next step, where the sun's position is compared with the centre to the right, left, up and down positions. Based on the comparison, the servomotor rotates the solar panel to the required position, so that the maximum intensity of the light can be captured by the panel. Finally, the system goes back to the initial step to repeat the process continuously.

C. Working of the Circuit

1. Construct the circuit according to the diagram in Figure 3.3.1 and transfer the code to the ATmega328 Microcontroller.

2. Turn on the power to the circuit and position it directly underneath the sunlight on the rooftop.

3. Using input from the two LDRs, the ATmega328 Microcontroller adjusts the Servo Motor's position, causing the panel to move.

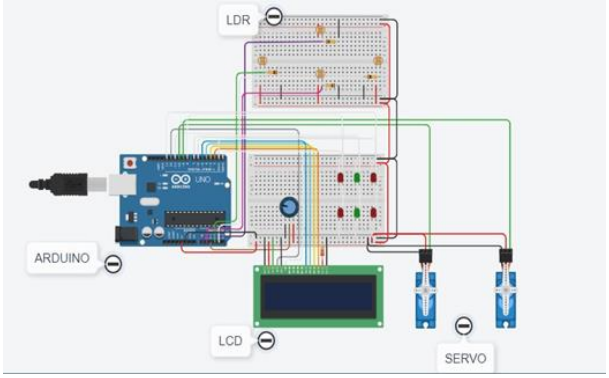

Fig. 3.3.1: Circuit Diagram on Tinkercad Simulator

IV. RESULTS AND DISCUSSION

The expected output is achieved as the model traces the path of sun with the use of various components mentioned. This model can be used in various applications such as agriculture, power supply, streetlights, etc.

Potential Applications of Sun Tracking Solar Panels

- These solar panels can be employed to power traffic lights and streetlights.
- They can be utilized in homes to power appliances through solar power.
- These solar panels are ideal for use in industries, where the ability to save more energy is paramount.

Advantages of Sun Tracking Solar Panels

- Solar energy is a non-renewable resource and utilizing it in this way makes it reusable.
- It saves money by eliminating the need to pay for the energy used (initial setup cost excluded).
- By continuously tracking the sun, these solar panels help maximize solar energy absorption.

Limitations of Sun Tracking Solar Panel Circuit

- Although solar energy can be utilized to its fullest extent, the rainy season can create problems.
- While solar energy can be saved in batteries, they are heavy, occupy more space, and require frequent replacement.
- Sun tracking solar panels can be expensive to acquire and install.

V.CONCLUSION

Advances in the algorithms for sun tracking systems have significantly increased the performance of solar thermal and photo voltaic systems, making them suitable for various applications. Compared to traditional fixed-position solar systems, sun tracking systems can generate a much higher output power by collecting a larger amount of solar energy throughout the day. A literature review of the major algorithms for sun tracking systems developed over the past two decades reveals that these algorithms can be broadly categorized into closed-loop or open-loop types based on their mode of control. The principles of each method have been reviewed, and their performance and advantages/disadvantages have been systematically discussed. The review suggests that sun tracking systems are applicable for a diverse range of high-performance solar-based applications.

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4 Wheel Drive Robot for Surveillance Purposes using GPS

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***Abstract*—This paper presents a review of the use of GPS technology in 4-wheel drive surveillance robots. The integration of GPS with these robots has greatly enhanced their accuracy in navigation and improved their data collection capabilities, making them essential tools in various industries and fields, including military and security operations, environmental monitoring, agriculture, forestry, and mining. The paper outlines the advantages of using GPS in these robots, including increased accuracy in navigation, improved safety and security, enhanced data collection and mapping capabilities, and cost-effectiveness. The paper also highlights the limitations of using GPS, including GPS signal interference and availability, cost and complexity of GPS technology, and dependence on satellite infrastructure. The paper concludes with a discussion of future developments and trends in this field, including advances in GPS technology, the integration of AI and machine learning, and miniaturization and cost reduction. By providing a comprehensive analysis of the current state of the technology, this paper aims to provide insights into the future of 4-wheel drive surveillance robots with GPS.**

Keywords—component, formatting, style, styling, insert (key words)

I. INTRODUCTION

A. Definition of 4-wheel drive surveillance robots

The use of robotics technology in various industries and fields has greatly advanced in recent years, offering new solutions and opportunities for automation and efficiency. One of the areas where this technology has made significant advancements is in the field of surveillance and mapping, where 4-wheel drive robots play a crucial role. These robots have the capability to operate in challenging terrains and environments, making them ideal for various applications such as military and security operations, environmental monitoring, agriculture, forestry, and mining.

The integration of GPS (Global Positioning System) technology with these robots has revolutionized the way they operate, providing increased accuracy in navigation and improved data collection capabilities. The GPS module, connected to the onboard computer of the robot, receives signals from multiple satellites to determine its location, speed, and direction. This information, along with other sensors and control systems, enables the robot to perform autonomous navigation and avoid obstacles, making it an essential tool for many industries.

The purpose of this research paper is to review the use of GPS in 4-wheel drive surveillance robots and its impact on their capabilities. The paper will discuss the advantages and limitations of using GPS in these robots, provide case studies and applications, and highlight the future developments and trends in this field. By providing a comprehensive analysis of the current state of the technology, this paper aims to provide insights into the future of 4-wheel drive surveillance robots with GPS.

B. Importance of GPS in robotics

GPS (Global Positioning System) technology plays a critical role in the field of robotics, providing a means for robots to determine their location, speed, and direction. This information is essential for many robotic applications, including navigation, mapping, and data collection.

The integration of GPS with robots allows for autonomous navigation, which greatly improves the efficiency and accuracy of the robot's operations. With GPS, robots can navigate to specific locations, follow predetermined routes, and avoid obstacles, reducing the need for human intervention.

GPS also enables robots to perform mapping and data collection with greater accuracy and precision. The GPS module, connected to the onboard computer of the robot, can track the robot's movement and collect data in real-time, providing an accurate representation of the environment.

In addition, GPS technology provides safety benefits for robots operating in challenging terrains and environments. With GPS, robots can be programmed to avoid hazardous areas and ensure safe navigation, reducing the risk of damage or accidents.

In conclusion, GPS technology is a crucial component in the field of robotics, providing essential information for navigation, mapping, and data collection, and ensuring the safe and efficient operation of robots.

C. Purpose of the research paper

The purpose of this research paper is to review the use of GPS technology in 4-wheel drive surveillance robots and its impact on their capabilities. The paper will discuss the advantages and limitations of using GPS in these robots, provide case studies and applications, and highlight the future developments and trends in this field.

The paper aims to provide insights into the current state of the technology, including the benefits of integrating GPS with 4-wheel drive surveillance robots, such as improved accuracy in navigation, enhanced data collection and mapping capabilities, and improved safety and security. It will also examine the limitations and challenges of using GPS, such as GPS signal interference and availability, cost and complexity of GPS technology, and dependence on satellite infrastructure.

By presenting a comprehensive analysis of the use of GPS technology in 4-wheel drive surveillance robots, this paper aims to provide valuable information for researchers, engineers, and practitioners in the field of robotics and related industries. The paper also aims to contribute to the ongoing discussions and debates in this field and to provide a platform for future research and development.

II. LITERATURE SURVEY

Determining variations in fields is important for precision farming applications. Precision farming is used to determine, analyse, and manage factors such as temporal and spatial variability to obtain maximum profit, sustainability, and environmental protection. However, precision farming is excessively dependent on soil and plant test processes. Furthermore, test processes are time-consuming, laborious and expensive. These processes also cannot be performed quickly by humans. For these reasons, autonomous robots should be designed and developed for the detection of field variations and variable-rate applications. In this study, a remote-controlled and GPS-guided autonomous robot was designed and developed, which can be controlled via the 3G internet and is suitable for image-processing applications. The joystick is used to manually remotely control the robot movements in any direction or speed. Real-time video transmission to the remote computer can be accomplished with a camera placed on the vehicle. Navigation software was developed for steering the robot autonomously.

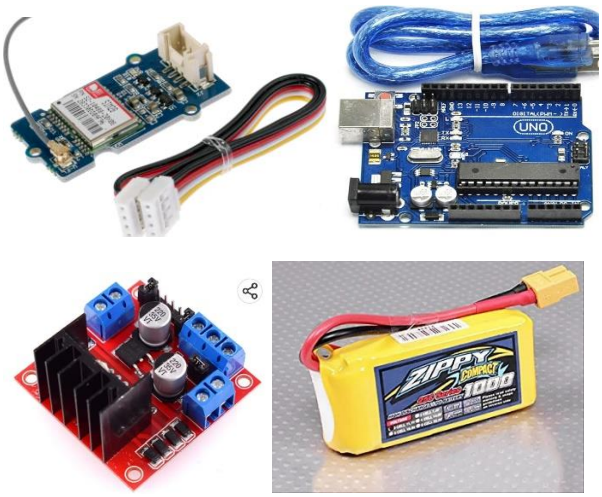
III. BACKGROUND

The integration of robotics technology with various industries and fields has greatly advanced in recent years, offering new solutions and opportunities for automation and efficiency. One of the areas where this technology has made significant advancements is in the field of surveillance and mapping, where 4-wheel drive robots play a crucial role.

These robots have the capability to operate in challenging terrains and environments, making them ideal for various applications such as military and security operations, environmental monitoring, agriculture, forestry, and mining. However, traditional 4-wheel drive robots often rely on human operators for navigation and data collection, which can be time-consuming, inefficient, and dangerous in some cases.

The integration of GPS (Global Positioning System) technology with these robots has revolutionized the way they operate, providing increased accuracy in navigation and improved data collection capabilities. The GPS module, connected to the on-board computer of the robot, receives signals from multiple satellites to determine its location, speed, and direction. This information, along with other sensors and control systems, enables the robot to perform autonomous navigation and avoid obstacles, making it an essential tool for many industries.

Despite the significant advancements in GPS technology and its integration with 4-wheel drive surveillance robots, there are still limitations and challenges that need to be addressed. The purpose of this research paper is to review the use of GPS in these robots, including its advantages and limitations, and to provide a comprehensive analysis of the current state of the technology. The paper will also highlight the future developments and trends in this field, and provide valuable insights for researchers, engineers, and practitioners in the field of robotics and related industries.



Evolution of 4-wheel drive robots

The evolution of 4-wheel drive robots can be traced back to the early days of robotics research and development, where the focus was on creating robots capable of

operating in challenging environments and terrains. Over the years, significant advancements have been made in the design and capabilities of 4-wheel drive robots, enabling them to perform a wider range of tasks and applications.

In the early days, 4-wheel drive robots were mainly operated manually, with limited navigation and data collection capabilities. These robots were typically large, bulky, and expensive, limiting their use to military and industrial applications.

With the advancement of technology, the size and cost of 4-wheel drive robots have decreased, making them more accessible for a wider range of applications. The integration of GPS (Global Positioning System) technology with these robots has revolutionized the way they operate, providing increased accuracy in navigation and improved data collection capabilities. The integration of other technologies such as artificial intelligence, machine learning, and the Internet of Things has further enhanced the capabilities of these robots, making them more versatile and efficient.

In recent years, the development of miniaturized 4-wheel drive robots has expanded the potential for their use, making them ideal for a wider range of applications, including environmental monitoring, agriculture, forestry, and mining. The ongoing advancements in technology, including the development of new materials, improved sensors, and more advanced control systems, will continue to drive the evolution of 4-wheel drive robots and further expand their capabilities and use in various industries.

a. Overview of GPS technology

GPS (Global Positioning System) technology is a satellite-based navigation system that provides precise location and time information to users around the world. Developed by the United States Department of Defense in the 1970s, GPS has become a critical tool for navigation and location-based applications in various industries, including transportation, agriculture, military, and more.

The GPS system consists of a constellation of 24 satellites orbiting the earth, ground control stations, and user receivers. The user receiver, commonly integrated with other devices such as smartphones, vehicles, or robots, receives signals from multiple satellites to determine its location, speed, and direction.

GPS technology works by using the principle of trilateration, which involves measuring the distance between the user receiver and at least three GPS satellites to determine its location. The GPS receiver uses the time difference between the transmission and reception of signals to calculate the distances, which are then used to determine its position. The precision of GPS technology is improved by using advanced algorithms and techniques, such as differential GPS and real-time kinematic GPS.

The integration of GPS technology with 4-wheel drive surveillance robots has greatly improved their navigation and data collection capabilities, enabling them to perform autonomous navigation and avoid obstacles. The use of GPS also provides accurate location and mapping information, which can be used for various applications, such as environmental monitoring, agriculture, forestry, and mining. Despite the benefits of GPS technology, there are also limitations, such as GPS signal interference and availability, cost and complexity of GPS technology, and dependence on satellite infrastructure. Nevertheless, GPS technology continues to play a crucial role in the development and evolution of 4-wheel drive surveillance robots, and its ongoing advancements will further expand its capabilities and applications in the future.

b. Integration of GPS with 4-wheel drive robots

GPS integration with 4-wheel drive robots allows the robot to determine its location, navigate and track its movement in real-time. This integration makes use of GPS receivers and navigation algorithms that process GPS signals to estimate the robot's position and velocity. The information obtained from GPS is then fed into the control system of the robot, which uses it to determine the necessary movement and control commands for the 4-wheel drive system. This integration enables the robot to carry out autonomous navigation, mapping, and location-based tasks with high accuracy and reliability.

IV. ADVANTAGES OF USING GPS IN 4-WHEEL DRIVE SURVEILLANCE ROBOTS

1. Autonomous navigation: GPS enables the robot to navigate autonomously, reducing the need for manual control and allowing it to cover large areas efficiently.

2. Increased Accuracy: GPS provides accurate positioning information, which helps the robot to carry out surveillance tasks with greater precision.

3. Real-time tracking: GPS allows for real-time tracking of the robot's location, making it easier to monitor its progress and respond to any deviations from its intended path.

4. Mapping: GPS can be used to create maps of the robot's environment, which can be used for future reference and to plan more efficient routes.

5. Improved safety: By reducing the need for manual control, GPS can help to increase the safety of the operators and reduce the risk of accidents.

6. Enhanced surveillance capabilities: The integration of GPS with 4-wheel drive robots can increase the range

and effectiveness of surveillance tasks, allowing the robot to cover larger areas and respond to unexpected events more quickly.

V. LIMITATIONS OF USING GPS IN 4-WHEEL DRIVE SURVEILLANCE ROBOTS

1. Signal Interference: GPS signals can be disrupted by various factors such as tall buildings, trees, and atmospheric conditions, which can result in decreased accuracy or loss of signal.

2. Dependence on satellite coverage: The availability and accuracy of GPS signals depend on satellite coverage, which may not be available in all locations or at all times.

3. Cost: The integration of GPS with 4-wheel drive robots can be expensive, especially for high-end systems with advanced navigation algorithms and sensors.

4. Maintenance: GPS systems require regular maintenance to ensure proper functioning and to maintain their accuracy over time.

5. Limitations in urban environments: GPS accuracy can be greatly reduced in urban environments due to the presence of tall buildings and other structures that can obstruct GPS signals.

6. Limited precision: Although GPS provides relatively accurate positioning information, it may not be precise enough for certain applications that require higher levels of accuracy. In these cases, additional sensors and algorithms may be needed to achieve the desired level of precision.

V. FUTURE SCOPE

Global Positioning System (GPS) is much more than just the means of finding a way while commuting. It full fills a much higher purpose than finding the fastest route. They help you to monitor crucial parameters like speed, trip distance, geo-fencing, real-time tracking among others. GPS trackers have paved the way for both automobiles like cars, trucks, buses as well as personal safety devices like GPS tracking smartwatches. They are easily trackable via smartphone or laptop keeping you tension-free .Trackers are small with technological advancement, tend to grow and improve. The future of GPS tracking looks extremely promising and we can expect some interesting advancement in this area. Let's look at what the future holds for GPS monitoring systems. Compact GPS devices are smaller than a cell phone but the experts predict that continuous development may shrink the sizes of these devices further .The size of the tracker depends on the battery, while a thumbnail-sized receiver can be improved, it needs to be big enough to accommodate the battery. As the battery technology unfolds, in the future, we may be able to see GPS trackers getting smaller in size.

These days, the best trackers can go up to 30 days without a recharge but to go longer, extended battery packs may be needed which provide up to 6 months of uninterrupted usage .GPS trackers are no longer a luxury reserved for big organizations and government agencies. The low price points have brought it within the reach of small companies and even individuals. GPS vehicle tracking is a must for every business and the raised productivity and efficiency make it a value for money. They are immensely useful for both the professional and personal front. As per their requirements, different sections of people can be catered through the affordable price range. The devices are getting compact yet powerful. Hence, this is the best time to invest in GPS tracking solutions. Past few years have seen a considerable rise in businesses turning to GPS technology, as an effective way to manage their transports, employees, and assets. GPS fleet management systems allow enterprises to access driver's performance, vehicle maintenance to providing other necessary inputs like live vehicle tracking .As the crime rate increases with each passing day, GPS trackers give a sigh of relief for parents. Trackers ensure the safety of your loved ones- be it children or elderly family members. Parents rely on these trackers to keep a watch and control their inexperienced young teenagers' reckless driving. Uni GPS solutions have gained a reputation for providing end-to-end service to the clients in the promptest and efficient manner with their GPS tracking systems .The vehicle tracker with its intelligent routing system provides alerts, reports, and notifications on a real-time basis about over speeding, geo fence entry and exit, etc. It updates the admin about upcoming vehicle maintenance reducing the instances of a transportation breakdown. The safety of his/her family members is of utmost importance for a person. Uni GPS smartwatches come with valuable features like auto feature answer, SOS button alerts, and more.

VI. CASE STUDIES AND APPLICATIONS

There are several case studies and applications of the integration of GPS with 4-wheel drive robots, including:

1. Search and rescue operations: 4-wheel drive robots equipped with GPS can be used in disaster zones or remote areas to locate and rescue survivors. The robots can navigate autonomously, allowing them to cover large areas efficiently and provide real-time updates on their progress.

2. Environmental monitoring: GPS-equipped 4-wheel drive robots can be used for environmental monitoring, such as monitoring wildlife populations, conducting soil and water analysis, and mapping ecosystems.

3. Agriculture: GPS-enabled 4-wheel drive robots can be used for precision agriculture, such as crop monitoring, soil mapping, and plant counting.

4. Mining and construction: GPS-equipped 4-wheel drive robots can be used in the mining and construction industries to perform tasks such as mapping underground mines, carrying out site surveys, and monitoring construction sites.

5. Military and security: 4-wheel drive robots equipped with GPS can be used in military and security applications, such as border patrol, surveillance, and bomb disposal.

6. Surveillance and security: GPS-enabled 4-wheel drive robots can be used for surveillance and security tasks, such as perimeter monitoring, crowd control, and asset protection.

VII. FUTURE DEVELOPMENTS AND TRENDS

Future developments and trends in the integration of GPS with 4-wheel drive robots are likely to include:

1. Improved GPS technology: Advances in GPS technology, such as the use of multi-constellation GPS systems and the integration of additional navigation sensors, are likely to improve the accuracy and reliability of GPS-enabled 4-wheel drive robots.

2. Increased autonomy: As AI and machine learning algorithms continue to evolve, 4-wheel drive robots equipped with GPS are likely to become increasingly autonomous and capable of carrying out more complex tasks.

3. Integration with other technologies: The integration of GPS with other technologies, such as LiDAR, computer vision, and 5G networks, is expected to enhance the capabilities of 4-wheel drive robots and enable them to carry out a wider range of tasks.

4. Miniaturization: As technology continues to miniaturize, it is likely that GPS-enabled 4-wheel drive robots will become smaller, lighter, and more portable, allowing them to access smaller and more confined spaces.

5. Increased affordability: Advances in technology and manufacturing are likely to make GPS-enabled 4-wheel drive robots more affordable, making them accessible to a wider range of users and applications.

6. Growing demand: As the demand for autonomous robots continues to grow, the market for GPS-enabled 4-wheel drive robots is likely to expand, leading to the development of new and innovative applications.

VIII. CONCLUSION

In conclusion, the integration of GPS with 4-wheel drive robots offers a number of advantages, including increased accuracy, autonomous navigation, real-time tracking, mapping, improved safety, and enhanced surveillance capabilities. Despite its limitations, such as signal interference, dependence on satellite coverage, cost, maintenance, and limited precision, GPS continues to be a critical component of 4-wheel drive robots.

Future developments in GPS technology, AI, and machine learning algorithms, as well as the integration of other technologies, are expected to further enhance the capabilities of 4-wheel drive robots. The growing demand for autonomous robots and the increasing affordability of GPS-enabled 4-wheel drive robots will also play a role in driving the continued growth and development of this technology.

Overall, the integration of GPS with 4-wheel drive robots has the potential to revolutionize a wide range of industries, from search and rescue operations, to agriculture, mining and construction, military and security, and surveillance and security.

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The preferred spelling of the word “acknowledgment” in America is without an “e” after the “g”. Avoid the stilted expression “one of us (R. B. G.) thanks ...”. Instead, try “R. B. G. thanks...”. Put sponsor acknowledgments in the unnumbered footnote on the first page.

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Coal and Gangue Positioning and Classification using Support Vector Machines

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***Abstract*- Coal classification is mainly done by manual screening method or by mechanical means. It cannot give immediate production as it is very time consuming. Coal and gangue sorting is gaining attention recently. The first work of the robot is to classify weather the particle on the conveyor is coal or gangue. Computer vision and machine learning algorithms are being used for recognition of coal and gangue and to apply is the real world scenario. This paper utilizes support vector machines (SVM) for coal classification. The particle positioning and count was done correctly and the accuracy of the SVM is 92% on the test set.**

Keywords – Support vector machine (SVM), Coal, connected components

I. INTRODUCTION

Manual and mechanical methods are mainly used for sorting of coal and gangue. But these methods use high cost of labour and energy due to which environment pollution and wastage of natural resources is caused [1]. The automatic sorting of coal and gangue can provide a connection in the processing and production of coal [2]. X- Rays and gamma rays are mainly used in equipment for separation of coal and gangue particles. Coal and gangue are radioactive materials and the radioactive material present in gangue is much greater than that of coal and can be ignored. Detectors of natural radiation were developed. It identifies the coal and gangue particles based on the education of the radiation passing through the samples [3]. The X-ray detects the coal and gangue particles based on the amount of radiation absorbed by the particles. Coals have lower density as compared to gangue, so the amount of radiation absorbed by coal is much lower than that of gangue. The X- rays are collected by detectors and are converted into digital signals. If the value of the digital signal is large then the object through which the X- ray passed is coal otherwise it is gangue [4]. High pressure valve and airflow are required for coal and gangue sorting by mechanical equipment. The limitation to these methods is fast response of system, ray detection should meet environmental standards, moisture content and low precision of execution part. The coal and gangue sorting robot has gained attention in the recent years. Primary task for the coal and gangue sorting robot is to recognize and position the coal and gangue perfectly. Many researchers have been trying to solve this problem through computer vision or image analysis and use these methods for real life scenarios. The coal and gangue have different parameters for entropy, peak and mean of gray scale and contrast ratio. These results can be found by analyzing texture level co-occurrence and gray matrix [5]. Many researchers have contributed in this field. By using image analysis, work has been done on method for density fraction prediction [6] and ash content prediction [7] of coarse coal. Particle size distribution (PSD) of coal using computer vision has been done on conveyor [8]. For the identification of different ores, a SVM model and a comprehensive model was established [9]. Many other coal and gangue identification models have been proposed but they have high hardware requirement, complex algorithm and long-time consumption. Many methods can be used for coal and gangue separation but neural network based classification, k-nearest neighbour based classification and SVM based classification are methods of choice for most researchers. SVM algorithm performs better than self- organizing competitive neural network for coal identification and classification [10]. This paper studies the coal and gangue classification problem. Morphological processing and binarization of image is done for obtaining clear and full target samples. Centre of mass is calculated for getting the position information of the coal and gangue samples. Support vector machine is used for classification of coal and gangue.

II. POSITIONING OF COAL AND GANGUE

1) Image Binarization – There is a need for removal of noise from the image before performing any operation on it. For this purpose, we need a filter that does not affect the edges of the images. A well know filter named bilateral filter is used for this purpose. This filter not only removes noise from the image but also performs smoothing operation on the image while preserving its edges. Bilateral filtering filter image on the basis of image intensity or colour and spatial closeness and is a non-iterative process [11-12]. For separating the object from the background, segmentation of image is done. Imbinarize function, which uses Otsu's thresholding method for image segmentation.

2) Hole filling and Removing Objects from Background - Morphological operations are the operations that depend on shapes. Structuring element used in morphological operations is applied on the input image and an output image of same size is created. There are many morphological operations like erosion, dilation, opening, top-hat filtering, bottom-hat filtering etc. [13]. The morphological operation used for removing the holes or white pixels' intensities is infills. Infill function fills the holes on the background of the image. But we need to remove the holes inside the object, so we take a negative of the binarized image and then apply the infill function. For removing the connected components (objects) smaller than a certain value, area opening is done [14-15]. The two parameters used in this function are the image and the numerical value. The numeric value determines the object having pixels less than the value and removing all that objects.

3) Solving Overlapping Problem - When multiple number of samples are on conveyor, then there may be chances that one particle is overlapping the other particle. Due to this there is a small connection formed between the two samples in binary image and the objects are treated as one object which causes a problem in positioning of the samples. To solve this problem erosion and dilation morphological operations are performed on the image. Erosion operation is performed on the image to separate the objects as erosion removes the pixels on the object boundaries. To get the image back to its original size dilation is performed as it adds the pixels to the image boundaries [13].

4) Extracting the Centroid of the Samples and Counting the number of Samples - Before extracting the centroid of the samples, erosion operation is performed on the object so that the overlapping problem can be fixed. For measuring the centroid of the samples, region props function is used. Region props function returns the measurement of the properties of an object in a binary image [16]. The illustration of the extraction of centroid is shown in figure 1. The marker are shown by red colour on the objects.

Fig 1. – Centroid detection of four objects

Bwconncomp function is used for counting the number of particles. This function counts all the connected components. The connected components which are connected forms one sample object and if two sample objects are very close or are counted as connected components then these two sample objects are counted as one object [17]. For preventing this situation, we have used erosion to remove the boundary pixels of objects and area opening to remove particles less than certain pixel value.

III. SVM APPLICATION ON COAL AND GANGUE RECOGNITION

1) Importing Images and creating training set and test set - For import images to the MATLAB workspace imageDatastore function is used and subfolders were also included. Image Data store supports various formats of image such as jpg, jpeg, tif, tiff etc. Images in the image data store are classified on the basis of the folder's name where they are stored and the data is saved as image Data cache object. Image data is split into training set and test set with the help of splitEachLabel function into a ratio of 80% and 20% respectively [18].

2) Feature Extraction - Image samples of coal and gangue are taken from random sources. Gangue images contain the images of shale and sandstone. Before extracting the features all the images converted to 128*128 size. Texture features, local binary pattern features and gray scale features are calculated. Texture parameters are calculated with gray level co-occurrence matrix. The texture features include contrast, homogeneity, correlation and energy [16]. Table 1 and 2 shows distribution range of gray-scale features and texture features respectively.

Table I : Range of Gray Scale features for Coal and Gauge

Features	Mean	Variance	Skewness	Kurtosis
Coal	12.768 - 19.35	243.01 - 10104	-2.6109 - 5.4884	1.4176 - 49.096
Gangue	16.131 - 238.56	200.04 - 7579.8	-2.0795 - 1.378	1.6426 - 12.95

Table II: Range of texture features for Coal and Gauges

Features	Local Binary Pattern Features	Contrast	Correlation	Energy	Homogeneity
Coal	1.3054-3.0804	0.013174-5.428	0.61658-0.99741	0.047157-0.80767	0.67657-0.99342
Gangue	2.7509-2.7509	0.027243-2.6938	0.99107	0.028541-0.70854	0.58885-0.98785

3)Training the SVM Model -For training of features with SVM, all the features were taken at once and were trained. Fitcsvm function is used for training the model. The parameters used for model classification are show in table below.

Table III: SVM Parameters and its options used

S.No.	Parameter	Parameter Option
1.	Kernal Function	Linear
2.	Standardization	True
3.	Hyperparamter Optimization	all

A graph between minimum observed objective and estimated minimum objective is drawn and is shown in figure 2.

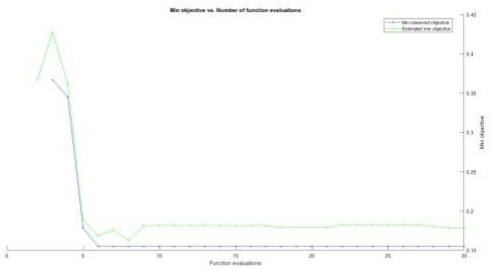

Fig 2. - A graph between minimum observed objective and estimated minimum objective

4) Cross-validation and testing accuracy on test set - Cross-validation of the model is done using crossval function taking KFold value as 10. The KFold randomly partition the data into 10 sets in our case. For a given dataset, crossval function is used to evaluate the model and find out the most favourable input parameters. According to random permutation, the training set data is reordered for each runs of cross-validation [19]. Then validation accuracy is calculated and is found to be 85.36. After this SVM model is applied on the test set which gives accuracy of 92.0530%. Confusion-chart of coal and gangue prediction for test set is given below in figure 3.

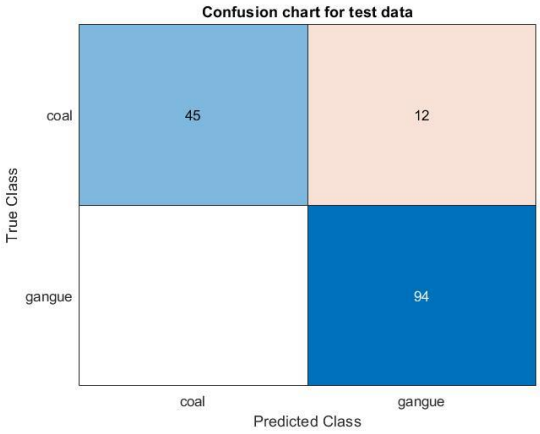

Fig 3. - Confusion chart of test set

5)Testing of an image - This image was taken from a local restaurant. After getting the results on the test-set, the classifier was used to check the classifier. And we found that the classifier predicts the image correctly as shown in figure 4. The results were displayed in the manner that if the classifier detects the objects to be coal, then it will show the image by using in show function and display the title as coal.

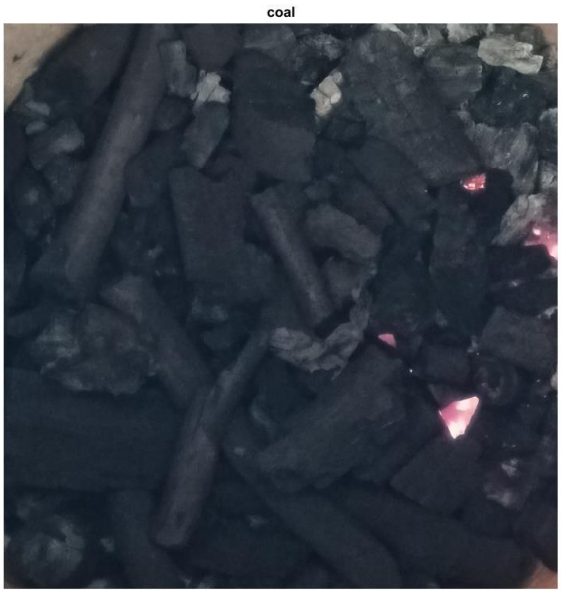

Fig. 4. – Test of coal classified correctly

IV. CONCLUSION

The following conclusions can be drawn from the study–

1. Coal and gangue can be distinguished based on the above properties. More number of samples, quality of light and images can increase the accuracy. The following classification was with 286 images of coal and 471 images of gangue. These were the randomly collected images and the classification is 92.0530% accurate on the test-set.

2. For positioning of the sample objects on the image erosion performs very well. Small particles should be removed from the images by area opening process and the choice of removing the objects depends on the size chosen by the person. So, it provides sample objects greater than the size input on the computer.

3. When all the small sample objects have been removed, the number of objects in the image can be calculated by seeing the connected components. We get desirable results if erosion and area opening process are done correctly.

4. Performance of SVM in imbalanced dataset is good. The correct classification of the minority class is challenging. So the datasets should be well balanced.

ACKNOWLEDGEMENT

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Coal Particle Size Distribution (PSD) Analysis Using Image Segmentation

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***Abstract*- Particle Size Distribution (PSD) is conventionally done by manual screening method, which is time-consuming and cannot be guided for production. Digital Image Processing is widely being used in the analysis in various fields and is a perfection tool for determining the PSD of coal particles. In this paper an image segmentation method is proposed and determination of particle size is done. Images from Scanning Electron Microscope (SEM) are taken for analysis. Colour image is converted to grey scale image and then to the binary image using the Otsu's thresholding method, morphological operations were performed on the binary image and particles were detected by applying the watershed segmentation.**

Keywords – Particle size distribution, Watershed Segmentation, Distance Transform, Scanning Electron Microscope

I. INTRODUCTION

In mining and mineral processing industry, particle size and PSD are main parameters. Many equipment's and processes in coal industry depend on PSD of coal. PSD can be used for increasing the production speed and quality. Sieving is the traditional method for determining the PSD of coal but it is slow and time-consuming process and cannot be used for online measurement [1-2].

In the field of computer vision, image contains a lot of information; this information can be used for many tasks like robot navigation, remote sensing [3]. In computer vision, much work has been done on grey scale images. The process used for segmentation of grey scale images cannot be applied to colour images. Segmentation of a grey scale image is much easier than colour image. Image segmentation is considered as the base of computer vision and object recognition [4]. It can be defined as the partitioning of an image into regions that are homogenous in some sense like brightness, colour, texture etc. [5]. Image segmentation is the first step in image analysis, before this image correction or enhancement or de-noising is done. There are various image segmentation techniques but not all techniques give the same result on each image [3]. Some of the image segmentation techniques are region-based segmentation, edge detection, Special theory-based segmentation, watershed segmentation etc. [4].

Now-a-days image processing and machine learning methods are used to find the PSD in the images. Many problems are encountered while determining the PSD of coal. The amount of fines possesses a great influence on the PSD determination through image processing. As the fines of the particle increases, the determination of the PSD decreases [6].

Gaussian filters cannot be applied in this process as it not only blurs the surfaces but blurs the edges equally. So we need an averaging filter that preserves the edges while do averaging within smooth regions. Anisotropic diffusion and bilateral filtering are the two processes that can do the job but anisotropic filtering is an iterative process and cannot be used in real time. Bilateral filtering is a non-iterative process and filters image on the basis of image intensity or colour and spatial closeness [7-8].

Traditional methods of segmentation are good for rigid objects. But objects with varying topological structures and lighting conditions cannot be dealt with traditional methods as boundaries detected by these methods may not be the true boundaries [9]. For same algorithm, different results are obtained for different environments and the amount of illumination. Generally used illumination normalization techniques for pre-processing are Logarithmic transforms, Gamma correction and histogram equalization but these techniques affect the quality of the image and are not much efficient. So these techniques cannot be used for normalization for SEM images with varying illuminations [10]. For lighting problems we'll use morphological normalization technique to get uniform contrast on the objects.

Morphological operations are the operations that depend on shapes. Structuring element used in morphological operations is applied on the input image and an output image of same size is created. There are many morphological operations like erosion, dilation, opening, top-hat filtering, bottom-hat filtering etc. The morphological operations used in this paper are top-hat filtering, dilation, erosion and hole filling [11].

The idea of watershed came from geography. It is a landscape or a topographic relief. Consider the high pixel values as peaks and low pixel values as valleys. Like in a real-world watershed, a drop of water falling at any point on the contour will go to the lowest possible location – the local minima. These local minima are called catchment basins and all the points from which the water falls into the same catchment basins are part of same watershed. Watershed is the dividing line of the areas from which water will fall into different catchment basins [12-14].

Watershed segmentation method is used for segmentation because it is fast, simple, provides closed contours, requires little computational time and is able to completely divide an image into separate regions. Over-segmentation and under-segmentation are two major drawbacks of watershed segmentation. These drawbacks can be removed either by pre-processing the image before applying watershed or region [15-16].

The main step before watershed is applying distance transform (DT) or Euclidean distance map to the image. Suppose the division of pixels is done into background and object. The DT calculates the distance between each object pixel and the closest background pixel in the binary image and labels it on the object pixel [17-18].

II. SAMPLES AND EQUIPMENT

The samples of fly ash were taken and were observed under SEM. The SEM image is taken as the image for analysis. The image processing techniques are applied on MATLAB 2021a software.

III. PROCEDURE

1) Illumination Normalization - In this study, SEM image of fly ash is taken for determining the PSD. First the image is converted into a gray scale image. For illumination correction, morphological top-hat filtering is done on the gray-scale image. Top-hat filtering morphological opens the image and then this opening is subtracted from the original image. For doing this a structuring element is required [10].

2) Bilateral filtering - After performing the top-hat filtering on the image, bilateral filtering is done on the image. Bilateral filtering is done to blur the surface regions of the top-hat image. One main advantage of using bilateral filtering here is that it only blurs the surface region of the image, preserving the edges of the image [8]. Conversion to Binary image - In a binary image the pixel values are either 1 or 0. A threshold value is chosen and the pixels above the threshold value are replaced by 1s and all the other values are replaced by 0s. Otsu's thresholding method is used for conversion of the gray scale image into binary image. Binary image is shown in fig. 3. Other morphological operations like bwareaopen, imfill etc. are performed on the binary image for making it fit for watershed transformation. After that gradient of the image is taken.

3) Distance transform - The binary image contains separate regions that are connected to each other and needs to be separated. For this purpose, DT is applied to negative of the binary image. This calculates the blob centres which are the local maxima of DT. Peaks of the DT are used for estimation of location of the particles [7].

4) Peak extraction - H-domes method is used for the peak extraction from DT and there is downshift of peaks by a factor of h. For lower value of h, non-circular and large blobs are split and for higher values, small blobs are missed [7].

5) Watershed Segmentation - Gradient of the image after applying h-domes is taken. The gradient is taken by applying the sobel operator. Then watershed segmentation is used on the gradient image. The watershed lines are then labelled over the gray image of the original image.

IV. RESULTS AND DISCUSSION

Fig. 1a shows the image taken from SEM. Fig. 1b shows the gray scale image of the SEM image. Top-hat filtering is applied to the gray scale image and is shown in fig. 1c. Fig. 1d shows the bilateral filtered image, fig. 1e shows the binary image of bilateral filtered image. Morphological operations are done after that and then gradient of the binary image is taken and is shown in fig. 1f. Image after applying distance transform and finding the minima fig. 1g.

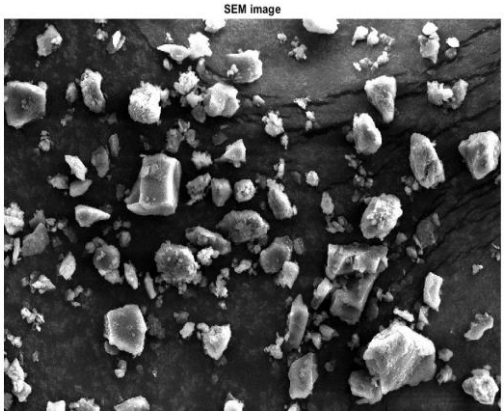

Fig. 1a. SEM image

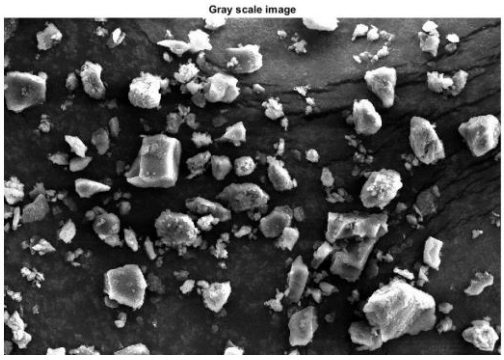

Fig. 1b. Grey scale image

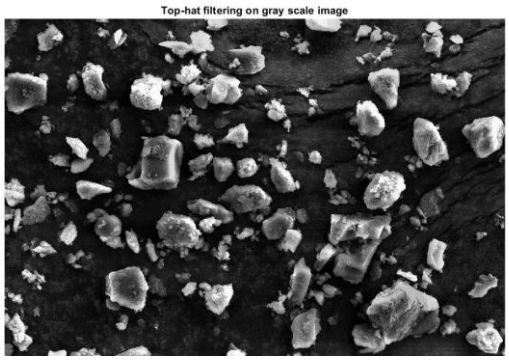

Fig. 1c. Top-hat filtering on grey scale image

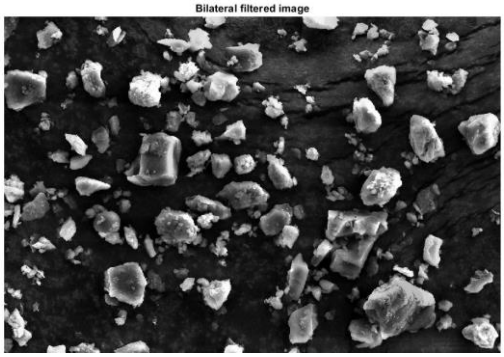

Fig. 1d. Bilateral filtered image

Fig. 1e. Binary image

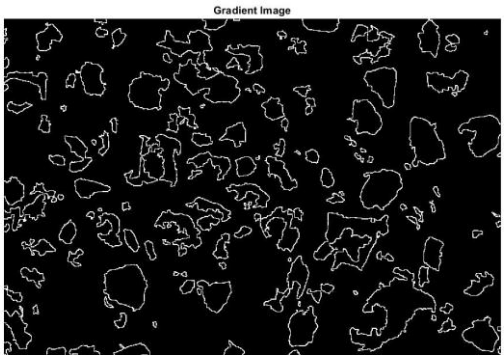

Fig. 1f. Gradient image

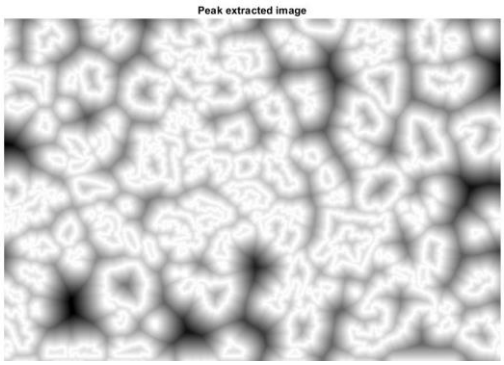

Fig. 1g. Peak extracted image of distance transform

The segmentation process used is watershed segmentation. Over and under segmentation are the two major drawbacks of watershed segmentation. In over-segmentation, the object is segmentation is further segmented into many sub-objects whereas in under-segmentation unwanted area is also segmented with the region of interest [19]. Over-segmentation can be reduced either by pre-processing the image before applying watershed or by merging the regions after watershed [15-16]. We have used pre-processing of image before watershed segmentation to get our results. Fig. 2a shows the image in which watershed is directly applied to the grey scale image and fig. 2b shows the image in which watershed is applied to the image after performing all the above-mentioned pre-processing algorithms

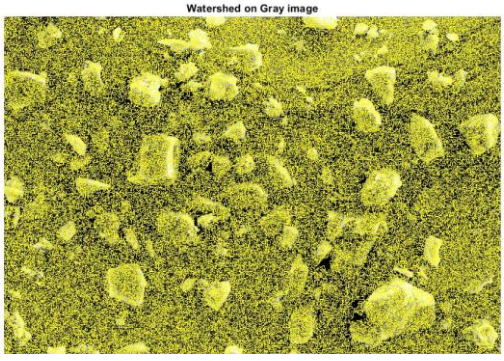

Fig. 2a. Watershed directly applied on grey scale image

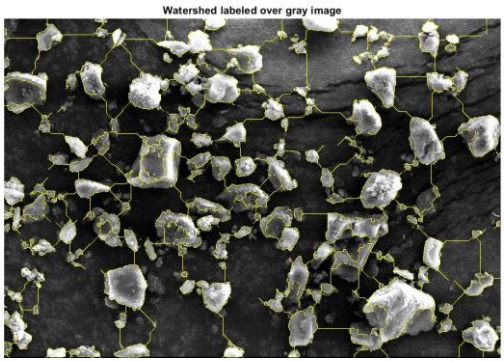

Fig. 2b. Watershed labelled over grey image

To find the number of objects in the image, bwconncomp function is used which returns the number of objects in the image [20]. Region prop function is used for calculating the properties of the segmented regions. The properties include centroid, minor axis length, major axis length, area and diameter.

All the particles having pixel value less than 45 were removed from the binary image. The total number of particles in the image was 196. The maximum and minimum diameter in terms of pixels was found to be 189.9819 and 1.1547 respectively. The diameters of each particle are calculated by using 106 as the maximum particle size. A histogram between the area (in terms of pixels) and particle number is plotted and is shown in fig. 3.

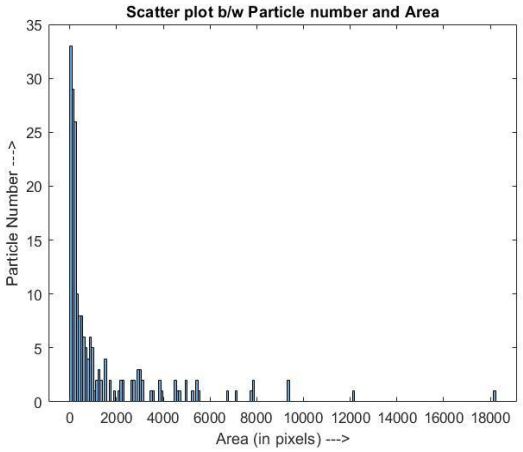

Fig. 3. Histogram between area (in pixels) and particle number

V. CONCLUSION

Many image processing techniques like illumination normalization, bilateral filtering etc. are discussed in this paper. PSD of the fly ash particles is done on the basis of watershed segmentation method. The total numbers of particles were calculated and their respective area and diameter are calculated in terms of pixels. Also the diameters are calculated by taking the maximum size as 106. Finally, a histogram is made between particle number and area (in terms of pixels) is drawn to show the PSD of in the image. The following conclusions can be drawn based on the above study-

Image with poor illumination needs to be processed for even illumination on the objects. Top-hat filtering is a good way to do so.

Bilateral filter is better options than other smoothing filters for smoothing the image while preserving edges.

Bwconncomp function is used to calculate the number of objects in the image. The total numbers of components were 196.

Based on the connected components, region prop function was used to calculated area, diameter and other properties. The maximum and minimum diameters in terms of pixels were found to be 189.9819 and 1.1547 respectively. The maximum and minimum area in terms of pixels were founds as 18220 and 1 respectively.

ACKNOWLEDGEMENT

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Sanket: ISL Interpreter

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***Abstract*— India is home to approximately 63 million people of the Deaf and Hard of Hearing community (DHH). There are only about 250 certified sign language interpreters in India, translating for a deaf population of between 1.8 million and 7 million. So, the ratio of interpreters to deaf is very small. The total number of smartphone users in India is likely to rise to nearly 83 crores by 2022. Estimates 1% of this are of the DHH community. This paper proposes the project work to provide a platform to the DHH community and bridge the communication gap between them. The project - Sanket aims to develop an android application virtual interpreter to interpret Speech to ISL and vice versa thereby addressing the issue and proposing a neat solution.**

Keywords—Hearing Community, DHH Community, ISL, interpreters, android application.

I. INTRODUCTION

Around the globe, the majority is of those who can hear. For Deaf people, living in a world where one's language is known by few & understood by even fewer influences how they view themselves. Communicating with people who don't know sign language is a huge barrier. India is home to approximately 63 million people of the Deaf and Hard of Hearing community (DHH). But there are only about 250 certified sign language interpreters in India, translating for a deaf population of between 1.8 million and 7 million. Sign language is nothing but composed of various gestures formed by different shapes of hand, its movements, orientations as well as the facial expressions. These gestures are generally used by deaf-dumb people in order to express their thought. Dumb-deaf persons faces communication barrier in public places while interacting with normal person, such as in bank, hospital and post offices. Sometimes the deaf needs to seek the help of the sign language interpreter so as to translate their thoughts to normal people and vice versa. However, this way turns out to be very costly and does not work throughout the life period of a deaf person. So, a system which can automatically recognize the sign language gestures and convert speech into sign language becomes a necessity. Introducing such a system would lead to minimize the gap between deaf and normal people in the society.

The sign language in use at a particular place depends on the culture and spoken language at that place. Indian sign language (ISL) is used by the deaf community in India. ISL is a standard and well-developed way of communication for hearing impaired people in India and speaking in English. Different symbols are involved for different alphabets for Indian Sign Language. It consists of both word level gestures and finger spelling. Speech to ISL translation and Sign Language Detection has become crucial and effective for humans and research in this area is in progress and is one of the applications of Natural Language Processing(NLP) and Computer Vision(CV). Moreover, Indian Sign Language (ISL) Interpreter app is the need of the hour to cater millions of DHH community people in India. Sanket project aims to start laying building blocks toward bridging the communication barrier between people from the hearing community and people from the DHH community.

II.REVIEW OF LITERATURE

In our review, we looked at a variety of research and summary papers to gather a better understanding of a Gesture and Voice Detection and translation application. Existing mobile applications use sign language as the only option for communication with Deaf-mute peoples. The proposed application, named as vocalizer to mute (V2M), uses automatic speech recognition (ASR) methodology to convert it into a recognizable form of speech for a normal person. [1] A research paper proposed system used the depth sensing and motion capture features of the Microsoft Xbox Kinect 360 to record motion data for all the various ISL movements. The animations were then made up using Unity3D, and everything was then assembled into an Android application [2].

Another paper by Vishwa Hari Haran Iyer titled "Sign Language Detection using Action Recognition" proposed an end-to-end human interface framework that is capable of recognizing and interpreting spoken language and then act out the corresponding ISL gestures to facilitate a very convenient, real time form of conversation between the disabled community and the rest of the population. They made use of the Microsoft Xbox Kinect 360s depth sensing and motion capturing abilities to capture motion data for all the different ISL gestures and then used Unity3D to set up all the

animations and then finally bundle everything into an Android application. [3] Moreover, a paper titled “Sign Language Recognition Based on Computer Vision” by Wanbo Li, Hang Pu and Ruijuan Wang proposes to develop an improved convolutional neural network (CNN) and long short-term memory(LSTM) neural network combined sign language recognition system, which is different from the current only for sign language recognition and translation, but also for sign language generation function. The model is proposed for American Sign Language. The paper evidently shows that sign language recognition rate is 95.52% compared with similar algorithms, and sign language (American sign language and Arabic numerals) is 90.3%. [4]. Finally, authors Jai Joshi, Parshav Gandhi and Rupali Sawant highlighted the experimental results of an ASL Learning Platform using LSTM Neural Networks. The accuracy achieved while training ASL words was 99.43%, while training ASL alphabets was 91.01% and while training ASL numbers was 98.80%. [5].

III.COMPARATIVE STUDY

3.1. +Open CV

Open CV stands for Open Source Computer Vision. It is a library of programming functions for real time computer vision. The library has more than 2000 optimized algorithms and has been widely used around the world. Befitting from this, android programmers are able to implement many digital image processing algorithms in Android phone platforms.

3.2. Long Short Term Memory

Long short-term memory (LSTM) is an artificial neural network used in the fields of artificial intelligence and deep learning. Unlike standard feed forward neural networks, LSTM has feedback connections. Such a recurrent neural network (RNN) can process not only single data points (such as images), but also entire sequences of data (such as speech or video).

3.3. Media pipe

Media Pipe is a Framework for building machine learning pipelines for processing time-series data like video, audio, etc.

3.4. Tensor flow

Tensor Flow is a free and open-source software library for machine learning and artificial intelligence. It can be used across a range of tasks but has a particular focus on training and inference of deep neural networks.

IV. PROPOSED WORK

4.1. Interface 1: Speech to ISL

The first interface is for Speech to ISL translation. We propose to have a real-time audio input and translate it into corresponding ISL signs and display the translated signs via a virtual Model(Sanket).

(a) Translation Algorithm: The Google Speech-to Text service available natively in Android was then called upon on click of a button which converted spoken input into parseableStrings. The Speech-to-Text service requires network access and hence all the necessary runtime permissions were explicitly provided for via code. The result of the Speech-to Text API was stored as a composite String. This String was passed as an input to our ISL parser. Our ISL parser separates out all the words in an order as prescribed by the rules of ISL. If any word was found not present in our library, that word was broken down into alphabets and each alphabet was processed independently. We also accounted for slangs and offensive words and they are automatically discarded by our system. We had to make use of multiple threads in the background as the enactment of the gesture took a considerable chunk of the processing time on the main thread. All actions had to be synchronized as well.

(b) User Interface: Designing the user interface was always going to be challenging. We adopted a minimal approach in preparing the application layout and kept everything as simple as possible. Our primary aim was to display the 3D character in the center of the screen so that it occupies the maximum available real estate. The speak and the translate buttons were kept in the bottom half of the screen for better accessibility. We also provided for a text input layout just in case giving a voice input was infeasible. Colour Scheme was well thought off and calibrated so as to follow the general Android design guidelines.

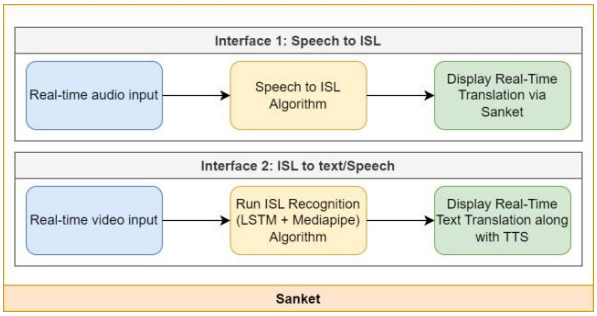

Fig.1: Proposed Model of Sanket

4.2. Interface 2: ISL to Speech

The second module is for ISl to Speech translation. We propose to have a real-time ISL video input stream and display the recognized translation of those ISL signs in form of text below. The translated text will be converted to speech via text_to_speech. In order to achieve ISL to Speech, we need to break down this into smaller problem statements.

a) ISL Recognition - ML model

i.Creation of Dataset: After referring the available datasets, it was decided that we'll be making our own dataset as all the dataset images where of the zoomed hand (palm region) and we wanted human pose images. For dataset of our project Sign Language Recognition, we'll need the data i.e. either image/videos of all the ISL sign corresponding to each letters (a to z), digits (0 to 9) and 5-10 predefined words. The dataset will be created by collecting key points (plotted onto the real-time input feed (Open CV)) from media pipe holistic and collect a bunch of data from key points i.e., our hands, on our body and on our face and save data in the form of numpy arrays.

ii.Algorithm Implementation: We'll use Sequential approach which consisted of layers of LSTM model which were stacked together via Dense layers. LSTM stands for long short-term memory networks. It is a variety of recurrent neural networks (RNNs) that are capable of learning long- term dependencies, especially in sequence prediction problems. LSTM has feedback connections, i.e., it is capable of processing the entire sequence of data, apart from single data points such as images. Sign language involves static as well as motion signs. Now for this we'll require our model to predict signs for not only image captures for a particular instance but in fact for a series of gesture that combines to form a particular sign. Hence for this LSTM proves perfect as long-term temporal dependencies can be captured effectively by LSTM, without suffering much optimization hurdles.

iii. Model evaluation: Evaluation of trained model will be done by real time hand gesture detection and simultaneously convert the gesture to speech.

b) App Implementation

The ISL to Speech interface will be created inside our flutter app after which the trained model will be imported into our application and desired output will be tried to achieve.

V. METHODOLOGY

5.1. Technology

Table 1: Tools and Technologies used

Sr No.	Tools	Specification
1.	IDE	Android Studio Jupyter Notebook
2.	Frameworks /Libraries	Flutter Mediapipe Tensorflow OpenCV Numpy text_to_speech speech_to_text
3.	Language	Dart Java/Kotlin Python 3.10.0
4.	Cloud Platform	Play Store

5.2. Methodology flow

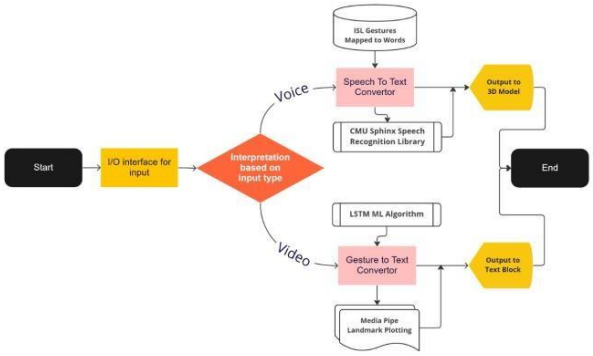

Fig.2: Proposed Data Flow of Sanket

The Proposed Data Flow of the Sanket system is shown in Fig.2. For the first interface viz. Speech to ISL, speech_to_text package is used to convert audio to string and upon that we formulated our own algorithm of string manipulation to essentially translate the string input to appropriate Indian Sign Language. Upon which the Blender model - 'Sanket' performs the translated ISL sign gestures.

For the second interface viz. ISL to Speech, we did a bunch of research and actually found that most of state-of- the-art models or models that are currently out there tend to use a number of CNN layers followed by a number of LSTM layers so specifically some people using a pre-trained mobile net followed by a number of LSTM layers so we trained with a similar number of sequences that we did in this project so we think about 45 different sequences per class so that would be 450 sequences in total and we was just getting nowhere near the level of accuracy that was going to be actually useful. So quickly we sort of transitioned and started using media pipe holistic combined with the LSTM layer now the reason that we ended up doing this is:

1.We needed less data to produce a hyper accurate model.

2.It was a much denser neural network so rather than having around 30 to 40 million parameters in CNN neural network we had around about half a million parameters which means it was going to be way faster to go ahead and train that particular model.

3.The neural network was a lot simpler and meant that it was going to be a whole heap faster when it comes to detecting in real time.

VI. RESULT & DISCUSSION

6.1. Speech to ISL

To create the user interface, we have used the Flutter framework. Screenshots of a working prototype of Speech to ISL interface is shown in Figure 3

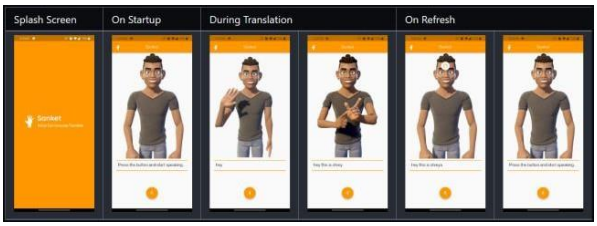

Fig. 3. Speech to ISL

6.2. ISL to Speech

We used 4 layers of LSTM with params 64, 64, 128, 64 sequentially. Model was compiled with 'Adam' optimizer and we tried to fit the model with 1000 epochs. The model summary is shown in Figure 4.

```
In [33]: model.summary()
         Model: "sequential_1"
         _________________________________________________________________
          Layer (type)                 Output Shape              Param #
         =================================================================
          lstm_3 (LSTM)                (None, 10, 64)            442112

          lstm_4 (LSTM)                (None, 10, 64)            33024

          lstm_5 (LSTM)                (None, 10, 128)           98816

          lstm_6 (LSTM)                (None, 64)                49408

          dense_3 (Dense)              (None, 64)                4160

          dense_4 (Dense)              (None, 32)                2080

          dense_5 (Dense)              (None, 27)                891

         =================================================================
         Total params: 630,491
         Trainable params: 630,491
         Non-trainable params: 0
         _________________________________________________________________
```

Fig 4. Model Summary

The model graph was observed to yield categorical accuracy close to 100% (i.e. 1) as the epoch reached towards 1000 epochs.

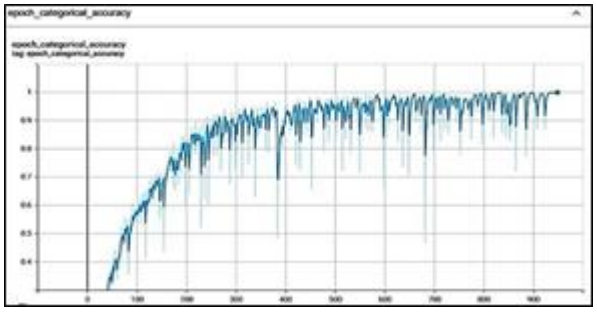

Fig. 5. Epoch categorical Accuracy Graph

This model yielded an accuracy of 83.60%.

```
In [45]: accuracy_score(ytrue, yhat)
Out[45]: 0.8360655737704918
```

Fig. 6. Accuracy from final model – 0.8360 (83.60%)

Further, testing and android implementation of this interface- ISL to Speech is still in progress. Work towards building an android compatible media pipe holistic interface is being done. Post which the model will be tested on an android prototype.

VII. CONCLUSION

In the proposed model we have experimented with various Machine Learning Algorithm to find the best suited algorithm for our problem statement. Sanket's novel approach to translate Speech to ISL and recognize the Indian sign language using Long Short Term Memory (LSTM) and Media pipe Holistic is presented in the paper. The proposed system can be used to translate more than 10 ISL words, 26 alphabets and 10 digits. LSTM neural network model is used after identifying key points using media pipe holistic which includes face, pose and hand features. Sequential model of 4 LSTM layer and 3 Dense layers is used to classify the sign which gives an average accuracy of 83.60%.

VIII. FUTURE SCOPE

This paper presents a novel solution that is Sanket Real-Time Translation and shares light on the development work of the project. This paper serves as a foundation for the concept of virtual interpreter for DHH community people. Combining emerging technologies like machine learning with a self-proposed ISL to Speech algorithm we have achieved the results as discussed above. For improved outcomes, we can work towards increasing the ISL dataset in our backend for both ways of translation. We can employ more features in our application such as speech control of model in Speech to ISL translation. Furthermore, we may also employ NLP for better translation.

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Design of Two-Mirror Fabry-Perot Amplifier and Filter for Optical Communication

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***Abstract*—The bandwidth and data rate of communication network gets limited due to distortion and broadening of optical pulse. The Fabry-Perot cavity is widely used for filtering and amplification of optical pulse in optical communication. The Fabry-Perot (FP) laser resonator is an arrangement of two mirrors which work on the phenomenon of multiple beam interference that arises when light passes through a two-mirror cavity. The principle of cavity resonance is to split a single beam into multiple beams to reflect in the confined boundaries of high reflecting cavity mirrors. The optical cavity surrounds the gain medium and provide feedback of the laser light that forms a standing wave pattern inside it. When the light signal is injected on one of the surfaces, some of the portion of light gets transmitted out and the other part gets reflected into the cavity. It leads to multiple reflections which causes optical amplification and filtering. In this research, the Fabry Perot cavity is constructed with two high reflecting mirrors. The cavity parameters like beam waist, stability factor, length, and radius of curvature of mirrors are optimized with the experiment as well as with mathematical modeling.**

Keywords*— *Fabry-Perot (FP) cavity, Finesse, Free Spectral Range (FSR), Spectrum Width, Beam wai

I. INTRODUCTION TO FABRY PEROT CAVITY PARAMETERS

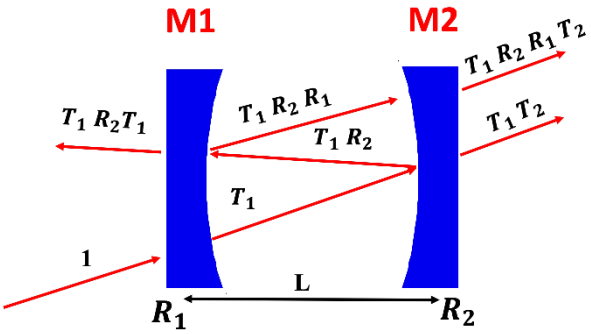

Fig. 1. A Basic Fabry-Perot Cavity Model

Arrangement of two mirrors with different transmittance and reflectance at a particular distance is referred as Fabry Perot cavity which is used as an optical amplifier, optical filter and optical resonator. The propagation of light in a closed path between the set of two or more than two mirror is called as optical resonator or optical cavity. The basic principle of working is to align two partial reflecting mirrors at a distance 'L' by forming a cavity for reflection as shown in Fig. 1. Whenever laser pulse of wavelength λ is injected in between this mirrors with a certain angle of incidence then laser pulse is subjected to multiple reflections. The Fabry-Perot cavity work by merging injection of laser pulses to create an interference pattern, which can be measured and analysed. Both constructive and destructive interference arise when laser beam incident within the optical cavity. When the mirror spacing is proportional to the integer number of $\lambda/2$ of the incident pulse, the constructive interference take place. When this condition is not satisfied then destructive interference takes place [1,2]. The Airy function is defined as the reduction in transmittance of the optical cavity and is given by the equation as

$$T = \frac{1}{1 + \mathrm{F}\sin^2\left(\frac{\delta}{2}\right)} \qquad (1)$$

F is the finesse of the optical resonator. Finesse is function of reflectance of two mirrors and is calculated as

$$F = \frac{\pi R_{eff}}{1-R_{eff}^2}. \qquad (2)$$

δ and R_{eff} are given by

$$\delta = {}^{2\pi L}/_{\lambda} \qquad (3)$$

$$R_{eff} = \sqrt{R_1 R_2} \qquad (4)$$

R_eff represents effective reflectance of the FP cavity. When a light beam is injected into the two-mirror cavity, the laser pulse is subjected to multiple reflections inside the cavity which enhances the effective laser power and thus the intensity of the signal. R_1 and R_2 represents the reflectivity of two mirrors in the cavity. The power enhancement takes place only when the cavity is in resonance condition. Finesse is a measure of cavity's resolution and it is an important parameter that represents the sharpness of resonance width. The high finesse results in a low width and high peak laser pulse on the optical receiver.

The free-spectral range is inversely proportional to the distance between reflective surfaces in the FP cavity. An optical mirror splits a laser beam into two parts reflected and transmitted part. The power- reflectance (R) and the power-transmittance (T) of a mirror are defined as the ratio of the reflected or transmitted power to that of the incident laser beam [3, 4]. When we consider a coherent summation of transmitted or reflected electromagnetic fields, it is convenient to introduce the amplitude of waves namely as reflectance amplitude and transmittance amplitude, which are given by

$$r = \sqrt{R} \quad (5)$$

$$t = \sqrt{T} \quad (6)$$

The laser wave inside the cavity built up the effective power after multiple reflections. The amplitude of each optical path can be calculated by considering the reflection and transmission experienced at the interface of the mirrors [5].

II. MATHEMATICAL MODELING OF FP CAVITY

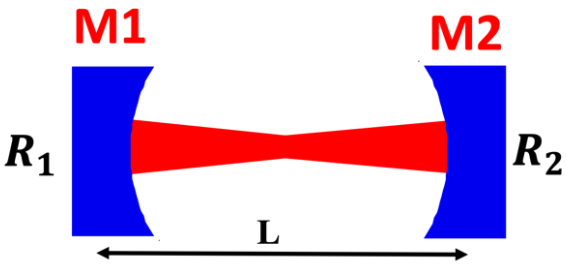

Fig. 2. Beam size variation inside the two-mirror FP cavity

The ray transfer matrices are used to create a mathematical model of Fabry-Perot cavity. The transfer matrix is calculated for complete one round trip of the laser pulse. The laser pulse enters to the FP cavity from concave mirror M1. After that it travel the distance 'L' and reaches to another concave mirror M2. After getting reflected from Mirror M2, the laser pulse travels the distance 'L' gain and arrives at Mirror M1. The two-mirror FP cavity is shown in Fig. 2. which is used for calculation of ray transfer matrix. The ray transfer matrix is represented for one round trip as

$$M_R = \begin{bmatrix} 1 & L \\ 0 & 1 \end{bmatrix} \times \begin{bmatrix} 1 & 0 \\ -2/R_2 & 1 \end{bmatrix} \times \begin{bmatrix} 1 & L \\ 0 & 1 \end{bmatrix} \times \begin{bmatrix} 1 & 0 \\ -2/R_1 & 1 \end{bmatrix} \quad (7)$$

The resultant ray transfer matrix for one round trip is also defined in terms of ABCD parameters as [6]

$$M_R = \begin{bmatrix} A & B \\ C & D \end{bmatrix} \quad (8)$$

For stability of the resonator, the following condition must be satisfied

$$0 \leq (A+D)/2 \leq 1 \quad (9)$$

Fig. 3. shows stability parameter with radius of curvature of mirror. From Fig. 3 it is observed that stability parameter lies between 0 and 1 from curvature value more than 20. In this mathematical model, the length of FP cavity is kept at 80 mm. The value of radius of curvature of two mirrors are selected as 50 mm and 80 mm. The stability parameter $\left(\frac{A+D}{2}\right)$ is determined for value of radius of curvature of mirror M1, which is shown in Fig. 3. The two-dimensional stability map for curvature of mirror $M1$ and $M2$ inside FP cavity is shown in Fig. 4 and Fig. 5 respectively [7]

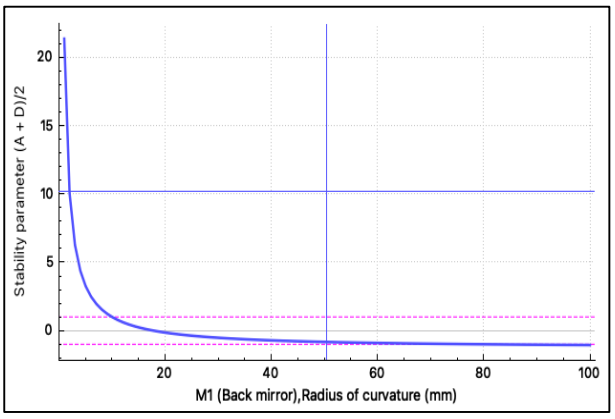

Fig. 3 Variation of stability parameter with radius of curvatire of mirror.

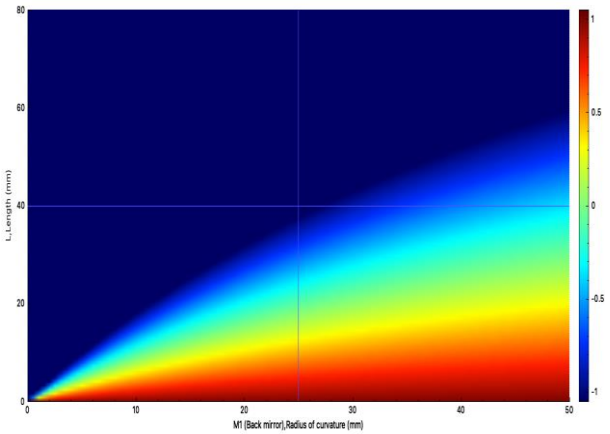

Fig. 4Stability of FP cavity with curvature of mirror M_1

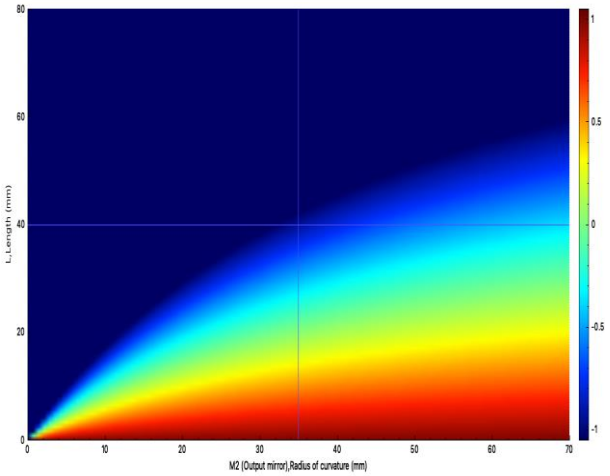

Fig. 5 Stability of FP cavity with curvature of mirror M_2

It is important to determine the evolution of laser beam inside the boundary of two mirrors as size of laser beam must be less than the diameter of two mirrors. This

arrangement prevents the light beam from leaking out from the mirror edges [8]. In this experiment, both mirrors are designed for one inch diameter. The variation of laser spot size with length of the 'L' and radius of curvature "R' is shown in the Fig. 6 and Fig. 7. Fig. 6 shows that laser beam radius is high at the surface of concave mirrors but very low in between the two mirrors.

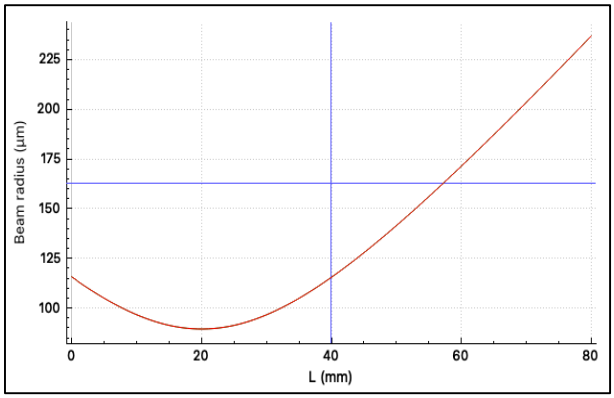

Fig. 6 Variation of laser beam size inside the FP cavity.

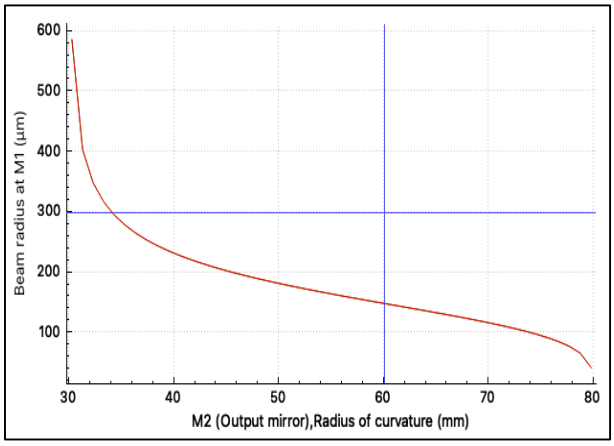

Fig. 7 Variation of laser beam size with radius of curvatire of mirror M_2

The Fabry-Perot cavity will also act as an amplifier as the beam is reflected multiple times inside the optical cavity and the input signal is amplified by enhancement factor of 5. The enhancement factor (S) is given by equation

$$S = \frac{T_1(1+R_2)}{(1-\sqrt{R_1 R_2})^2} \qquad (10)$$

Where, R_1, R_2 are reflectance of two mirrors and T_1, T_2 are transmittance of two mirrors of cavity. The Enhancement factor is function of total reflectivity of two mirrors and its characteristics of the Fabry-Perot cavity is shown in Fig. 8. In this experiment, both mirrors are of 80 % reflectivity and 20% transmittivity. The enhancement factor is calculated as 9 for this arrangement of FP cavity. The finesse is important parameter to measure the sharpness of the output pulse which is main function of an optical filter in communication network. The finesse is function of reflectivity of two mirrors, and it is not dependent on length of the FP cavity [9, 10]. The finesse is calculated as 7 for the same arrangement of two-mirror FP cavity. The finesse variation with reflectivity of mirrors is shown in Fig. 9.

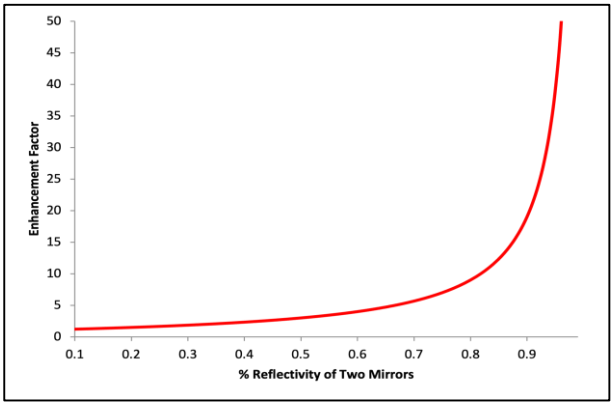

Fig. 8 Enhancement factor variation with reflectivity of both mirrors

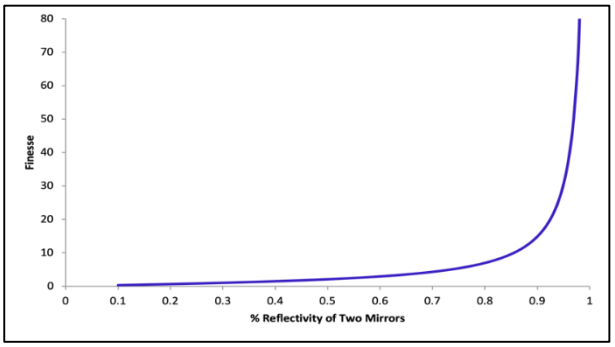

Fig. 9. Finesse variation with reflectivity of both mirrors.

III. EXPERIMENTAL SETUP

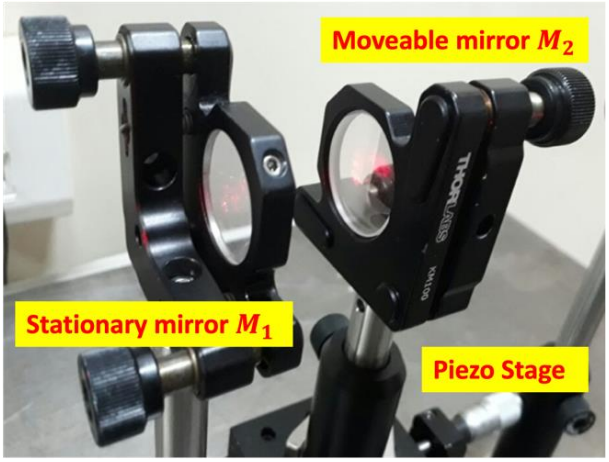

Fig. 10 Experimental setup for two-mirror FP filter and amplifier

A Fabry-Perot cavity is developed with two partially reflecting mirrors having reflectance of 80% and transmittance of 20%. A three semiconductor laser diode

(InGaAs) with wavelength 660 nm, 530 nm and 450 nm are used in this setup. When laser beam is passed in the optical cavity, it creates mutilple reflections which can be stabilized by controlling the length of the cavity [11-15]. The length of cavity is controlled by mounting the second conacve mirror M_2 on a piezo actuator stage. The output of laser contains noise due to thermal fluctuations. The noise can be removed from the main signal with multiple reflections across the boundary of two mirrors [16, 17].

If cavity is not at resonance, then the signals spreading occurs inside the cavity which may reduce accuracy of the output. Thus, it affects the amplification and filtering of the beam. When cavity is at resonance, the frequencies comparable to the resonant frequency of the cavity will be sustained and other frequencies will be filtered out. The cavity can be tuned to a certain resonant frequency by altering the gap between two mirrors. At the output a photo detector is used to detect the final output beam that is transmitted from the cavity as shown in Fig. 11.

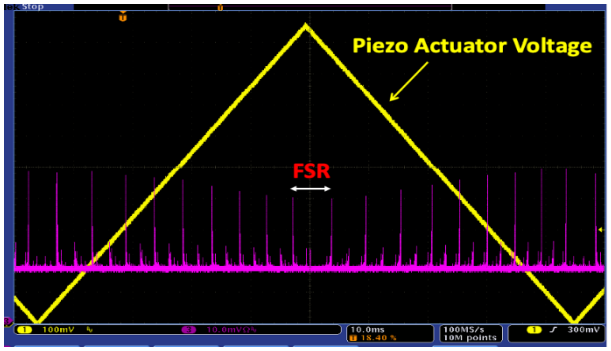

Fig. 11. Transmitted laser intensity obtained at the photo receiver.

The resonance frequency ‘is given by

$$f = {}^{c}/_{2L} \qquad (11)$$

The distance ‘2L’ is considered as laser beam travels one round trip from one mirror to second mirror and again reflects back to first mirror. The length of cavity must be optimized and should be integer multiple of wavelength of the laser.

$$L = n\lambda \qquad n = 1,2,3 \ldots \qquad (12)$$

In this case the resonance frequency is the inter-mode beat frequency of cavity, which is calculated as 3.74741 GHz.

The Fabry-Perot cavity acts as a band pass filter for wavelength of the laser pulse and band stop filter for other frequencies. The three pair of mirrors are prepared to demonstrate the concept of optical filtering. The three pairs of mirrors are designed to have reflection coating for wavelengths 660 nm, 530 nm, and 450 nm respectively. The result for the optical filtering is shown in figure Fig. 12, Fig. 13, and Fig. 14 respectively. It is observed that, obtained transmitted light intensity is single wavelength beam with very low laser line width. The laser source frequency always consists of laser phase noise. This noise appears as other frequency components in the laser pulse. The Fabry-Perot cavity acts as a band stop filter for laser phase noise and provides the low width laser pulse at the output. The overall cavity parameters are shown in the Table 1.

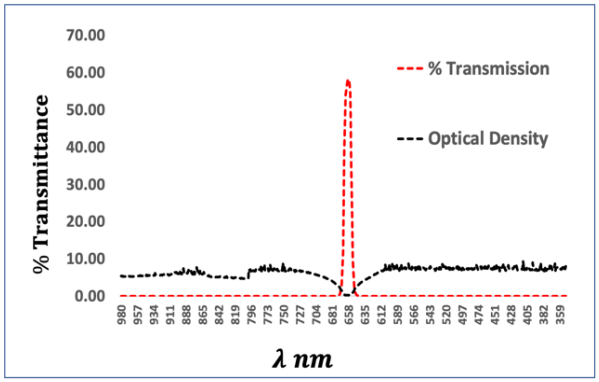

Fig. 12 Optical filtering for λ=660 nm

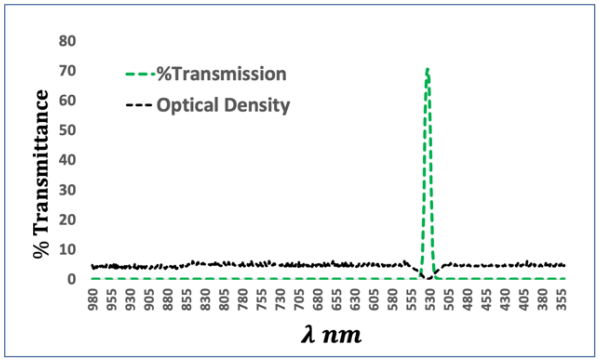

Fig. 13 Optical filtering for λ=532 nm

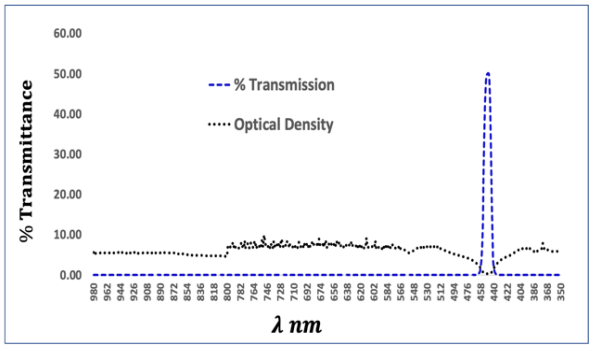

Fig. 14 Optical filtering for λ=450 nm

Table 1: Experimental results from two-mirror Fabry-Perot cavity

Sr. No.	Parameter	Value
1	Finesse	$7 \pm 1\ ms$
2	Gain factor	9
3	Filtered pulse width	$12 \pm 2\ nm$
4	Inter-mode beat frequency	$3.74741\ GHz$

IV. CONCLUSION

The two mirror Fabry-Perot cavity acts as an optical amplifier and optical filter. The results shows that laser phase noise is significantly removed from the transmitted laser pulse. The pulse width of laser as well as gain factor can be further improved by using the very high reflective mirrors with reflectivity more than 90%. The resonance stability can be improved by adding multiple mirrors to the cavity and performing the laser operation inside the ring type cavity.

ACKNOWLEDGMENT

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Stock Market Prediction Using Machine Learning

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***Abstract*— In Stock Market Prediction, the aim is to predict the future value of the financial stocks of a company. The recent trend in stock market prediction technologies is the use of machine learning which makes predictions based on the values of current stock market indices by training on their previous values. Machine learning itself employs different models to make prediction easier and authentic. The paper focuses on the use of Regression and LSTM based Machine learning to predict stock values. Factors considered are open, close, low, high and volume.The stock market prediction has attracted much attention from academia as well as business. Due to the non-linear, volatile and complex nature of the market, it is quite difficult to predict. As the stock markets grow bigger, more investors pay attention to develop a systematic approach to predict the stock market. Since the stock market is very sensitive to the external information, the performance of previous prediction systems is limited by merely considering the traditional stock data. New forms of collective intelligence have emerged with the rise of the Internet (e.g. Google Trends, Wikipedia, etc.). The changes on these platforms will significantly affect the stock market. In addition, both the financial news sentiment and volumes are believed to have an impact on the stock price.**

***Keywords- Close, high, low,LSTM model, open, regression, and volume*.**

I. INTRODUCTION

Stock market prediction is the act of trying to determine the future value of a company stock or other financial instrument traded on an exchange. The successful prediction of a stock's future price could yield significant profit. The efficient-market hypothesis suggests that stock prices reflect all currently available information and any price changes that are not based on newly revealed information thus are inherently unpredictable. Others disagree and those with this viewpoint possess myriad methods and technologies which purportedly allow them to gain future price information.

A correct prediction of stocks can lead to huge profits for the seller and the broker. Frequently, it is brought out that prediction is chaotic rather than random, which means it can be predicted by carefully analyzing the history of respective stock market. Machine learning is an efficient way to represent such processes. It predicts a market value close to the tangible value, thereby increasing the accuracy. Introduction of machine learning to the area of stock prediction has appealed to many researches because of its efficient and accurate measurements [1].

The vital part of machine learning is the dataset used. The dataset should be as concrete as possible because a little change in the data can perpetuate massive changes in the outcome [2]. In this project, supervised machine learning is employed on a dataset obtained from Yahoo Finance. This dataset comprises of following five variables: open, close, low, high and volume. Open, close, low and high are different bid prices for the stock at separate times with nearly direct names. The volume is the number of shares that passed from one owner to another during the time period. The model is then tested on the test data.

II. LITERATURE SURVEY

Forecasting the way of stock prices is a widely deliberate subject in many fields including trading, finance, statistics, and computer science. Depositors in the stock market can maximize their yield by export or selling their investment if they can determine when to enter and exit a position. Specialized traders typically use essential and/or technical analysis to inspect stocks in making venture decisions. The vital analysis involves a study of company fundamentals such as proceeds and profits, market position, growth rates, etc. Technical analysis, on the other hand, is based on the study of historical price oscillations. Due to the nature of market forces, economies tend to follow a pattern of expansion and contraction, over long periods of time. The stocks trade within an overarching environment where the economy moves from one phase of the business cycle to the next.

Compared to the existing work, this project analyses the stocks trading decisions utilizing the technical conduct of the trading patterns within the context of the changeable economic and business environment.

The objective function is to maximize medium to longer term profits based on S&P500 stock market index. The inputs are the technical pointers data and the economic indicators data. Three models (svm, decision forest) are then used to predict the buy/sell decisions. To plaid the practicability of the overhead model the given productivity will be plaid and coordinated alongside the graph of the definite company for that period of time and distinguish the patterns. As a future Scope in our project

we will further use quantopiana online platform for emerging trading approaches and back testing them, we will use it to advance a plan on quantopian and back test it to check the possibility of the tactic.

III. PROPOSED SYSTEM

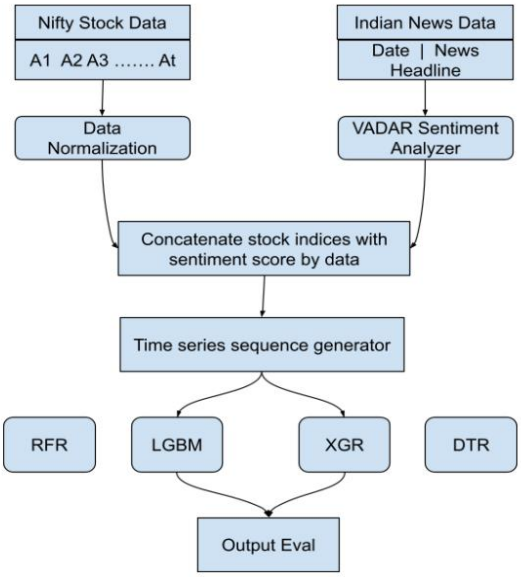

Fig 1 Block Diagram

The process that was followed was a simple process of applying sentiment analysis in the historical news dataset to analyze the news trend of good or bad. The other side was applied with different Arima model time series processes to catch the trend of the technical data and predict the future result for it. After both parts are done through the Time series sequence generator we will combine both the dataset and by merging the new dataset new models would be used for good prediction accuracy and results. The database used in the paper was of Historical Numerical data and News data for that duration. The Arima model was used for numerical data and the Sentiment analyzer was used for News data for getting the sentiments of the news for the better accuracy of the final output. By combining both the data through date time series the new dataset will form and would be applied for further models.

IV. SYSTEM DESIGN AND IMPLEMENTATION

Stock market prediction seems a complex problem because there are many factors that have yet to be addressed and it doesn't seem statistical at first. But by proper use of machine learning techniques, one can relate previous data to the current data and train the machine to learn from it and make appropriate assumptions. Machine learning as such has many models but this paper focuses on two most important of them and made the predictions using them.

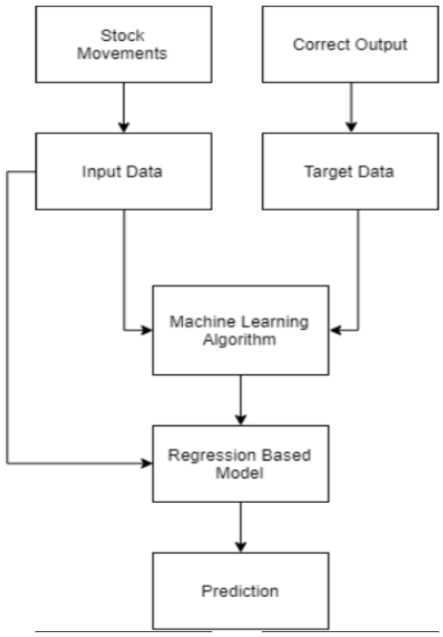

Fig 2 Flow Chart

Regression is used for predicting continuous values through some given independent values [5]. The project is based upon the use of linear regression algorithm for predicting correct values by minimizing the error function as given in Figure1. This operation is called gradient descent. Regression uses a given linear function for predicting continuous values:Where, V is a continuous value; K represents known independent values; and, a, b are coefficients. Work was carried out on csv format of data through panda library and calculated the parameter which is to be predicted, the price of the stocks with respect to time. The data is divided into different train sets for cross validation to avoid over fitting. The test set is generally kept 20% of the whole dataset. Linear regression as given by the above equation is performed on the data and then predictions are made, which are plotted to show the results of the stock market prices vs time [6].

V. RESULTS

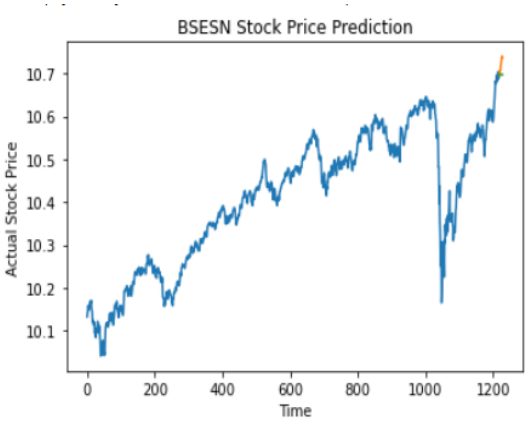

Fig.3 Result

We were successful in predicting the stock price for a future time stamp. The prediction for this was made by the ARIMA model. Using the concept of Euclidean distance to calculate the root mean square error. We found the metric value to be 0.02. This shows that the predicted value was not very far off the original trend.

VI. CONCLUSION AND RECOMMENDATION

Hereby, it can be proposed that no trading algorithm can be 100% effective, not only 100%, it will typically never be close to 70% but to attain even accuracy of 40% or 35% is still good sufficient to get a good forecast spread. Although extreme attained accurateness was 39%, it was still able to closely forecast the predictable outcome and have coordinated against the company graph. To make our expectation more efficient, it can be done by including bulky data sets that have millions of entries and could train the machine more powerfully. Different activities of stocks can lead to diverse raises or lows in the forecast price, use these movements to magistrate whether a company should be traded in or not. No training Data can ever be stable, hence there is always some unevenness that can be seen in the above data spread, but to still forecast close to a consequence will also lead to a good approach if it has greater than 33% accuracy. While developing a strategy traders should always think to always have nominal imbalance while still being above 33%accurate.

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Face Detection and Recognition: A Survey

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***Abstract*- With the tremendous development in the area of artificial intelligence, interest in the research increased in computer vision technology. Due to its countless applications in different fields, this area has become one of the top choices of researchers. As computer vision systems carry out repetitive and monotonous tasks at a faster rate, hence, simplifying the work for humans. So, systems have been trained very well so that they commit no mistakes, which results in high-quality products and services. Due to flawless work and the least defective products, it extinguishes the burning pockets of people. Due to the above reasons, the authors of the paper surveyed one of its most popular applications which is face detection and recognition using the concepts of machine learning to get a deep knowledge of this topic further authors could create an efficient model as a development in this field of face recognition.**

Keywords-artificial intelligence (AI), computer vision (CV), face recognition(FR), machine learning (ML).

I. INTRODUCTION

Before continuing with topic, how are we able to understand the things seen with our eyes? Like we see someone eating, although we don't actually sense it ourselves, still using the prestored knowledge, our brain interprets what's happening around us and stores it as information. In the same way, a computer vision model, interprets the activity based on the information prestored in the dataset while its training.

So, what exactly the computer vision is? According to Wikipedia, Computer vision[1,2] is a computer science field that deals with the way computers can access information from digital images and videos. It works on understanding and automating tasks in the same way humans do. It allows computers to think, see, observe, and recognize.

The article published on IBM states Computer vision system works as human vision, except humans have much more time for training and has larger dataset. C.V. systems are trained to examine products or watch a production work, so it can analyse thousands of products or processes in a minute, surpassing limited human capabilities.

F.R. systems extract the facial features from a digital images and videos from the data of different faces matching and measuring features from a given image. Due, to involvement the measurement of facial features which are unique, these systems can be classified as biometric systems.

F.R. has become one of the trending research areas in computer vision and image processing. With the development of new algorithms like deep learning and use of filters it is entering in more and more real-life based projects. Invention of faster GPUs are enhancing its potential.

Authors have divided this paper into various sections including introduction as section-1, section-2 contains various applications of computer vision with their implementations explored from related work of various researchers, section-3 demonstrates various face recognition work, section-4 includes the methodology behind F.R., section-5 ends the paper with a conclusion.

II. APPLICATIONS OF COMPUTER VISION

1.1. Agriculture

Agriculture has been a major source of economy of almost every nation that makes them self-independent and stand out in between the global market. But, due to various problems low number density of land over population which in some way turns out in underdeveloped techniques, innovation by using big machines result in high production costs in several places.

Not all but some of the problems can be handled by the innovation of computer vision in agriculture. It could be promising in lowering production costs and could increase overall production. In recent time, computer vision proved its skilled in the major in various stages of agriculture like harvesting, planting, advanced and reliable weather forecast, weeding and plant's health detection. Different organizations in various parts of earth are giving their best and succeeded at great level in the above field some of them are XSUN[3] from France is able to provide aerial survey and imaging, and Occipital Technologies[4] from India are researching and providing more and more techniques of sorting and grading with the use of computer vision.

2.1.1. Air-based imaging to measure NDVI: NDVI[5] is measurement of density greenery in a particular area. The images could be captured by various lightweight aircrafts and drones mainly used nowadays in agriculture. The sensor used in NDVI are very accurate and can cover various fields at a same time from a good height up to hundreds of feet.

2.1.2. Use of AirSurf-Lettuce: AirSurf is an open-source tool for farmers for evaluation of the health of their crops. It is mainly used in measuring quantity and size of particular type of crop checking their health precisely and location to equally distribute and feed accordingly.

This tool built using deep learning has great precision and uses large-scale image processing and comparing. This tool mainly needs images of field, accurate coordinates of the field and the rotation value of image.

2.1.3 Neural network based analysis: These types of neural network uses various types of layer in specific order which creates set of layer known as Convolutional Neural Network. It is mainly made using the well-established training data set. This program normally uses various filters, hidden layers and gives a good accuracy. These programs are generally used to measure the distribution of crops and their quality so a farmer can get good quality crop production. These programs can achieve great accuracy using small number of epochs.

Fig. 1. Computer Vision in Agriculture (Courtesy – Source: Google)

1.2. Face Recognition

Face recognition technology is getting a great response and are used in almost everywhere in every part of the world. These are used in criminal identification, school and labour attendance, and phone unlock systems. These systems are trained using a set of facial images to grab a sense of features of human face. This system generally contains a database like of the pre-stored facial features of attendees in a concert or a class. When the system sees a face, it tries to match its features with its prestored features and if it matches it gives a green signal identifying the person.

2.2.1. Erosion and Dilation: Erosion and dilation[6] are fundamental operations in image processing. These operations are generally in combination to remove various unwanted white marks via erosion which thickness of text to bring back the thickness dilation used. Final image is free of unwanted marks.

2.2.2. Haar-Cascade Classifier: The root of Haar[7] based object detection is the Haar-like features. These features grab various measurements which later helps in face recognition.

2.2.3. Use of CNN model: Convolutional Neural Network[8] is a special type of deep learning model majorly used in image processing and object identification. This involves group of different types of hidden layers taking output of previous as input.

2.2.4. Morphological Analysis of Images: Facial morphology[9] refers to a set of different complex traits, each influenced by genetic and environmental factors. It includes simple operations based on the shape and dimensions of an image. It takes an image with a structuring element which decides the type of output.

Further, about above topic is discussed in section-4 of this paper.

Fig 2. Face Recognition as biometric(Courtesy – Source: Google)

2.3. Medical Imaging

Application of computer vision in healthcare lead to improvement a of medical disciplines and save thousands of lives. Both doctors and patients benefit from the use of tools based on CV in healthcare applications. For a doctor, Computer Vision helps in reduction of the number of faults in the scan and giving red flag from a problem, it also helps in reducing false errors by providing a second opinion on diagnostic conclusions. It can detect the most miniature irregularities and deviations from the standard that can be overlooked by physicians during manual observations. It helps patients by providing the multiple types of medical applications decoding into faster admissions, access to self-service booths, remote health monitoring and numerous medical automations. Computer vision in health-related usage scenarios also helps in saving lives and make treatments less violent, painful, and expensive.

2.3.1. Use of Cermg Application: The Cermg Application[10] is a tool used to check-out the problems found in a scan using a approach trained by various datasets. This hels in scanning a part by giving the control to user by various functions used in diagnosing.

2.3.2. Motion Counter: Motion counter used in the counting the motion of various organs and parts of the body like heartbeat, blood flow in a particular part or to check the spread tumours in an infected part. This uses the base of cv and image processing to scan the change in state of part,

2.3.3 Scar Quantification: Atrial fibrillation(AF) is a state where heart beats with an irregular and often abnormally fast heart rate. Fibrosis plays a major role in the AF problem. This tool is being used to visualize, measure, and validate the multiple steps required for the calculation of fibrosis development and calculation of number of scarred tissues. It uses Convolutional Neural Network to examine the flow of blood in arteries and veins connected to heart. The output from the above tool helps in reducing the user dependency which can sometime be false and allows accurate measurement of reproducible fibrosis from scans.

2.3.4. Morphological Scans: These scans help in examine the abnormal change in the shape of heart chamber producing various deadly cardio-vascular diseases.

These scans check the change in shape comparing them by previously stored images of normal heart chambers. These scans helps in warning the doctor of the present so the one can do an appropriate operation and then finally get a validity from these scans equating them to normal heart.

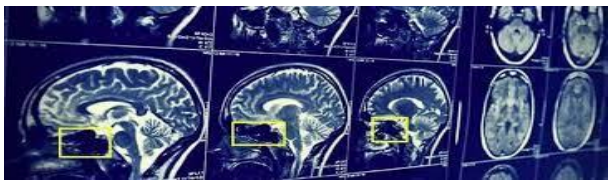

Fig.3. Medical imaging using computer vision(Courtesy – Source: Google)

III. Related work

Many authors curiously researched above topic published their various techniques which we have mentioned below:-

3.1. History Works

3.1.1. Woody Bledsoe, Helen Chan Wolf and Charles Bisson between 1964 and 1965, began research to recognise the human face using computers. Their work involved marking of various features of the face manually. These features rotated mathematically to create more advanced dataset just by pose differing. The distances between various features were computed and compared from stored dataset's images for identification of a person.

3.1.2. Sirovich and Kirby applied linear algebra for the development of facial detection procedure. Eigenface system was used by them to load different features and to store them. They showed that we don't require hundreds of feature values in order to accurately code a regularised facial image.

3.1.3. Turk and Pentland in initial 1990s discovered how to detect faces within an image which is the earliest instances of automatic facial recognition. It started a race towards the development of face recognition.

3.1.4. Facebook around 2010 implemented facial recognition program that helped to identify people whose faces may appear in the images. Enabling the feature of tagging Facebook friends in images.

3.2. Recent Works

3.2.1. In 2017 Apple launched the iPhone X – in which iPhone users could unlock with Facial-ID (term apple uses for face recognition).

3.2.2. Maciej Geremek and Krzysztof Szklanny [1] developed face analysis screening tool analysing genetic disorders by measuring specific facial characteristics also recognized as dysmorphic features. This project was able to take a broad view of differences between patients and controls, and to detect abnormalities without information about the specific disorder.

3.2.3. Jiameng Pu and team [2] developed a project regarding analysis and detection of deep-fake videos. These are AI-manipulated videos generally used by scammers and blackmailers to commit crimes.

3.2.4. Taeckyung Lee and team [3] worked on the project to examine whether student is attentive in lecture. This has become an important topic due to the rise of online classes during covid pandemic. This process used the features and algorithms related to emotion recognition.

3.2.5. Jiankang Deng and team [4] developed a project which recognises person with masked face. The rise of covid lead to need of masks which created difficulties for face recognition.

IV. Methodology

4.1 Morphological Analysis

Facial morphology refers to a different set of features in images, each influenced by biometric factors which are unique in each person. It conveys that facial recognition can be used as biometric scanner. It includes simple operations based on the shape and dimensions of an image. It takes an image with a structuring element which decides the type of output. Below are several steps regarding the work of morphological analysis:

a. Choose the training data of images under different situations to get the set of images for training purposes.

b. Calculate the major and minor set values from the set of features in training data and store it for further processing.

c. Apply and test with a freshly clicked image which differs from the other training images.

d. Face recognition of the fresh image will be compared with that of different database images for facial feature identification.

It mainly works efficiently on the dataset of binary images. A binary image has only two possible inputs one could be black and other be white in grey images. The two colours are divided one for lighter parts and other for darker spots. In case of binary process, we approach by this procedure:

a. Take a fresh image from the input and convert it into binary grey image. Then intensity value is to be calculated.

b. Add the calculated pixels and find the total pixel for the facial region.

c. Since we get all input from database so all pixels should be of same size. Now, divide the two-dimensional image pixel with the total calculated pixel to get final value either 0 or 1.

4.2 Erosion and Dilation

Erosion is one of the basic-fundamental operations in image processing including various morphological

features. Dilation is a process of improving the quality of an image by removing the unwanted marks and enhancing its features. It involves making an image lighter or darker, increasing or decreasing contrast. Various image altering software also known as image editor supports filters for altering images in numerous ways. It is an operation that bolds the borders in a binary two-dimensional image. These specificness and accurate way are controlled by a shape element known as "structuring element."

The basic idea here is to take a raw image with various unrequired white spots and remove them by lightning and rethicken the borders. Dilation process decodes the required image by thickening the borders which have been lightened by the erosion method. These operators are applied after converting raw picture to binary two-dimensional images. These basically are filters used to enhance a particular face or an image.

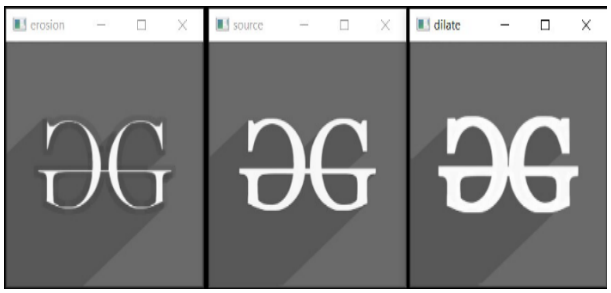

Fig.4. Erosion and dilation applied on an image(Courtesy – Source: Google)

4.3. Haar Cascade Classifier

The use of Haar Cascade is mainly based on its features which is used in efficient face tracking. These features use the difference between the pixels in form of light and dark. Multiple features with same shape and brightness form the haar-like features. The size of Haar-like features are feasible to check by altering pixels therefore checking image size. These features calculate the size between different facial features and sense their shape and check with its trained dataset whether it is a face or not. One can increase the false alarms and positive presumptions by reducing the number of steps.

Haar-like features are trained by various facial features datasets so it could measure the facial features in a fresh picture like nose, and eyes. The classifiers are trained using the AdaBoost algorithm and Haar feature algorithms. Open-cv is an open library which contains various models of machine learning and other artificial intelligence algorithms like data science, robotics, etc. it contains various types of haar cascade algorithms for various types of project of different body parts and general image analysis. The cascade may be traditional and slow model as compared to latest models but itself is very important for the understanding of a beginner. It is the first step of learning in face detection and still used in many applications. Its algorithm clears the basic concept of various face detection algorithms.

V. Conclusion

From the above review, authors have examined various methods and features for face recognition using image processing in computer vision. This paper has been able to show the importance and further scope of above topic in modern world. It is a fact that computer vision has been stretched almost in every field. The combination of autonomous machines and computer vision has been able to overcome the limited human power and unconscious faults by human. Face recognition and detection has been able to strengthen the security and increased the advancement in cameras increasing the quality of images by increasing the focus on facial features. With an increase in the researches made by curious scientists this technology is getting more and more push. But it also true that this technology is only at the infant stage of its development and still needs lots of time and research to show its true power which might change the future in an unexpected manner.

Message From Authors

"From the above survey authors were able to acknowledge the true power of computer vision world. Authors were able to learn countless applications of computer vision with their implementations. Therefore, authors have achieved their moto for above survey. Now, authors are ready to develop their own model of face recognition and detection using its powerful implementations that could bring a vital change in the field of artificial intelligence."

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Automated Medical Condition Alerting System Using Machine Learning Approach

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Abstract— Skin diseases are many common diseases in the world. Their diagnosis is very difficult due to problems with skin texture, presence of hairs on the skin, and color. Methods such as machine learning need to be developed to improve diagnostic accuracy for various types of skin diseases. Machine learning techniques are widely used in the medical field for diagnostics. These algorithms use feature values from the image as input to make decisions. The process consists of three phases: feature extraction phase, and testing phase. The process uses machine learning technology to train itself on different skin types. The goal of this process is to improve the accuracy of skin disease detection. Three important features in image classification are texture, color, shape, and their combination. In the proposed system Convolutional Neural Network will be used for image-based skin diseases classification.

Keywords— Skin diseases, Deep Learning, Convolutional Neural Network (CNN), Image Processing

I. INTRODUCTION

Dermatology is the area of biology that deals with the diagnosis and treatment of conditions that primarily affect the skin. Due to temperature, humidity, and other environmental conditions, the vast spectrum of dermatologic illnesses varies geographically as well as seasonally. Due to its unevenness, tone, hairiness, and other mitigating factors, human skin is one of the most unexpected and difficult surfaces to mechanically synthesize and evaluate. Even while many studies are done to identify and simulate human skin victimization (using PC Vision techniques), very few have focused on the underlying medical paradigm of the problem. Due to the absence of medical services in the outlying areas, patients typically disregard early symptoms that could possibly worsen over time. scenario changes over time. Consequently, there is a growing need for high accuracy automatic skin disease detection systems. In order to classify skin diseases into their primary classes, such as vascular tumors, exanthems and drug eruptions, urticaria hives, ringworm candidiasis, herpes HPV, basal cell carcinoma of the actinic keratosis, atopic dermatitis, and bullous disease, we construct a multiclass deep learning model. We utilized Deep Learning to train our model. Deep Learning is a subset of machine learning, however unlike machine learning, it makes use of big datasets, which significantly reduces the number of classifiers. The machine self-learns, divides the supplied data into levels of prediction, and provides accurate findings in a short amount of time, encouraging and supporting development of Dermatology. The algorithm that we have used is Convolutional Neural Network (CNN) as it is one of the most preferred algorithms for image classification.

II. LITERATURE REVIEW

To identify the many types of skin diseases, several researchers have suggested image processing-based approaches. Here, we go over a few of the methods that have been documented in the literature. In [1], a system is suggested for the color image-based dissection of skin disorders without the requirement for medical assistance. The method has two stages: the first involves identifying diseased skin using color image processing, k-means clustering, and color gradient algorithms, and the second involves classifying the disease kind using artificial neural networks. The method was evaluated on six different skin disease types, and the first stage and second stage accuracy averages were 95.99% and 94.016%, respectively extract more features. The first stage in the approach of [2] for detecting skin disorders is the extraction of picture features. In this process, the more image features that are extracted, the more accurate the system becomes. The strategy was used to nine different skin disease types by the author of with up to 90% accuracy. Melanoma is a form of skin cancer that, if not detected and treated in its early stages, can be fatal. In [3], the author concentrated on the analysis of various segmentation methods that may be utilized to identify melanoma through image processing. The segmentation procedure that uses the boundaries of the diseased spot to extract more information is discussed. The research of [4] suggested creating a tool for diagnosing melanoma in people with dark skin utilizing specific algorithm databases that also included photographs from other melanoma websites. Similarly, [5] studied classification of skin illnesses using the technology support vector machine, including melanoma, basal cell carcinoma (BCC), nevus, and seborrheic keratosis (SK) (SVM).

From a variety of other procedures, it produces the most accurate results. On the other side, the spread of chronic skin conditions beyond geographical boundaries could have negative effects that are severe.

III. PROPOSED SYSTEM

The proposed system aims in automatic computer-based detection of skin diseases to reduce life risks. Convolutional Neural Network (CNN) is used for the image-based classification of skin diseases which is a Deep Learning Algorithm.

Deep Learning:

Deep learning is a machine learning technique that teaches computers to do what comes naturally to humans. In deep learning, a computer model learns to perform classification tasks directly from images, text, or sound. Models are trained by using a large set of labeled data and neural network architectures that contain many layers.

In the project 4002 images are trained to classify 22 skin diseases.

Convolutional Neural Network (CNN):

A Convolutional Neural Network (CNN) is a Deep Learning algorithm which can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other.

They are comprised of

Node Layers

Containing An Input Layer,

One Or More Hidden Layers

An Output Layer.

The workflow of CNN in our project will be as follows:

- Input Image
- Convolution Layer (Kernel)
- Pooling Layer
- Classification—Fully Connected Layer

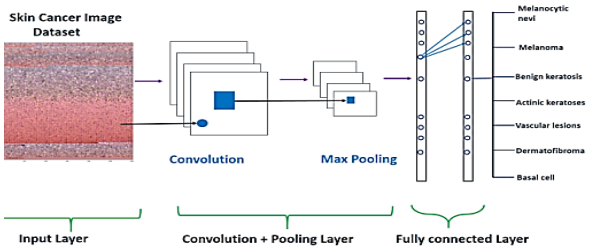

Fig 1: Convolutional Neural Network (CNN)

Our dataset was created by compiling photos from Kaggle that were particular to skin conditions. The collection has 4002 photos of 22 common skin conditions, including eczema, melanoma, acne, and rosacea. Fig. 2 displays a few examples of the photos from our dataset.

Fig 2. The first image is acne, the second Rosacea; the third is Eczema, and finally Melanoma.

The Proposed System Will Use The Following Technology Stack:

1. TensorFlow
2. OpenCV
3. Flask
4. HTML
5. Cascading Style Sheet [CSS]
6. JavaScript [JS]

IV. METHODOLGY

This section describes the proposed system's methodology for image-based detection, extraction, and classification of skin disorders. Pre-processing, feature extraction, and classification are some of the components that make up the entire architecture. Fig. 3 displays the system's block diagram.

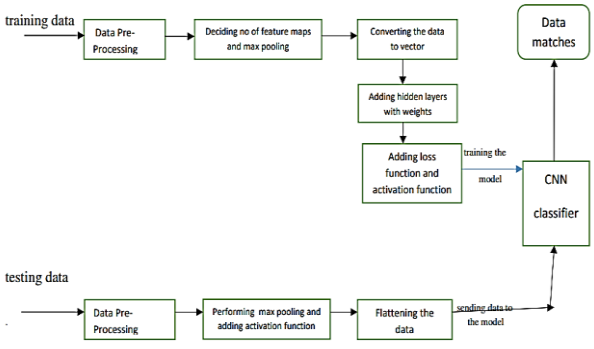

Fig. 3. The proposed system block diagram.

The three main stages for prediction and classification of skin diseases based on CNN is as following:

Pre-processing: High performance skin disease detection systems need to overcome several significant obstacles.

Like building a database and standardizing picture dimensions. An input image is either made larger or smaller to address the issue of various image sizes in the database. The same number of features will be obtained from all photographs by standardizing the image size. Additionally, shrinking the image speeds up the system by reducing processing time.

Feature Extraction: CNN by itself detects the filters and features in the training phase from the input images so there is no need of specifically applying in feature extraction

Classification: Classification is a computer vision method which classifies different images based on the disease predicted after extracting features

V. CONCLUSION

Even though skin conditions are the fourth most common cause of sickness in people, many people still avoid seeing doctors. We provided a reliable and automated approach for the dermatological illnesses' diagnosis. When skin conditions are treated early on, they are less disfiguring and more successful. In this study, deep learning algorithms are used to create a model for the prediction of skin illnesses. It has been discovered that utilising deep learning and feature assembling, we can predict more diseases with greater accuracy than we could with any other model developed in the past. As the previous models developed for this application could only indicate a maximum of six skin conditions with a maximum level of 75% accuracy. Using CNN, the suggested approach will forecast 22 common skin illnesses. Deep learning algorithms offer a tremendous potential for diagnosing skin diseases in the real world, according to extensive study. The accuracy can be further improved by using even more advanced hardware and software, together with a very large dataset, and the model can be utilised for clinical experiments because it does not involve any intrusive procedures. As it will shorten the time between diagnosis and treatment, further work can be done to standardise this model for preliminary skin disease diagnosis.

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Design of AI-Enabled Secured Architecture for Smart Home

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***Abstract*—The Internet of Things (IoT) refers to the interconnection of smart devices to collect data and make intelligent decisions and as the Internet of Things (IoT) is stepping out of its infancy into full maturity and establishing itself as part of the future Internet, security and privacy remain a major challenge, mainly due to the massive scale, distributed nature of IoT networks and the lack of intrinsic security measures makes IoT vulnerable to privacy and security threats. The Internet of Things (IoT) is a fairly disruptive technology with inconceivable growth, impact, and capability. Deploying existing data security solutions to the Internet of Things (IoT) is not straightforward because of device heterogeneity, highly dynamic and possibly unprotected environments, and large scale. In this paper, after outlining key challenges in data security and privacy, we summarize research directions for securing IoT data, including efficient and scalable encryption protocols, software protection techniques for small devices, and fine-grained data packet loss analysis for sensor networks.**

Keywords - Smart Home, Security, Blockchain,

I. BACKGROUND

Smart home applications are ubiquitous and have gained popularity due to the overwhelming use of Internet of Things (IoT)-based technology. The revolution in technology has made homes more convenient, efficient, and even more secure. The need for advancement in smart home technology is necessary due to the scarcity of intelligent home applications that cater to several aspects of the home simultaneously, i.e., automation, security, safety, and reducing energy consumption using less bandwidth, computation, and cost. The Internet of Things (IoT) is establishing itself as part of the future internet nut with its large scalability and usability, IoT security and privacy remain a major challenge so with the help of blockchain which provides decentralized security and privacy we can overcome the problem and along with some AI/ML algorithm we can make the smart home devices smarter.

A smart home appears "intelligent" because its daily activities are monitored by a computer. A smart home consists of many technologies via home networking for improving the quality of living. A smart home is a place that has highly advanced automatic systems for controlling and monitoring lighting and temperature, home appliances, multimedia equipment, security systems, and many other functions. IoT plays an important role in building a smart home. Through IoT, almost every object of our daily life in a home can be connected to the Internet. IoT allows monitoring and controlling all these connected objects regardless of time and location.

Smart homes include connected devices that make our lives easier, more convenient, and more comfortable. Home IoT services enhance the efficiency and comfort of users in daily life.

II. PROBLEM DEFINITION

Technology is advancing with every passing day and owning a smart home is becoming a necessity. In the past, smart homes were considered to be part of a luxurious lifestyle but today they have become an important part of our lives. As IoT devices store, transmit, and process so much essential data every day, they serve as the perfect target for cybercriminals. According to an article published by Cyber Magazine, IoT devices suffer an average of 5,200 cyber-attacks every month and there are also multiple bugs present within a system which can lead to insecure smart home architecture. There is an utmost need for a system that not only provides a secure architecture but also helps reduce power consumption while using the same architecture.

III. OBJECTIVE OF PROJECT

The main objective behind the project is to provide an easy and convenient way to access the smart home. The user will be able to control his smart home devices through an application that is also designed within the project. For the time being, the primary focus is to have control of the smart door of the home at the user's fingertips through the application and have good security backing to the network the entire system is connected to.

The main objectives are:

1) To provide a unique and convenient product for the users to rely on.
2) To implement blockchain for securing the network architecture of the system.
3) To collect user data to identify him/her and to derive insights from it.

IV. SCOPE OF PROJECT

As India's per capita income is much less when compared to other nations, an individual tries his best to have a second source of income, to survive the inflation present in the country, and when they can't find anything legal to do and they end up being a thief, India last year has reported 578,000 cases of house thefts which proves that either the traditional key and lock security system is poor or there wasn't any alarm system present to warn the house owners, so a need for a smart, secure and convenient system was much required which would not only let the homeowner have complete access to the system but also provide network security to prevent cyber thefts.

IV. APPLICATION OF PROJECT

• The most basic application is to use the System at your home and use it to unlock your door in case of emergencies, keys lost, relatives coming, and any other situation demanding your participation when you are miles away.

• Apply the system for managing big enterprises (hospitals, warehouses, stores, manufacturers). There are usually a lot of doors and a lot of people. The challenge is to provide specific persons with access to specific doors.

• Use the application as a pass to enter your office. This will prevent unauthorized people at your company, who might just get a pass from one of your employees and freely use it to enter your premises.

V. EXPECTED OUTCOME

The expected output, should be tedious to use the key as it requires new attention while carrying means the owner needs to carry the key with him/her all the time, or if a guest visits their home and if there is no one is at home, they need to wait for the owner to come back, as using the proposed model by our group it is easier to access the door from anywhere i.e., the owner can lock or open the door even if the owner is not there at home. Cyber-crimes have been more common now and there is a need for always having a secured network architecture to avoid having all the information leaked online, all this information can be sold online or may be used for setting up a trojan to attack the system, so with the help of blockchain a firewall can be set up to prevent hackers from attacking the system.

VI. METHODOLOGY

This project develops a smart home automation system that allows the user to check the status of the appliances at home like LED, FAN, DOOR, etc. The venture saves time as well as gives an energy-effective arrangement that tells you which gadget at your home consumes more power. A simple GUI application that has a simplified office will permit clients to deal with the gadgets absent a lot of problems without any problem. The expense of growing such gadgets is a lot more straightforward when contrasted with exceptional IP-based gadgets. The client might see the all-out number of gadgets introduced at home, as well as the floor data, on the application's principal screen. Three extra tabs might be found at the lower part of the program. The subsequent tab gives all of the sensor status data. The third tab shows the historical backdrop of every gadget's state, as well as the name of the person who transformed it and when it worked out. The logout tab is the fourth tab in the program. Accreditations are taken care of by means of shared inclinations, and the information is put away. To order the situation with house machines in a savvy home mechanization framework, the SVM classifier is utilized. It isolates the situation with home devices into two classifications, "ON" and "OFF," in view of how they are utilized. We likewise contrasted the utilized expectation model with different models to see which one was awesome. Moreover, blockchain innovation is used to encode the entire correspondence and validation between IoT gadgets and purchasers who demand that any domestic devices be turned "ON" or "OFF." Data transfer IoT devices, servers, apps, and users of the smart home automation system can also be secured, thanks to blockchain technology.

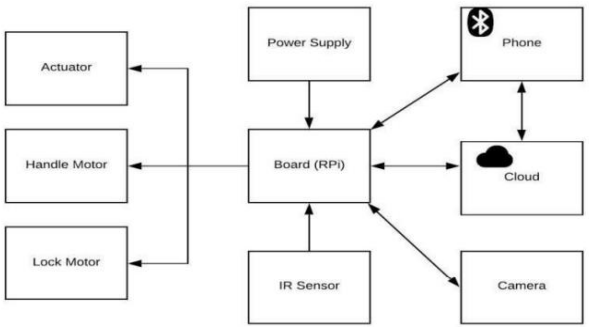

Fig.1 Data Flow Diagram

VII. RESULT & DISCUSSION

In this project, the main discussion has been to emphasize the importance of security and build a project for home security. We started off by referring to and understanding various papers regarding security in IoT and how to integrate the secured architecture feature with the smart home model for the same. After having a brief understanding of how things work and how software and hardware need to be implemented in a proper systematic way for the entire system to work in a synchronized way, we started of with implementation of the software part.

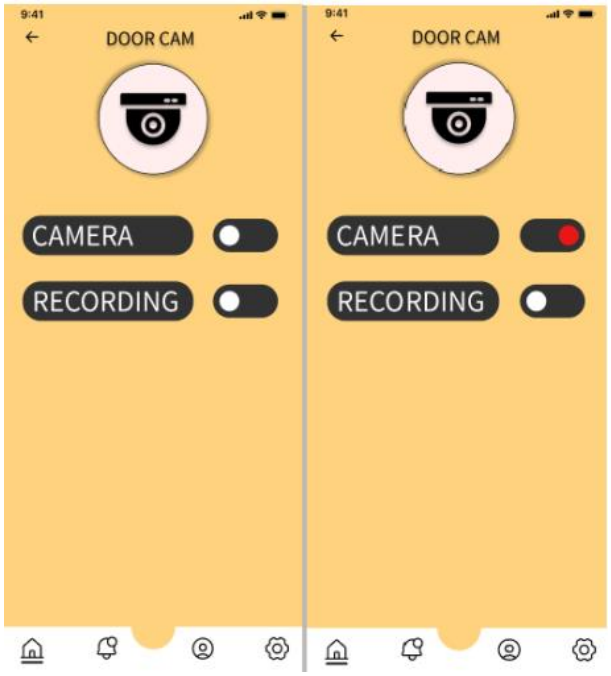

Fig. 2.1 UI designed on Figma

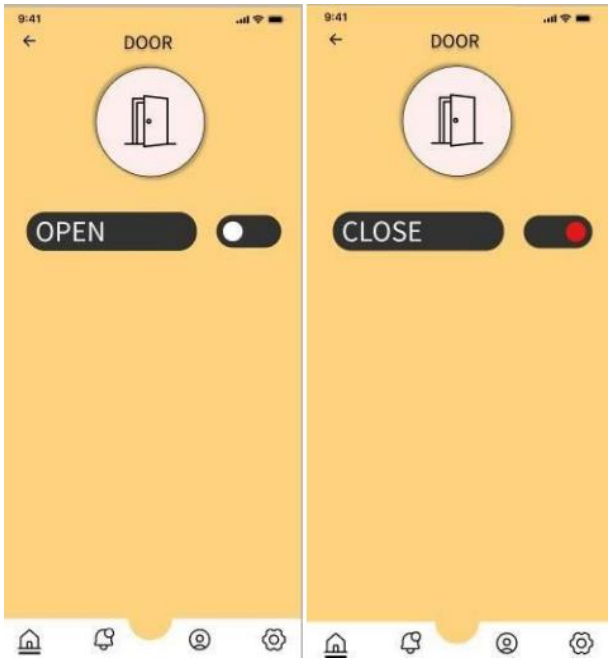

Fig. 2.2 UI designed on Figma

In order to control our home appliances, the need of an application is a must. Before working on te application directly the need of an User interface was required so the UI was developed using the Figma tool, so to have a design ready for the application to be developed.

Fig. 3 Application developed on Flutter

The conversion of the user interface to the application was done using flutter where a siple hoe page was coded along with the menu icons and will be connected to the backend later.

Our primary focus lies on building a smart door that will allow access only to the home owner and his family members and would be controlled using an application. In order to recognize the faces of the home owner and the family members a machine learning model using Face_recognition library was build on colab using the python language. Face recognition library of python contains pertain model of machine learning and hence we need not trained the model over various datasets.We used the Face_recognition.ecoding() function to find the face in the given image.

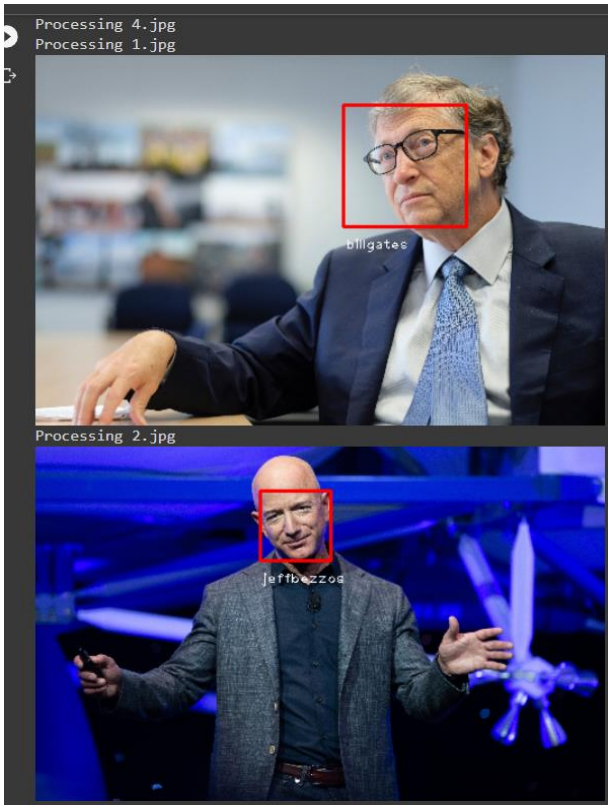

Fig. 4 Face recognition model

To start of with the hardware part of the project we are using raspberry pi where in the OS was installed and all the necessary libraries required to code the face recognition model were installed and Camera(Rpi camera v2) module was interfaced with the Raspberry Pi to capture images, now we have to identify the face of a person by capturing real time video and integrating the face recognition model with Rasperry pi and if the model recognizes the person with stored images of faces in the database then unlock the door, else not.

We are planning to use Blockchain as a part of security over network as we know that IOT devices are light weight devices and implementing heavy algorithms would result in lagging and other technical challenges. We would be deploying out trained model on raspberry pi and thus it will become the heart of processing the whole system with blockchain to keep the ledger of the visitors and the machine learning algorithm to identify the face of the person.The raspberry pi would also act as a node over the network for blockchain network and the ledger would help to keep the record of the visitors. we can use cloud platforms for the same to provide a way to store the records so that the memory of the raspberry pi should not be wasted .

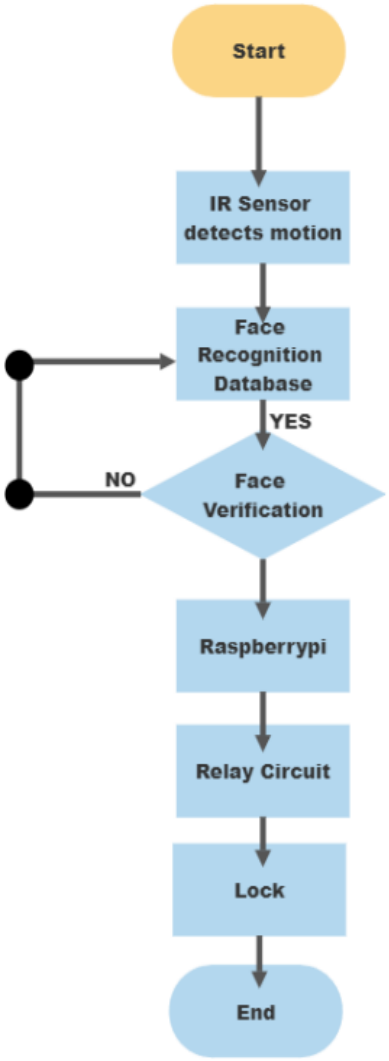

Fig.5 Flowchart

VIII. CONCLUSION

The project was planned in a way so that we developed the application first and then the hardware part of the project was implemented. The Internet of Things (IoT) can be referred to as physical objects that have sensors, processing capabilities, software, and other technologies to connect and exchange data with other devices and systems over the Internet or any other communication networks. The Internet of Things has been viewed as a network system because devices do not need to be connected to the public Internet, they just need to be networked and individually addressable.

Innovative technology on intelligent processes for smart home applications that utilize the Internet of Things (IoT) is mainly limited and dispersed. The available trends and gaps were investigated in this study to provide valued visions for technical environments and researchers. Thus, a survey was conducted to create a coherent taxonomy of the research landscape. An

extensive search was conducted for articles on (a) smart homes, (b) IoT (c) applications (d) AI/ML, and (e)Security. Three databases, namely, IEEE Explore, IRJET, ScienceDirect, and Google Scholar, were used in the article search. The project was planned in a way so that we developed the application first and then the hardware part of the project was implemented. A blockchain can be viewed as a distributed database or ledger that shared information between the nodes in a computer network. As a database, blockchain electronically stores information in digital form. Blockchain is best known for its vital role in maintaining a secure, decentralized record of transactions in cryptocurrency systems like Bitcoin. Blockchain innovation is to ensure the fidelity and security of data records and create trust without the need for a trusted third party.

ACKNOWLEDGEMENT

Firstly we would like to thank our mentor Dr. Payal Saha who gave us her valuable suggestions and ideas when we needed them. She encouraged us to work on this project.

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IOT-Enabled Real-Time Health Monitoring System

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***Abstract*— The recent developments in the biomedical sector and IOT technology have led to a new revolution in the medical arena. The health monitoring system is not only used in hospitals for patients but nowadays it is also required to monitor the health of a person continuously, Which will help to avoid the spread of pandemic diseases like covid-19. Hence health monitoring systems are gaining importance these days. This project is based on monitoring the health of people so to avoid the spread of pandemics and epidemic diseases. We will design and develop a reliable, energy-efficient health monitoring system. It enables the caretakers to monitor health parameters (heart rate, oxygen level, blood pressure, temperature) in real-time. If any of the parameter values go beyond the threshold value an alert is given to the caretaker and the doctor, using the web application.**

Keywords— healthcare, applications, technology, diseases.

I. INTRODUCTION

The size and composition of the world population have changed over the last couple of decades, and these trends are projected to continue. Such demographic trends have significant implications for almost all areas of society, particularly in health and healthcare. Life expectancy has increased dramatically, especially in the more affluent nations, which is set to be celebrated and should be viewed as an opportunity for people to live longer and better. People are more likely to suffer from Deadly diseases like the Spanish flu, the COVID-19 pandemic, plague, etc. To prevent such diseases countries spent more amount of money, which creates a burden for the common people For example, China spent over 50 million Yuan on healthcare infrastructure in 2001, which was 4.58% of its total GDP, whilst the figure increased up to over 400 million Yuan in 2015, which account for approximately 6.05% of the total GDP. Therefore it is essential to make a flexible system that helps to live to linger and be free of such health diseases without creating a financial burden on common people. Hence such a health monitoring system is a need in today's world.

II. PROBLEM DEFINITION

This project is based on monitoring the health of people so to avoid the spread of pandemics and epidemic diseases. We will design and develop a reliable, energy-efficient health monitoring system. It enables the caretakers to monitor health parameters (heart rate, oxygen level, blood pressure, temperature) in real-time. This will help to prevent the spread of diseases.

III. LITERATURE SURVEY

After looking into many research papers and websites related to this we found out 1. Mobile phones are commonly harnessed for outdoor tracking systems, serving mainly as signal transmitters. [1] Ganapati Bhat explained that Wearable IOT devices offer an attractive solution for continuous health monitoring and augmenting clinical treatment. Sensor data can be processed both locally and at a gateway by mobile health applications to enable remote diagnostics.
Wearable devices are ideal for health monitoring since they can enable monitoring users in a free-living home environment. As a result of this capability, health professionals can evaluate the progression of symptoms over time. Hence, there is a need for replacing conventional devices made of rigid materials with physically flexible and stretchable alternatives. Finally, the adoption of new devices can be enabled only by high-impact and practical applications that demonstrate their value. There is a wide range of wearable health and activity monitoring solutions. 2. Remote health monitoring has been proposed and investigated for a few decades [2]. Sensors and sensor networks are the fundamental technologies, which are deployed to collect several health-related signals, such as ECG and heartbeat. A typical solution for remote health monitoring is utilizing a smartphone as a networking gateway, which gathers the sensor signals, with or without further processing, and then transmits them to an associated medical Centre or data processing server. 3. Another key concept is the Body Area Network (BAN), which is composed of several interconnected wearable sensing devices to collect a series of biomedical parameters, such as ECG, EEG, blood pressure, and body temperature. Such sensor nodes are interconnected via various communication protocols such as ZigBee, Bluetooth, and Wi-Fi. However, sensor nodes are often designed with limited memory and computing capacity, thus, sensor data are typically transmitted to another processing server, where the mobile phone is commonly adopted. [3] 4. Heterogeneous wearable sensing devices have been introduced to collect the patient's biomedical data, including EMG, ECG, EEG, blood pressure, body temptation, pulse oximetry, blood glucose, and sweat

sensor. Due to the limited computing capability of the sensing devices, which are not able to manipulate all the sensed data, a typical solution is to harness a smartphone or tablet as the data processing component [4]. A series of tasks can be accomplished by a smartphone or tablet, for example, raw data processing, visualization of the data for the users, and transmission of the data to other data centres. Nonetheless, such systems often require applications operating on a 24/7 basis, which will indeed affect the normal use of the mobile phone. With the recent advancement of cloud computing [5], the sensor data can be directly transmitted to a cloud server, authorized users can access the data with any Internet-enabled devices at anytime from anywhere. For example, Pigadas et al. [6] present an IoT-cloud-based ECG monitoring system, where the sensed data are transmitted to the cloud server via Wi-Fi directly. The patients, doctors, and family members can access the data via either the web or a mobile application. 5. Only monitoring the patient's health condition and sending the necessary information and notification to doctors, and family members. Moreover, it does not contain the appliance control, which is included in our project; it only focused on Monitoring and provides notifications to the respective people on time. [7] In this project, at first, we will take parameters like temperature, and pulse using a sensor then record the date and send it to the server using networking. [8] After that date will process and analyse and then the data as output get displayed using the web or mobile application.

IV. PROPOSED DESIGN

In this project, at first, we will take parameters like temperature, and pulse using a sensor then record the date and send it to the server using networking. After that data will process and analyse and then the data as output get displayed using the web or mobile application.

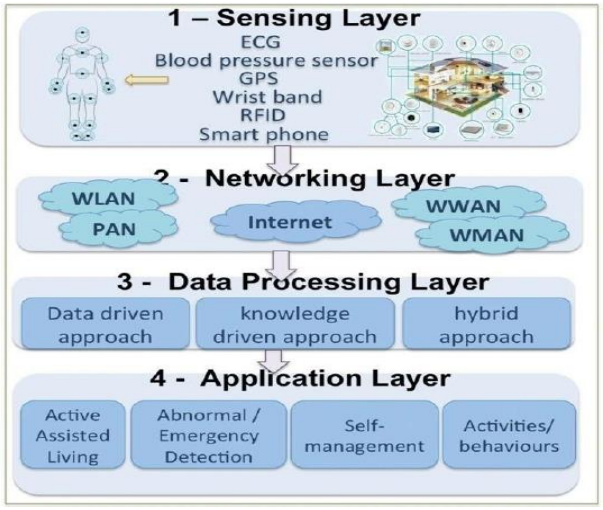

Figure 1: Data Flow Diagram

I. PROJECT PROTOTYPE

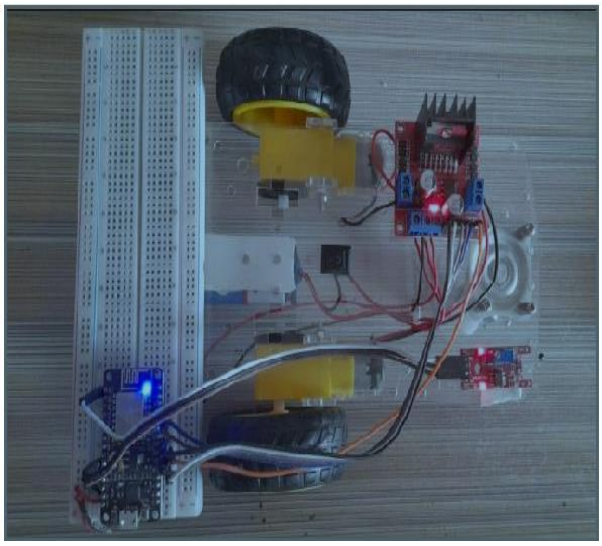

Figure 2. Prototype of project

IOT technology is expanding day by day to include different sectors and applications. One of them is the smart health sector and this sector offers incredible opportunities for us with new applications. The monitoring of the patients, who should be kept under constant surveillance, in the hospital environment is very difficult with the existing infrastructure and methods. In this study, a wireless patient monitoring system is developed that allows patients to be movable in their social areas. The developed system continuously measures the patient's heart rate and body temperature and provides monitoring and tracking through an android-based interface. We assembled the sensor and Microcontroller and built a prototype Robotic System Which will be controlled by the Remote controller or using the Patient's Hand Gesture So that any patient can handle our device by keeping the understanding of isolation so that no outsider can come in contact. In this by measuring the health parameter of the Patient and displaying the result on the IOT application and giving access to control the Robotic System. So, Patient can monitor their Health parameter and analyse the result without any problem. Even doctors can use such a system to monitor the patient remotely and can give treatment to the Patient Remotely without having any Contact. Such Robotic enabled systems with integrated sensors help patients and doctors to solve or prevent the spreading of pandemics and epidemic Diseases.

II. RESULT & DISCUSSIONS

In this study, a real-time heart monitoring system is developed for chronic disease management. Various cardiac parameters such as heart rate, blood pressure, and temperature are being acquired using wearable sensors. Input System is created to receive and store the medical information of the patient which is then transmitted to the web interface using wireless communication. The web interface has been designed to be on the doctors' side to inform them of the medical status along with the location of the patient in real time. The accumulated data is stored

in a data server which pushes the information to the doctor's web interface and ultimately, data of the patient located in the remote area is made visible to the doctor sitting in a super specialty hospital.

V. CONCLUSION

The Internet has brought a great revolution to our society. The Internet of things is connecting everything to the internet. IOT is seen everywhere nowadays. IOT has made cities and homes smart. And now IOT in healthcare plays a great role in monitoring patients' health anywhere, especially if patients need to be monitored continuously. IOT in healthcare not only made easy monitoring of patients at their homes but also made healthcare cost effective. The data collected by using various forms of sensors are sent to doctors and patient relatives for immediate action in case of emergency. The important medical data of the patient is stored on the cloud which can be tracked by the patient or doctor anytime and can also be used for analysis as well for predicting diseases. This project focuses on various applications running that make smart healthcare systems.

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Signal Processing Applications Affecting Human Lives – A Review

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***Abstract*— Amongst the myriads of signal processing applications, few include audio and speech processing, sonar, radar and other sensor array processing, spectral density estimation, statistical signal processing, digital image processing, data compression, video coding, audio coding, image compression, signal processing for telecommunications, control systems, biomedical engineering, and seismology, among others. In this article, the main applications of signal processing directly affecting human life and human behaviour have been discussed. Focus is placed on methods developed for these systems. In the first part of the paper, all the applications are categorised and then, few of the most popular approaches to address various aspects of these applications are briefly described and the significant contributions of these articles are discussed.**

Keywords— Signal Processing, Human Emotion, Human Behavior, Human tracking and detection, Pose Estimation

I. INTRODUCTION

The digital age has seen a significant impact on signal processing. It has been for the creation of complex systems that combine the contributions of various scientific fields. With the development of signal processing techniques, significant obstacles in crucial fields like remote sensing, healthcare, finance, transportation, entertainment, communications and security have been successfully surmounted

II. PROPOSED FRAMEWORK

We give an overview of all the included papers summarizing the contributions and novel aspects of each paper. All the articles are divided into 5 subsections roughly according to their areas, namely, human emotion detection, human behaviour recognition, human tracking and detection, pose estimation and recovery, and other related topics.

A. Human Emotions:

In the article entitled "Wavelet based machine learning models for classification of human emotions using EEG signal", the authors have proposed classification of the human emotions with machine learning models and extracting discrete wavelet features of Electroencephalogram (EEG). The EEG data from Database for Emotion Analysis using Physiological signal (DEAP) online datasets have been used for analysis and consists of peripheral biological signals as well as EEG recordings. EEG signal was collected from 32 subjects while watching 40 1-min-long music videos. Each video clip was rated by the participants in terms of the level of Valence, Arousal, Dominance. In the proposed work the authors have considered a significant band of EEG with a reduced frontal electrode (Fp1, F3, F4, Fp2) to get a comparable good result. The accuracy obtained from K- nearest neighbour (KNN), Fine KNN and Support Vector Machine (SVM) are 92.5%, 90% and 90% respectively for Valence, Arousal and Dominance. [1]

In the article entitled "Improving Accuracy of Classification of Emotions Using EEG Signal and Adaptive PSO", the authors have used the EEG headset for collecting the brain signal of the subject. Because of lots of noise in the input signal taken by EEG headset, various features need to be used as a single feature that cannot give accurate output. The authors identified various features including mean, maximum, minimum, standard deviation, variance, correlation Coefficient, covariance Coefficient, Median, Kurtosis, Energy, Zero crossing rate, using an AI based scheme from EEG recorded signals which were saved in the database. By using Maximum Relevance Minimum Redundancy (MRMR), as per the name the features were arranged to minimum-relevance and maximum-importance of every feature. For removing essential segments PCA was used to diminish the produce feature. The proposed system had four different modules for collecting the data from EEG headset, pre-processing of signal by utilizing adaptive Gaussian filter for eliminating the noise from the signal from EEG headset and to get the spike free signal, extraction of features from the Signal with the help of statistical and wavelet features, and Classification of Signal by using adaptive PSO which is the combination of SVM (Support Vector Machine) and PSO (Particle swarm optimization). The authors took 20 inputs from EEG headset for testing and classifying the emotions of human being. By using KNN 17 correct output was classified out of 20 and by using Adaptive PSO, 19 correctly classified outputs was obtained. So the

accuracy of the classifier KNN was 85% and Adaptive PSO accuracy was 95%. [2]

B. Human behaviour recognition

In the article titled “Automatic Human Behaviour Recognition and Explanation for CCTV Video Surveillance”, high-level text reports and explanations of human activity have been produced from a video taken from a single, static camera. The following information was extracted directly from the video: 1. Gaze direction: what lies in a person’s visual focus of attention, in the image. 2. Spatio-temporal action: e.g. walking or running. 3. Behaviour: a sequence of spatio-temporal actions e.g. crossing the road. The final output were text descriptions that not only described, in human-readable terms, what was happening but also explained the interactions that took place. The input to the reasoning process was the information obtained from video processing methods that provide an abstraction from the image data to qualitative (i.e. human-readable) descriptions of observed human activity. Explanations of global scene activity, particularly where interesting events have occurred, was achieved using an extensible, rule-based method.[3]

The article entitled “Sparse Motion Bases Selection for Human Motion Denoising” proposes a data-driven based human motion denoising method that sparsely selects the most correlated subset of motion bases for clean motion reconstruction. Meanwhile, it takes the statistic property of two common noises, i.e., Gaussian noise and outliers, into account in deriving the objective functions. To achieve a considerably finer-grained pose representation, this method separates each human posture into five parts known as poselets in the first step. To maintain the underlying spatial-temporal motion patterns, these poselets are then reassembled into numerous overlapped poselet groups using a delayed window that moves across the whole motion sequence. Then, using rapid K-SVD in the training phase, five compacted and representative motion dictionaries are created; in the testing phase, they are used to clean up noisy motion sequences by solving "1-minimization" issues. Extensive testing demonstrates that the suggested strategy performs better than its rivals. More importantly, compared with other data-driven based method, this method does not need to specifically choose the training data; it can be more easily applied to real-world applications. [4]

The article “Online Gesture-based Interaction with Visual Oriental Characters Based on Manifold Learning” proposes a new feature descriptor named segmented directed-edge vector (SDV). This straightforward but highly effective descriptor can accurately describe the traits of visual oriental characters. The suggested method's resilience to problems with gesture-based character input, such as unnatural breaks, overlapped or distorted radicals, and unconscious or quivering trajectories, is shown through extensive trials on the online interactive system. The paper's main contributions were the Segmented Directed Edge Vector (SDV), a new stroke-level feature representation for dynamic gestures, and the implementation of the suggested practical gestures-based character input and recognition (GCIR) system using depth images from monocular videos captured by a Kinect sensor and the features.. This system could tackle unnatural breaks, overlapped or distorted radicals, and unconscious or quivering trajectories in real applications. Moreover, a semantic associative database was built that could accelerate the speed of the system further. The system achieved accurate recognition when accumulative errors occur with complex characters. [5]

C. Human tracking and detection

In the article titled "A Comparison of OpenCV Algorithms for Human Tracking with a Moving Perspective Camera", O. Haggui et al compared the Human tracking algorithms offered by the OpenCV software library. Even though the trackers are quick and simple to use, it was still challenging to monitor pedestrians with a moving camera. This work provided a standard for the use of moving cameras in person tracking systems. It suggested a comparison with a particle filter method based on histograms of both colour and texture data, followed by a qualitative and quantitative assessment. Finally, experiments were conducted with a new dataset to verify either the accuracy of OpenCV trackers or a user-friendly particle filter in order to compare to newly created tracking algorithms in the context of pedestrian tracking accuracy in an uncharted area.[6]

The article entitled “An Audio-Visual Human Attention Analysis Approach to Abrupt Change Detection in Videos” proposes an approach to detect abrupt changes in videos based on Bayesian surprise theory, which considers both visual and audio modalities. Specifically, a synchronised sequence based on the time-synchrony between audio-visual series in videos is created after creating surprise curves from the audio and visual modalities. The method is entirely automated and doesn't call for any prior knowledge. The suggested system may detect abrupt changes like sudden sprinting or the collapse of an object, according to experimental findings from studies on human behaviour and video datasets of natural scenes. The main contributions of the article was to propose a unified framework for abrupt changes detection applicable to various types of datasets, to efficiently utilize Bayesian surprise model as fundamental method to detect surprising parts both in audio and visual fields and conduct comprehensive experiments to verify the performance of the said approach on the dataset collected. The results prove the effectiveness of proposed method. [7]

In the article titled “Human Tracking and Counting Using the KINECT Range Sensor Based on Adaboost and Kalman Filter”, Zhu et al discussed the problem of occlusion among the people to be counted using

Conventional methods for human tracking and counting based on images captured by 2-D frontal cameras. The Head and Shoulder Profile (HASP) of a human was utilised as the input feature in the authors' method, which involved using a 3-D sensor (Kinect) to capture a top-down view of the crowd at a building's entry for the goal of counting people. After that, a weak classifier Adaboost algorithm that is sensitive to specific spatial input features has been employed to identify human things from the input. The suggested method could accurately detect a person facing any direction. A Kalman-based tracker was utilised to monitor the observed human object after detection and filter false detection, which greatly increased the false positive detection rate. Experiment result showed that the system could detect and track human motion accurately in real time at about 20 Frames per second. The two main contributions of this work were that it was the first time top-down 3-D views based on the HASP model used for human detection. Therefore, the outcome was not greatly influenced by the illumination or the hue of the human subject. For processing, the Kinect sensor's 3-D range data for HASP was first converted into a 2-D image with the range (depth) data as the intensity. Second, the tracking framework was built using a combination of the Kalman filter and the Adaboost detection algorithm using spatial characteristics. Adaboost detection system cannot produce a detection rate of 100%, so Kalman filter was applied to increase tracking accuracy and decrease false detection rate. The effectiveness of the Adaboost and Kalman system in solving the aforementioned issue in real time was successfully shown. [8]

In the paper titled “Multiple human tracking in high-density crowds”, Ali et al introduce a fully automatic algorithm to detect and track multiple humans in high-density crowds in the presence of extreme occlusion. When most of the scene is moving and most of the pedestrians' body parts are obscured, common methodologies like backdrop modelling and body part-based pedestrian detection fail. The authors suggested combining human detection and tracking into a single framework to solve this issue. They also devised a tracking technique called confirmation-by-classification that links detections with tracks, follows persons across obstructions, and gets rid of false positive tracks. For tracking, a particle filter, the Viola and Jones AdaBoost detection cascade, and appearance modelling, colour histograms were utilised. A method for estimate and use of a 3D head plane was proposed that lowered false positives while maintaining high detection rates in order to further reduce false detections brought on by dense features and shadows. Without any a priori extrinsic camera calibration information, the algorithm gradually learned the head plane from views of human heads. It didn't start using the head plane until there was a sufficient level of confidence in the parameter estimates. An excellent pedestrian tracker for crowded crowds might be built using head plane estimate and confirmation-by-classification, according to an experimental evaluation. [9]

D. Pose estimation and recovery

The article entitled “Dynamic Spatio-Temporal Modelling for Example-based Human Silhouette Recovery” aims to effectively recover the original human silhouette signals from noisy corruption or partial occlusion by investigating their intrinsic structural properties in both spatial and temporal dimensions. The model was composed of multiple layers of tree-structured pictorial-structure models, each of which represented a human stance at a different scale and with a varied graphical layout. The submodel functioned as a human detector at the highest level, while at the lowest level, the body was broken down into a variety of little local pieces. Cross-model restrictions were embedded in the edges of the composite model's adjacent layers. While still allowing for effective inference via dual-decomposition, this multi-layer composite model was able to loosen the independence assumptions in tree-structured pictorial-structures models. The contributions of this work lie in the following three aspects: Introducing the spatiotemporal modelling into the process of human silhouette recovery, that is, utilizing the intrinsic spatio-temporal information leading to the significant improvement of silhouette signal restoration, formulating the problem of temporal correlation mining as a dynamic programming based time-series data matching problem and proposing a sparseness constrained NMF based linear shape model that was capable of well utilizing the local shape information to reduce the influence of partial occlusion or noisy corruption.[10]

In the article titled “Human pose estimation via multi-layer composite models” the authors introduced a hierarchical part-based approach for human pose estimation in static images. The model was composed of multiple layers of tree-structured pictorial-structure models, each of which represented a human stance at a different scale and with a varied graphical layout. The submodel functioned as a human detector at the highest level, while at the lowest level, the body was broken down into a variety of little local pieces. Cross-model restrictions were embedded in the edges of the composite model's adjacent layers. While still allowing for effective inference via dual-decomposition, this multi-layer composite model was able to loosen the independence assumptions in tree-structured pictorial-structures models. The contributions of this article included a novel multi-layer model for human pose estimation, an efficient inference algorithm using dual decomposition, an algorithm for jointly learning the parameters of proposed models using structural SVMs, and experimental results showing that the models outperform existing work on modern benchmarks. [11]

The article titled “Human Pose Detection for Robotic-Assisted and Rehabilitation Environments”, aimed to evaluate and compare the angles in the elbow and shoulder joints estimated by OpenPose and Detectron during four typical upper-limb rehabilitation exercises:

elbow side flexion, elbow flexion, shoulder extension, and shoulder abduction. To gather the ground truth for the joint and skeleton estimations during the various activities, a configuration of two Kinect 2 RGBD cameras was used. In the article's last section, angle measurements derived using OpenPose, Detectron, and the ground truth were compared numerically (using RMSE and MAE). The findings demonstrated how OpenPose performs better in these kinds of applications than Detectron. The goal of the project was to create environments for upper limb robotic rehabilitation where effective pose estimation could be achieved without the use of markers. Qualitatively, OpenPose produced higher outcomes for the four suggested rehabilitative exercises. Detectron2 had an average RMSE of 14.18 while OpenPose had an RMSE of 7.9 on average. Both approaches produced substantial mistakes for the elbow flexion exercise, which had a worse angle of view. Therefore, with the results obtained in this approach, it can be concluded that OpenPose is an adequate library for evaluating patient performance in rehabilitation programs that involve the following exercises: left elbow side flexion, shoulder abduction, and shoulder extension.[12]

E. Other related topics

Advances in machine learning technology have enabled real-time extraction of semantic information in signals which can revolutionize signal processing techniques and improve their performance significantly for the next generation of applications.

In the paper titled “Image retrieval using scene graphs”, Johnson, J.et al . develops a novel framework for semantic image retrieval based on the notion of a scene graph. The scene graphs represent objects (“man”, “boat”), attributes of objects (“boat is white”) and relationships between objects (“man standing on boat”). These scene graphs have been used as queries to retrieve semantically related images. A conditional random field model have been designed to this end that reasons about possible groundings of scene graphs to test images. The likelihoods of these groundings are used as ranking scores for retrieval. The authors also introduce a novel dataset of 5,000 human-generated scene graphs grounded to images and use this dataset to evaluate their method for image retrieval. In particular, they evaluate retrieval using full scene graphs and small scene subgraphs, and show that their method outperforms retrieval methods that use only objects or low-level image features.

Fig 1: Image search using a complex query like “man holding fish and wearing hat on white boat” returns unsatisfactory results in (a). Ideal results (b) include correct objects (“man”, “boat”), attributes (“boat is white”) and relationships (“man on boat”). [13]

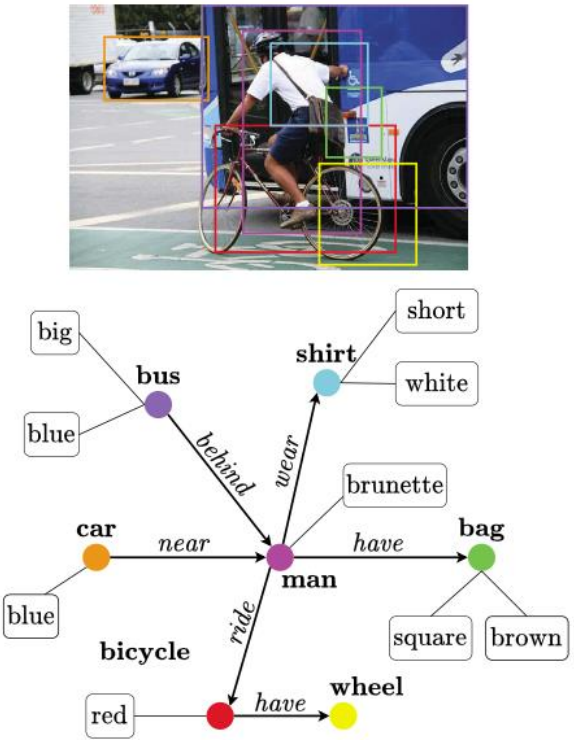

Fig. 2. A scene graph example. Detected objects are represented as objects with circular colored nodes. Relationships among object nodes are shown with directed edges. Object attributes are denoted with rectangular uncolored nodes and they are connected to object nodes with undirected edges. [14]

In the article titled “Towards goal-oriented semantic signal processing: Applications and future challenges”, Mert Kalfa et al has proposed and demonstrated a formal graph-based semantic language and a goal filtering method that enables goal-oriented signal processing with the objective of a concrete representation and efficient processing of the semantic information. The proposed semantic signal processing framework can easily be tailored for specific applications and goals in a diverse range of signal processing applications.

In this research, a formal semantic signal processing framework that consists of a graph-based semantic language and a goal-oriented parsing approach is offered for the organized and universal representation and effective processing of the semantic information. The suggested framework is easily adaptable to certain signal processing applications and objectives. A semantic information extractor in the suggested architecture locates and categorizes signal components into a set of application-specific classes. An assortment of application-specific predicates explain the semantic relationships between the recognized components. Each node in the graph is additionally associated with a hierarchical collection of attributes that provide extra information and are arranged in increasing detail, in addition to the identification and classification of the components. Only edges between a component and a predicate are permitted in directed bipartite graphs, which are made up of the components that are semantically connected to one another. Since these graphs often have a very small number of nodes, operations on them can be carried out very effectively. Additionally, the suggested bipartite structure permits a comprehensive yet relatively straightforward representation of signals and significantly lowers the computing complexity of applications for graph-based signal processing.

The graphs that will be examined further and those that are not now of interest can be categorised in the proposed semantic signal processing framework based on an internally or externally established set of goals that can change over time. Spatio-temporal tracking of graph parameters and performing different operations on their properties may be included in the later processing stages. The chosen level of semantic data for those graphs that are of interest can be locally kept or exchanged with another processor over the appropriate communication protocols at any stage in the processing chain. Since interesting events typically occur infrequently in high bandwidth sensor data, the corresponding semantic signal processing algorithms produce astoundingly high compression rates. The authors examine and suggest methods for communication over a sensor network where sensor data is semantically processed and semantic information is transmitted in the network to demonstrate the significant reduction in communication rate compared to classical ways. They also look at a few use cases and provide information on how the proposed framework may be customised for other signal modalities in order to show the broad range of applications of the proposed goal-oriented semantic signal processing framework.

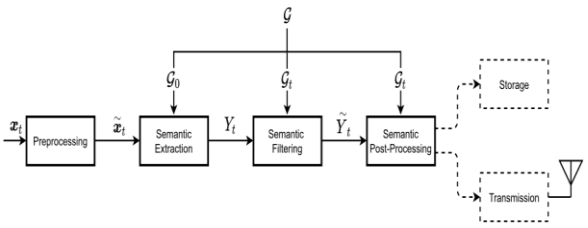

Fig 3: The proposed goal-oriented semantic signal processing framework. [14]

An agent-based signal processing in-node environment for real-time human activity monitoring based on wireless body sensor networks

Wireless body sensor networks are currently enabling a variety of assisted living applications, such as human biophysical/biochemical control, activity monitoring for health care, e-fitness, emergency detection, emotional identification for social networking, security, and highly interactive gaming (WBSNs). For the creation of a real-time WBSN-based system for human activity monitoring, an effective application development framework for WBSNs called MAPS, an agent framework for wireless sensor networks based on the Java-programmable Sun SPOT sensor platform, has been presented. These frameworks outline design practises and coding paradigms that make it possible to quickly prototype WBSN applications. The MAPS agent-oriented programming abstractions make the development of sensor-side software effective and rapid. A coordinator node and two sensor nodes are positioned on the monitored assisted living's waist and thigh, respectively, in the system's standard star-based WBSN design. The coordinator enables sensor configuration, data collection, and identification of predefined human behaviours. It is based on an SPINE coordinator modification made by JADE. Each sensor node's MAPS-based agent senses the 3-axial accelerometer sensor in addition to computing key characteristics on the acquired data, aggregating those features, and sending the information to the coordinator. It is possible to assess the monitoring capabilities and activity recognition accuracy of the prototype during this trial period. Additionally, a comparison of the effectiveness of the monitoring system based on MAPS, AFME, and SPINE.[15]

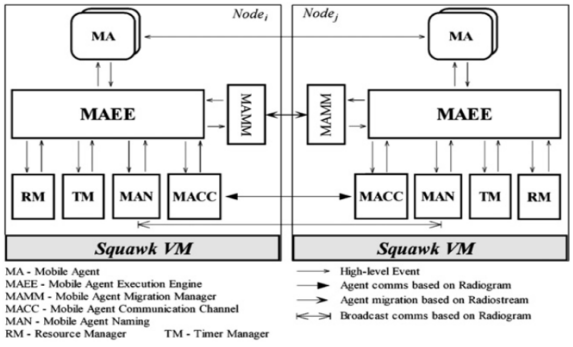

Fig 4: MAPS Architecture [15]

III. CONCLUSION

A wide range of industries, including but not limited to communications, banking, entertainment, and healthcare, are impacted by recent advancements in machine learning. One of the great achievements of machine learning technology is the real-time extraction of rich semantic information from streaming data, which is essential for emerging signal processing applications. For instance, it is now able to instantly recognise and classify elements in streams of images and movies. The accessibility of such extensive semantic data has the potential to significantly improve signal processing techniques..

With connected people, things, and intelligence, the 6G and beyond communication networks have the potential to create the Internet of Intelligence. It will have the capacity to develop a wireless network of everything intelligent, linked, and sensing. The goal-oriented semantic signal processing and communications will be a key component of the innovative architectures and technologies that 6G and beyond will explore in addition to advancements in traditional radio technology. The bandwidth of the network will be used effectively thanks to semantic communications. The goal-filtered semantic data exchanges between users of the network, such autonomous driving automobiles, and the smart city backbone, will also be very advantageous to them.

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The Interaction Between Humans and Computers

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***Abstract*:- The interaction between humans and computers has rapidly evolved in the past few decades, becoming a fundamental aspect of modern-day society. This paper aims to provide a comprehensive review of literature, analysis, and future directions on the interaction between humans and computers. The study reviewed various academic articles, books, and conference proceedings to identify the current state of knowledge on the topic. The analysis highlighted critical factors affecting the interaction, including human-computer interface, usability, user experience, and social and ethical implications. The findings suggest that the success of human-computer interaction depends on the ability of the interface to provide intuitive, accessible, and user-friendly interactions, while addressing social and ethical issues. The study concludes by outlining the future directions in the field, including research in natural language processing, cognitive and affective computing, and ethical considerations in human- computer interaction.**

Keywords:-(HCL, Computer, Human, paper, affective, literature)

I. INTRODUCATION

The increasing prevalence of computers in various aspects of human life has led to a growing interest in the interaction between humans and computers. The design of user interfaces, user experience, and ethical considerations are critical factors in the success of human-computer interaction. The purpose of this paper is to provide a comprehensive review of literature, analysis, and future directions on the interaction between humans and computers. Human- computer interaction (HCI) is a multidisciplinary field of study focusing on the design of computer technology and, in particular, the interaction between humans (the users) and computers. While initially concerned with computers, HCI has since expanded to cover almost all forms of information technology design

Human-Computer Interaction (HCI)Your constantly-updated definition of Human-Computer Interaction (HCI) and collection of topical content and literature What is Human-Computer Interaction (HCI)? Human-computer interaction (HCI) is a multidisciplinary field of study focusing on the design of computer technology and, in particular, the interaction between humans (the users) and computers. While initially concerned with computers, HCI has since expanded to cover almost all forms of information technology design.

II. THE METEORIC RISE OF HCI

HCI surfaced in the 1980s with the advent of personal computing, just as machines such as the Apple Macintosh, IBM PC 5150 and Commodore 64 started turning up in homes and offices in society- changing numbers. For the first time, sophisticated electronic systems were available to general consumers for uses such as word processors, games units and accounting aids. Consequently, as computers were no longer room-sized, expensive tools exclusively built for experts in specialized environments, the need to create human-computer interaction that was also easy and efficient for less experienced users became increasingly vital. From its origins, HCI would expand to incorporate multiple disciplines, such as computer science, cognitive science and human-factors engineering. HCI soon became the subject of intense academic investigation. Those who studied and worked in HCI saw it as a crucial instrument to popularize the idea that the interaction between a computer and the user should resemble a human-to-human, open-ended dialogue. Initially, HCI researchers focused on improving the usability of desktop computers (i.e., practitioners concentrated on how easy computers are to learn and use). However, with the rise of technologies such as the Internet and the smartphone, computer use would increasingly move away from the desktop to embrace the mobile world.

III. METHODS

In this study, we conducted a systematic review of literature, covering various academic articles, books, and conference proceedings, to identify the current state of knowledge on the interaction between humans and computers. We analysed the research findings to identify critical factors affecting human-computer interaction and outline future research directions in the field. he Three Types of Formal Methods for HCI users.

It perhaps comes as no surprise that there are formal methods dedicated to capturing what goes on at the user-level. This is of course, the reason that we all do what we do. Without users any HCI (or indeed User Interface/UI) work is wasted. If no-one uses the product; who cares what it does? There's a time and a place for theory but once we're doing design work – it's not about theory it's about practice. What may come as a bit of a surprise is there are no commonly used formal methods for dealing with groups of users at higher levels. Use there are task-modelling systems, for example, which deal with more than one user but there are no in depth formal methods for social-level modelling or demographic-level modelling.

IV. SYSTEM

If you have a formal method for documenting the user's approach to a product; you also need a method for documenting the system level too.

That is not just the user's interaction with that system but what happens during that interaction "out of sight" of the user. Choosing to represent the system rather than the user does not mean that we have not taken the user into account; it's rather that we sometimes need to document what is happening and why in different ways. This also gives us the opportunity to examine the back-end of the model as well as the front-end.

V. WORLD

This might be better described as contextual or environmental; it's often important to examine the physical context of a user's interaction with a product. It's all well and good designing a system to make it easier for someone in a wheelchair to use a computer but if in the real work environment; that computer is not positioned in a wheelchair accessible zone – it's not going to deliver the benefits that we hope for. It's important to understand where and how our systems are used not just the people who use them.

VI. RESULT

Our analysis highlighted several critical factors affecting the interaction between humans and computers. The human-computer interface plays a crucial role in determining the success of the interaction. A good interface should be intuitive, accessible, and easy to use, allowing users to perform tasks efficiently and effectively. Usability is also a critical factor, as it affects the effectiveness, efficiency, and satisfaction of users Additionally, the user experience, including emotional responses, perceptions, and attitudes toward technology, plays a significant role in the interaction between humans and computers.

Furthermore, the social and ethical implications of the interaction between humans and computers are essential considerations for researchers and designers. The use of technology can affect human behaviour, social interactions, and even cultural norms. It is crucial to consider the potential negative consequences of the interaction between humans and computers, such as addiction, loss of privacy, and social isolation. As such, ethical considerations play an essential role in the design of human-computer interfaces and the development of technological applications.

Additionally, the study identified future directions in the field of human-computer interaction, including research in natural language processing, cognitive and affective computing, and ethical considerations. The use of natural language processing in human- computer interaction can significantly improve the ease of use and accessibility of technology. Cognitive and affective computing can enable computers to interact with humans in a more human-like way, improving the user experience. Finally, ethical considerations are essential for developing human-centred technology that respects the dignity and autonomy individuals.

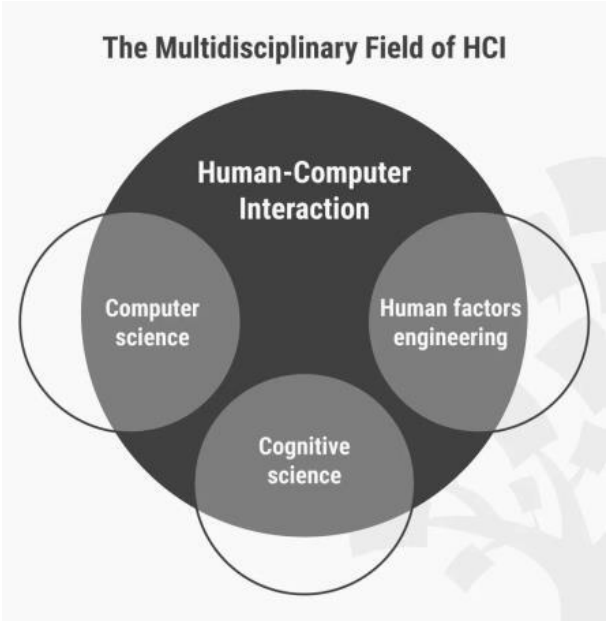

Fig. 1 Human Computer Interaction

VII. CONCLUSION

The interaction between humans and computers is a complex and rapidly evolving phenomenon, with critical implications for individuals and society. This paper provides a comprehensive review of literature, analysis, and future directions on the interaction between humans and computers. The study highlights the critical factors affecting human- computer interaction, including human- computer interface, usability, user experience, and social and ethical implications. Additionally, the study identifies future research directions, including research in natural language processing, cognitive and affective computing, and ethical considerations. As

technology continues to develop, it is essential to consider the social and ethical implications of human-computer interaction to ensure that technology enhances, rather than detracts from, human life

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Real Time Tracking of Students Learning Outcome and Their Academic Progress Across Schools

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***Abstract*- Tracking of student's learning's outcomes and their academic progress platform, is use full to track the student learning because to improve the learning process. and also we can track the individual person with the help of register number, we can view all data like CGP arrears to be completed, assignment, courses completed and courses to be completed with the text format and also with analytics like bar graph, pie chart. Adding student's data to the database will be essential thing. Retrieve the data the help of query's, implementing the data mining techniques like cleaning, sorting, exploratory data analysis to display the quality data to the corresponding search result. In this part the advance test case tools will be used. Monitoring the data students learning with the help on machine learning bots.**

Keywords-Web Application, React js chart js, Firestore, node js, database, react-router-dom, material ui

I. INTRODUCTION

An online student tracking system software is an edTech tool or software that offers provisions like online student attendance management, assignments upload & sharing, e-learning, online examination management & proctoring, and much more to keep a tab on daily students' activities & their performance. It can be integrated with the web as well as mobile to enable students to learn from anywhere and at any time with convenience. Tracking of students learning's outcomes and their academic progress platform, is use full to track the student learning because to improve the learning process. and also we can track the individual person with the help of register number, we can view all data like CGP arrears to be completed, assignment, courses completed and courses to be completed with the text format and also with analytics like bar graph, pie chart.

II. LITERATURE SURVEY

1.Hengyu Li:In online intelligent education systems, to offer for the proactive studying services to students (e.g., learning path recommendation), a crucial demand is to track students' knowledge mastery levels over time. However, existing works ignore the impact of learning transfer on knowledge tracing and only track knowledge proficiency. Knowledge proficiency alone cannot fully reflect students' knowledge mastery levels. A student's knowledge structure (the similarities and differences within knowledge concepts) and abstract principle mastery level (common attributes among knowledge concepts, such as learning methods) also need to be tracked.

2.*Jie Xu* -Based on their ongoing academic records is crucial for effectively carrying out necessary pedagogical interventions to ensure students' on-time and satisfactory graduation. Although there is a rich literature on predicting student performance when solving problems or studying for courses using data-driven approaches, predicting student performance in completing degrees (e.g., college programs) is much less studied and faces new challenges: (1) Students differ tremendously in terms of backgrounds and selected courses; (2) courses are not equally informative for making accurate predictions; and (3) students' evolving progress needs to be incorporated into the prediction. In this paper, we develop a novel machine learning method for predicting student performance in degree programs that is able to address these key challenges.

3.*Adnam Rafique*-Big data analytics has shown tremendous success in several fields such as businesses, agriculture, health, and meteorology, and education is no exception. Concerning its role in education, it is used to boost students' learning process by predicting their performance in advance and adapting the relevant instructional design strategies. This study primarily intends to develop a system that can predict students' performance and help teachers to timely introduce corrective interventions to uplift the performance of low-performing students. As a secondary part of this research, it also explores the potential of collaborative learning as an intervention to act in combination with the prediction system to improve the performance of students.

4.Fredys Alberto Simanca Herrera-Learning Analytics (LA) has a significant impact in learning and teaching processes. These processes can be improved using the available data retrieved from students' activity inside the virtual classrooms of a (LMS). This process requires the development of a tool that allows one to handle the retrieved information properly. This paper presents a solution to this need, in the form of a development model and actual implementation of an LA tool. Four phases (Explanation, Diagnosis, Prediction and Prescription) are implemented in the tool, allowing a teacher to track students' activity in a virtual classroom via the Sakai LMS.

5.Antoine Cully: Intelligent Tutoring Systems are promising tools for delivering optimal and personalized learning experiences to students. A key component for their personalization is the student model, which infers the knowledge level of the students to balance the difficulty of the exercises. While important advances have been achieved, several challenges remain. In particular, the models should be able to track in real-time the evolution of the students' knowledge levels. These evolutions are likely to follow different profiles for each student, while measuring the exact knowledge level remains difficult given the limited and noisy information provided by the interactions.

III.EXISTING SYSTEM

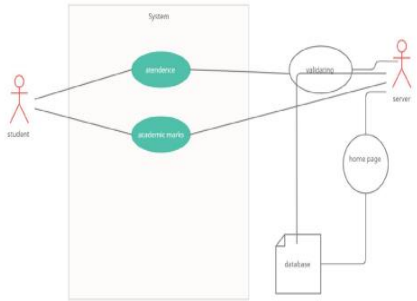
Maintaining the application is complex task Securing the student data in database is difficult The user must have the knowledge about the application and student data Updating the student data accordingly or continuously to the database is complex task to data admin department in the application.

IV.PROPOSED SYSTEM

Tracking the student progress and learnings we Can visualize the student academic history of the data. It is useful to present the student learning and progress to their parents. It reduces the workload for teachers and academic

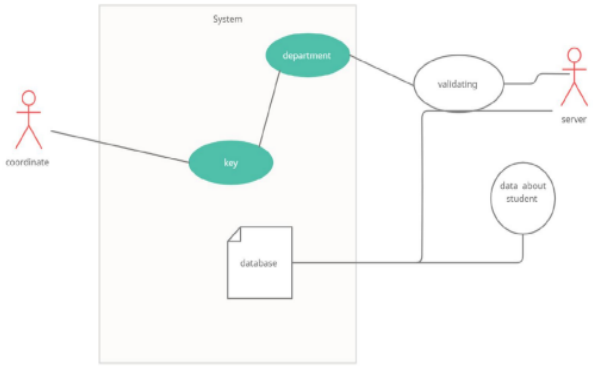
V.METHODOLOGY

5.1 Student Module



The authentication module allows the user to login or register so that they can make use of the features provided by the quiz application. The users are asked to register with username, email, phone number and their designation. These data are verified by firebase authentication. After verification firebase provides a unique user-ID called u-id. U-id along with other user data is stored in the Cloud Firestore. The stored data can be fetched and send to dashboard during login process. The data can view in the data visualization.

B. Coordinate Module



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VI.IMPLEMENTATION

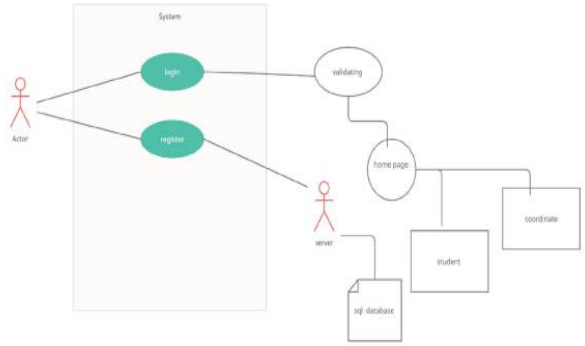
A.Student

The authentication module allows the user to login or register so that they can make use of the features provided by the quiz application. The users are asked to register with username, email, phone number and their designation. These data are verified by firebase authentication. After verification firebase provides a unique user-ID called u-id. U-id along with other user data is stored in the Cloud Firestore.

B.Coordinate

The stored data can be fetched and send to dashboard during login process. The users are asked to register with username, email, phone number and their designation. These data are verified by firebase authentication. After verification firebase provides a unique user-ID called u-id. U-id along with other user data is stored in the Cloud Firestore.

C. Admin



The stored data can be fetched and send to dashboard during login process. The authentication module allows the user to login or register so that they can make use of the features provided by the quiz application. The users are asked to register with username, email, phone number and their designation. These data are verified by firebase authentication. After verification firebase provides a unique user-ID called u-id. U-id along with other user data is stored in the Cloud Firestore. The stored data can be fetched and send to dashboard during login process.

VII.CONCLUSION

A conclusion, this application is useful for schools to maintain the student Data and track the student based on the student (department) key, the coordinate member will login to the application by using the key given by admin, the coordinate can access the individual student data and the coordinate can't delete the data, but admin can delete the data. coordinate can view the data in bar, pie, scatter chart. The student can view the data but they can't modify it. the student work is to submit the assignment on time, courses can be also submitted on the time.

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Portal for National & International Scholarships

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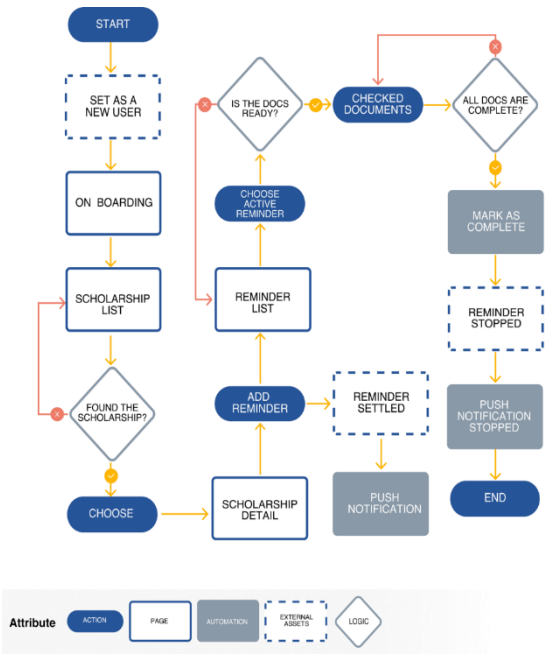
***Abstract*— The purpose of this research paper is to explore the availability of national and international scholarships for higher education students. With the increasing cost of tuition, scholarships have become a crucial tool for students to achieve their academic goals. The study aims to provide a comprehensive analysis of the different types of scholarships available and their requirements, including academic merit, financial need, and field of study. The paper will also examine the role of educational institutions and government agencies in promoting and facilitating access to scholarships. Furthermore, the study will evaluate the impact of scholarships on student success and its role in reducing student debt. The findings of this study will have important implications for policymakers, educators, and students in their efforts to promote access to higher education and ensure that students have the resources they need to succeed.**

Keywords—Component, Real Time Updates, Application, Scholarship, National Scholarship Portal (NSP).

I. INTRODUCTION



A scholarship is a form of financial aid awarded to students for further education. Generally, scholarships are awarded based on a set of criteria such as academic merit, diversity and inclusion, athletic skill, and financial need.

Scholarship criteria usually reflect the values and goals of the donor of the award, and while scholarship recipients are not required to repay scholarships, the awards may require that the recipient continue to meet certain requirements during their period of support, such maintaining a minimum grade point average or engaging in a certain activity (e.g., playing on a school sports team for athletic scholarship holders).

Scholarships also range in generosity; some range from covering partial tuition ranging all the way to a 'full-ride', covering all tuition, accommodation, housing and others.

II. LITERATURE SURVEY

Before coming up with our solution of this problem we conducted a survey amongst students to know their difficulties they were having on searching for scholarships and portals related to it . The most common problems that we got to know were:

1. In an ocean of scholarships, it's hard to find and apply to the right one: Scholarships are everywhere! There are thousands of them, offered by professional associations, nonprofit organizations and charitable groups, private corporations and firms, government agencies, and even individuals. Seeking out and applying to those you are eligible for in an ocean of disorganized information called "the Internet" has become an overwhelming and time-consuming process. Moreover, making the wrong decision can lead to failure in meeting deadlines and application requirements, eventually leading to losing a whole academic year.

2. Biased access to scholarships: Each scholarship has its own unique eligibility requirements. Although many of them are determined by factors such as test scores, grade points, artistic or academic talents, others rely on requirements set by each donor (background, ethnic or gender factors, etc.). This means that access to scholarships could be discriminatory and accessible only to a small number of individuals that match the "right" ethnic or religious criteria.

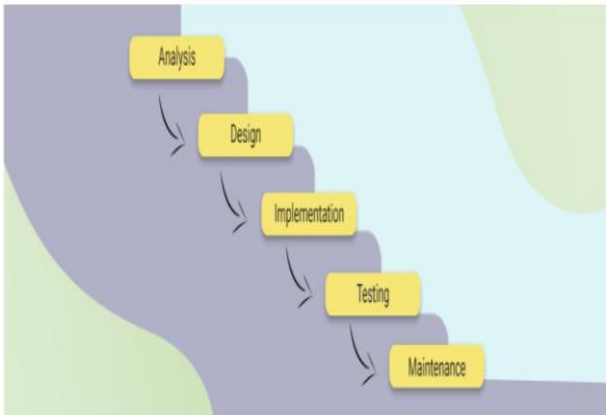
3. No centralized portal for national and International scholarships: There are various scholarships that you will find on the internet but there is not a single portal or site wherein based on the students requirements they can find

a scholarship be it a national scholarship or international scholarship. And that's what makes a tedious task for the students .

That's where our proposed solution comes into picture. We aim on building a portal wherein based on students need he or she will get to know about all the various national and international scholarships without going to other places and wasting their time and that too for free

III. PROPOSED MODEL

The methodology used for this project will be 'Waterfall Methodology'. As mentioned, the steps involve analysis, design, implementation, Testing and Maintenance. Waterfall methodology is given below.



Looking at what the problem is, and after analyzing it we proceed on selecting or choosing a design idea suitable to everyone's interests.

Implementation: We use website building programs coded in html, CSS and JavaScript.

Testing: After launching the website, one needs to test it whether it works or has any errors. If any errors, rectify it and move a step further. For collecting the dataset we plan on comparing the students academic details with the the students who have already received the scholarship. That algorithm comparing would be done by K-nearest algorithm. K-Nearest Neighbor is a method using the supervised algorithm. It is an algorithm using classification towards objects based on the nearest data (to the objects) Following is the formula of distance search using Euclidian formula.

In general, the processes of the k-NN algorithm are as follows. a. Preparing sample data in the form of an array. b. Preparing testing data in the form of an array. c. Calculating the distance between attributive values of testing to each training using Euclidean Distance. d. Sorting the distance results based on the lowest values and the predetermined number of neighbors. e. Obtaining the prediction results based on the calculation of the highest number. f. Calculating the accuracy based on the prediction.

Testing accuracy: To measure the accuracy model, this paper uses Confusion Matrix tool. It is commonly used to evaluate the classification model to predict correct and incorrect objects. In other words, it usually contains information on actual values and prediction on classification. What follows is the calculation formula of accuracy rate. x 100% Total Data Amount Number of True Values Accuracy Value

Results:

To simplify data modeling, the scholarship chosen explicitly in this study is BPPA. The scholarship is also chosen since it is the most wanted scholarship in the campus every year. Based on the rules, one of the requirements for the scholarship recipients candidates, those who propose should have the minimum GPA of 3.00 and should be at least in semester 6. 4.1. Manual data processing Manual data processing is necessary to clean up the data and decrease noise effect in the process of calculation and removing the unused attributes. For the following illustrations are presented examples of manual data processing. The sample data used comprises 24 students out of a total of 1018 students described in table 1

Students sample data:

Student Name	Semester	GPA	Parent Income	Dependents	Grantee
Student 1	6	3.57	2,933,300	7	Yes
Student 2	6	3.51	2,849,063	2	Yes
Student 3	6	3.33	1,800,000	5	Yes
Student 4	6	3.35	500,000	4	Yes

To decrease the distance, data normalization is done by converting the data using a minimum-maximum parameter on each criterion. The results of the data normalization are shown in table 2

Table 2. Normalized student sample data.

Student Name	Semester	GPA	Parent Income	Dependents	Grantee
Student 1	1.00	0.58	0.71	1.00	Yes
Student 2	1.00	0.52	0.69	0.17	Yes
Student 3	1.00	0.33	0.38	0.67	Yes
Student 4	1.00	0.35	0.00	0.50	Yes
Student 5	0.50	0.75	0.76	0.33	Yes

To proceed with k-NN calculation process, the following analogy can be used.

Student: NoName Semester: 4 GPA: 3.45 Parent Income: 1,850,000 Dependents: 3	Conversion Results →	Student: NoName Semester: 0.50 Grade Point: 0.46 Income Parent: 0.40 Dependents: 0.33

The data are calculated using k-NN to decide the recipients of the scholarship finally. The value of k used is 5. Euclidian formula 1 is also used to find the distance of student name with "NoName" towards the sample data. From the results of calculation of Euclidean Distance for each data, then done sorting data based on the values of the distance of the smallest to largest, then taken to a number of values of K, i.e., 5 top data starting from the smallest distance value. Then, the obtained results as shown in table 3.

Student Name	Grantee	Distance
Student 8	Yes	0.15
Student 7	Yes	0.20
Student 18	No	0.45
Student 5	Yes	0.47
Student 6	Yes	0.49

V. CONCLUSION

The proposed model will help students gain access to a centralized portal that would help them find all national and international scholarships available and what are their chances of getting that scholarship. After going through various current system portals and conducting surveys we have proposed a method wherein all the information about various national and international scholarships would be available at one place without any hassle which the current systems lag making the job of students tedious.

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Signature Verification using ML

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***Abstract*- Signature verification is a crucial task in various applications such as financial transactions, legal documents, and security systems. Traditional signature verification methods rely on human experts to manually compare and analyze signatures. With the advancement of machine learning (ML) algorithms, automatic signature verification has become an active research topic. This paper presents a comprehensive overview of signature verification using ML algorithms. We discuss various ML models and feature extraction techniques for signature verification. We also present the datasets used for signature verification and evaluate the performance of different ML algorithms on these datasets. Finally, we discuss the challenges and future directions in signature verification using ML.**

I.INTRODUCTION

A signature is a unique personal identifier that is used to verify the authenticity of documents and transactions. Signature verification is an important task that involves comparing a given signature with a reference signature to determine whether they are from the same person. Traditional signature verification methods rely on human experts to manually compare and analyze signatures, which is time-consuming, subjective, and error-prone. With the advancement of ML algorithms, automatic signature verification has become an active research topic.

II. LITERATURE SURVEY

ML algorithms can learn the features and patterns of signatures and use them to classify them as genuine or forged. Signature verification using ML involves two main steps: feature extraction and classification. In feature extraction, various features such as stroke thickness, slant, curvature, and speed are extracted from the signature. In classification, ML algorithms are used to classify the signature as genuine or forged based on the extracted features.

ML models for signature verification:

Various ML models have been used for signature verification, including support vector machines (SVM), random forests, neural networks, and deep learning models. SVM is a popular ML model that has been used for signature verification due to its high accuracy and ability to handle high-dimensional feature spaces. Random forests are also widely used for signature verification due to their ability to handle noisy data and their robustness to overfitting.

Neural networks are another popular ML model for signature verification. Convolutional neural networks (CNN) have been used to extract features from signatures and classify them as genuine or forged. Recurrent neural networks (RNN) have also been used for signature verification due to their ability to handle sequential data. Long short-term memory (LSTM) networks are a type of RNN that has been used for signature verification.

Deep learning models such as autoencoders and generative adversarial networks (GAN) have also been used for signature verification. Autoencoders are used for feature extraction and can learn the features that are most relevant for signature verification. GANs are used to generate realistic forged signatures for training and evaluating signature verification models.

Feature extraction techniques:

Various feature extraction techniques have been used for signature verification, including time-domain features, frequency-domain features, and spatial-domain features. Time-domain features include stroke duration, number of pen-ups and pen-downs, and number of peaks and valleys. Frequency-domain features include power spectral density and frequency components. Spatial-domain features include stroke direction, slant, and curvature.

Another popular feature extraction technique for signature verification is the use of dynamic features. Dynamic features include the velocity and acceleration of the pen during signature formation. These features can capture the subtle differences between genuine and forged signatures.

Datasets for signature verification:

Several datasets have been used for signature verification, including the CEDAR signature dataset, the GPDS signature dataset, and the Brazilian signature dataset. The CEDAR signature dataset is a benchmark dataset that contains signatures from 55 different signers. The GPDS signature dataset contains signatures from 160 signers and is a challenging dataset due to the presence of various types of forgeries. The Brazilian signature dataset contains signatures from 20 different signers and is a relatively small dataset.

Evaluation metrics:

Various evaluation metrics have been used for signature verification, including accuracy, precision, recall, F1 score, receiver operating characteristic (ROC) curve, and area under the curve (AUC). Accuracy measures the percentage of correctly classified signatures, while precision measures the percentage of correctly classified genuine signatures. Recall measures the percentage of correctly classified forged signatures. F1 score is the harmonic mean of precision and recall and is a measure of overall performance.

ROC curve is a graphical representation of the trade-off between true positive rate (TPR) and false positive rate (FPR) at different classification thresholds. TPR measures the percentage of genuine signatures correctly classified, while FPR measures the percentage of forged signatures incorrectly classified as genuine. AUC measures the area under the ROC curve and is a measure of the classifier's ability to distinguish between genuine and forged signatures.

There are several algorithms that can be used for signature verification using ML, each with its own strengths and weaknesses. Here are some of the most commonly used algorithms:

1. Support Vector Machines (SVM): SVM is a powerful classification algorithm that is often used in signature verification. SVM works by finding the hyperplane that maximally separates the two classes of data points (i.e., genuine and forged signatures) in the feature space. SVM is particularly effective when the number of features is high relative to the number of samples.

2. Random Forests: Random forests is an ensemble learning algorithm that combines multiple decision trees to improve classification accuracy. Random forests work by randomly selecting a subset of features and building decision trees based on these features. The final prediction is made by combining the predictions of all the decision trees.

3. Neural Networks: Neural networks are a class of deep learning algorithms that are particularly effective at modeling complex relationships between inputs and outputs. In signature verification, neural networks can be used to learn a mapping between the signature features and the corresponding classification label (i.e., genuine or forged).

4. Convolutional Neural Networks (CNNs): CNNs are a type of neural network that is particularly effective at processing images. In signature verification, CNNs can be used to extract features from the signature image and then classify the signature as genuine or forged.

5. Recurrent Neural Networks (RNNs): RNNs are a type of neural network that is particularly effective at modeling sequential data. In signature verification, RNNs can be used to model the temporal dependencies between the signature features and classify the signature as genuine or forged.

The choice of algorithm depends on several factors, including the size and complexity of the dataset, the number of features, the desired level of accuracy and speed, and the resources available for training and testing the model. Ultimately, the success of the algorithm depends on the quality and representativeness of the dataset, the feature extraction techniques used, and the careful design and optimization of the ML model.

We are using Convolutional Neural Network

Convolutional Neural Networks (CNNs) are a type of deep learning algorithm that is particularly effective at processing images and other types of 2D data. CNNs are widely used in computer vision applications, including signature verification, object detection, and image classification.

At a high level, CNNs consist of several layers of neurons that are connected in a specific way to form a hierarchical processing pipeline. The first layer of the CNN is typically a convolutional layer, which applies a set of learnable filters to the input image to extract local features. The output of the convolutional layer is then passed through a non-linear activation function, such as ReLU (rectified linear unit), to introduce non-linearity into the model.

The next layer is typically a pooling layer, which down samples the feature maps by taking the maximum or average value over a small window of neighbouring pixels. This helps to reduce the spatial dimensions of the feature maps and improve the computational efficiency of the model.

The process of alternating between convolutional and pooling layers is typically repeated several times to form a deep hierarchy of feature representations. The final layer of the CNN is typically a fully connected layer, which maps the learned features to the output labels (i.e., genuine or forged).

During the training process, the weights of the filters in the convolutional layers are learned using backpropagation, a gradient-based optimization algorithm. The goal of the optimization process is to minimize a loss function that measures the difference between the predicted and actual output labels.

One of the key advantages of CNNs is their ability to learn hierarchical representations of the input data. By applying multiple layers of filters and pooling operations, CNNs can learn increasingly abstract and complex features that are discriminative for the task at hand. This makes CNNs particularly effective at tasks such as object recognition and signature verification, where the relevant features may be highly localized and difficult to extract using traditional feature extraction methods.

CNNs are a powerful deep learning algorithm that are widely used in computer vision applications, including signature verification. By learning hierarchical representations of the input data, CNNs can extract

complex and discriminative features that can be used to accurately distinguish between genuine and forged signatures.

III. CHALLENGES AND FUTURE DIRECTIONS

One of the main challenges in signature verification using ML is the lack of large and diverse datasets. Most of the existing datasets contain signatures from a limited number of signers and may not be representative of the population's diversity. Another challenge is the ability of the ML models to handle various types of forgeries, including skilled forgeries and simple forgeries.

Future research directions in signature verification using ML include the development of more robust and accurate feature extraction techniques, the use of transfer learning and ensemble learning to improve classification performance, and the development of more advanced deep learning models such as attention-based models and graph neural networks. There is also a need for research on the ethical implications of automatic signature verification, such as the potential bias and discrimination in the algorithms and the impact on individual privacy and autonomy.

IV. CONCLUSION

Signature verification is a crucial task that has various applications in financial transactions, legal documents, and security systems. With the advancement of ML algorithms, automatic signature verification has become an active research topic. ML models such as SVM, random forests, neural networks, and deep learning models have been used for signature verification. Various feature extraction techniques and datasets have been used, and various evaluation metrics have been proposed. Challenges and future directions in signature verification using ML include the development of more robust and accurate feature extraction techniques, the use of transfer learning and ensemble learning to improve classification performance, and the development of more advanced deep learning models. In addition to the challenges and future directions mentioned in the previous section, there are several other important factors to consider when using ML for signature verification.

One of these factors is the impact of variability in the signatures themselves. Signatures can vary widely depending on the signer's writing style, age, physical condition, and emotional state. ML models need to be able to handle this variability and still accurately distinguish between genuine and forged signatures.

Another important factor is the need for a secure and reliable system for collecting and storing signatures. In many cases, signatures are collected using electronic devices such as tablets or signature pads. These devices need to be reliable and secure, with appropriate safeguards to prevent unauthorized access to the signature data.

Another challenge is the need to balance accuracy with speed and efficiency. In many applications, signature verification needs to be done quickly and efficiently, without sacrificing accuracy. ML models need to be designed and optimized to provide accurate results in real-time or near real-time.

Finally, it is important to consider the potential ethical and legal implications of using ML for signature verification. There is a need to ensure that the algorithms used are fair, transparent, and unbiased, and that they do not discriminate against any particular group of individuals. Additionally, there may be legal and regulatory requirements governing the use of signature verification systems in certain contexts, such as financial transactions or legal documents.

V. SUMMARY

Signature verification using ML is a complex and challenging task that requires careful consideration of a range of factors, including data collection and storage, variability in signatures, system efficiency, and ethical and legal considerations. Despite these challenges, advances in ML algorithms and techniques offer significant potential for improving the accuracy, speed, and efficiency of signature verification systems, with important applications in a wide range of contexts.

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Smart Solar Irrigation System Using IOT

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Abstract **-Cost effective solar power can be the answer for all our energy needs. Solar powered smart irrigation systems are the answer to the Indian farmer. This system consists of solar powered water pump along with an automatic water flow control using a moisture sensor. It is the proposed solution for the present energy crisis for the Indian farmers. This system conserves electricity by reducing the usage of grid power and conserves water by reducing water losses. Keywords: Smart irrigation; solar power; solar pump; moisture sensor; energy crisis.**

Keywords: Smart irrigation; solar power; solar pump; moisture sensor; energy crisis.

1.INTRODUCTION

Solar energy is the most abundant source of energy in the world. Solar power is not only an answer to today's energy crisis but also an environmental friendly form of energy. Photovoltaic generation is an efficient approach for using the solar energy. Solar panels (an array of photovoltaic cells) are nowadays extensively used for running street lights, for powering water heaters and to meet domestic loads. The cost of solar panels has been constantly decreasing which encourages its usage in various sectors. One of the application of this technology is used in irrigation systems for farming. Solar powered irrigation system can be a suitable alternative for farmers in the present state of energy crisis in India. This a green way for energy production which provides free energy once an initial investment is made. In this paper we propose an automatic irrigation system using solar power which drives water pumps to pump water from bore well to a tank and the outlet valve of tank is automatically regulated using controller and moisture sensor to control the flow rate of water from the tank to the irrigation field which optimizes the use of water. Irrigation system are crucial component of modern agriculture providing necessary water for crops to grow traditional irrigation depend on electricity or fossil fuels to pump water, but this can be expensive and unstainable .Solar irrigation systems offer a cost-effective and environmentally friendly alternative, harnessing the power of the sun to pump water for irrigation.

2. LITRATURE SURVEY AND BACKGROUND STUDY

According to the survey conducted by the Bureau of Electrical Energy in India in 2011 there are around 18 million agricultural pump sets and around 0.5 million new connections per year is installed with average capacity 5HP. Total annual consumption in agriculture sector is 131.96 billion KWh (19% of total electricity consumption). As cited in paper solar powered smart irrigation technique is the future for the farmers and a solution for energy crisis. So, for the proposed solar powered system we are using techniques analysed in paper and modified. Sine PWM technique has been used for inverter operation for minimum harmonics as given in paper which further increases the efficiency of the system.

I. SYSTEM DESIGN:

Solar irrigation systems typically consist of a solar panel array, a water pump, a storage tank, and a distribution system. The solar panel array converts sunlight into electrical energy, which is then used to power the water pump. The water pump draws water from a well or other source and pumps it into a storage tank. From the storage tank, the water is distributed to the fields through a network of pipes and sprinklers.

II. TECHNICAL COMPONENTS

The main components of a solar irrigation system include solar panels, a pump controller, a water pump, and a storage tank.

A. Solar panels: Solar panels convert sunlight into electrical energy, which is then used to power the water pump. The size of the solar panel array will depend on the power requirements of the water pump and the amount of sunlight available in the area.

B. Pump controller: The pump controller is responsible for regulating the power from the solar panels to the water pump. It helps to ensure that the water pump operates efficiently and prevents overloading or damage to the system components.

C. Water pump: The water pump is responsible for drawing water from the well or other source and pumping it into the storage tank. The size of the water pump will depend on the volume of water needed for irrigation and the head height (vertical distance) of the water source.

D. Storage tank: The storage tank is used to store the water that has been pumped from the well or other source. The size of the tank will depend on the volume of water needed for irrigation and the frequency of pumping.

III.SYSTEM DESCRIPTION

Proposed irrigation system mainly consists of two modules- Solar pumping module and automatic irrigation module. In solar pumping module a solar panel of required specification is mounted near the pump set.

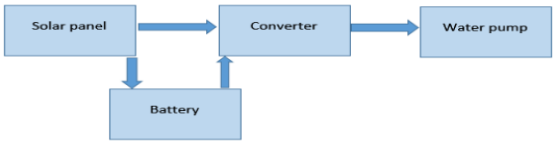

Fig. 1: Block diagram of solar pumping module.

Then using a control circuit it is used to charge a battery. From the battery using a converter circuit it gives power to the water pump which is submerged inside the well. Then the water is pumped into an overhead tank for storing water temporarily before releasing the water into the field. In automatic irrigation module the water outlet valve of the tank is electronically controlled by a soil moisture sensing circuit. The sensor is placed in the field where the crop is being cultivated. The sensor converts the moisture content in the soil into equivalent voltage. This is given to a sensing circuit which has a reference voltage that can be adjusted by the farmer for setting different moisture levels for different crops. The amount of water needed for soil is proportional to the difference of these two voltages. A control signal was given to a stepper motor whose rotational angle is proportional to the difference in voltage. The stepper motor in turns controls the cross sectional area of the valve to be opened controlling flow of water. Therefore the amount of water flowing is proportional to the moisture difference.

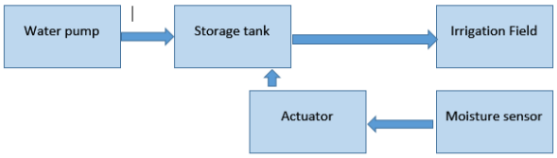

Fig. 2: Block diagram of automatic irrigation module.

3.IMPLEMENTATION

For the implementation of the proposed system we are using a 2 HP water pump and
various modules which are designed and fabricated separately and then finally they are
assembled together to implement the proposed system. Solar energy is harnessed using
solar panel PVL-68 that generates 53W at Nominal Operating Cell Temperature. It is
24V, amorphous silicon type solar cell.
Specification of the solar panel selected:
Array capacity --240Wp
Irradiance – 580 W/m^2
Open circuit voltage – 18.1 V
Short circuit current – 3.98 A
Load test on a solar panel have been conducted and its maximum and minimum
values is tabulated.

4.COST ANALYSIS

With over nine hundred thousand tube wells being used in every state of India, around Rs.18 Million of energy is used for pumping water for irrigation. This amount of money used for electricity can be saved with the help of solar water pump. Annually the cost of nearly five million kilo watt hour of energy can be spared. That is around Rs.27 Million per annum can be redeemed which comes around 40% of the total amount of investment. Even though the initial investment is high, it can be earned back in 2 and a half years' time. If we assume the cost of power is Rs. 1.5 Million per kilo watt hour, Rs.18 Million is used for pumping water alone in a year. By using the solar water pump, we can save up to 4.8 million KWh of energy annually which saves a lot of energy. The excess energy can also be given to the grid with small modifications and investments in the circuit, which can add to the revenue of the farmer

Table2: Cost analysis.

Component	Unit Cost	Quantity	Total Cost
Solar Panel (1.4m^2)	24000	4	Rs.96000
Converter Circuit	400	1	Rs.400
Battery 24V,100Ah	8250	1	Rs.8250
		Overall cost	Rs.104650

5.CONCLUSION:

By implementing the proposed system there are various benefits for the government and the farmers. For the government a solution for energy crisis is proposed. By using the automatic irrigation system it optimizes the usage of water by reducing wastage and reduce the human intervention for farmers. The excess energy produced using solar panels can also be given to the grid with small modifications in the system circuit, which can be a source of the revenue of the farmer, thus encouraging farming in India and same time giving a solution for energy crisis. Proposed system is easy to implement and environment friendly solution for irrigating fields. The system was found to be successful when implemented for bore holes as they pump over the whole day. Solar pumps also offer clean solutions with no danger of borehole contamination. The system requires minimal maintenance and attention as they are self starting. To further enhance the daily pumping rates

tracking arrays can be implemented. This system demonstrates the feasibility and application of using solar PV to provide energy for the pumping requirements for sprinkler irrigation. Even though there is a high capital investment required for this system to be implemented, the overall benefits are high and in long run this system is economical.

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Indicator for Cyclists

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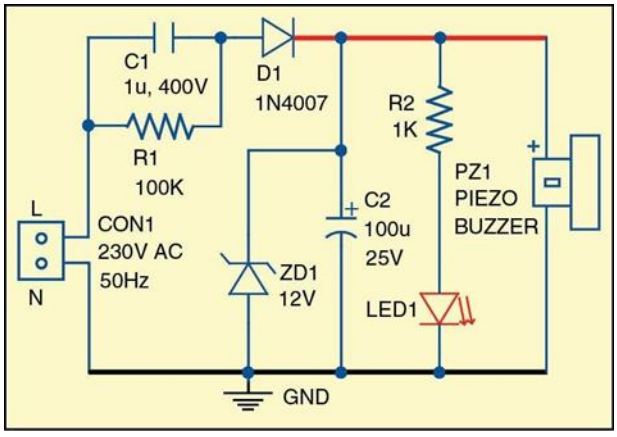
***Abstract*— an indicator is any of various instruments used to accurately measure small distances and angles, and amplify them to make them more obvious. The name comes from the concept of indicators to the user that which their naked eye cannot discern; such as the presence, or exact quantity, of some small distance (for example, a small height difference between two flat surfaces, a slight lack of concentricity between two cylinders, or other small physical deviations. Cycle indicator is something that helps cyclists to indicate on roads about what path they are going to take further it is same as cars the only difference is car is replaced by cycle in this context.**

I. INTRODUCTION

Indicators inherently provide relative measure only. But given that suitable references are used (for example, gauge blocks), they oftenllow a practical equivalent of absolute measure, with periodic recalibration against the references. However, the user must know how to use them properly and understand how in some situations, their measurements will still be relative rather than absolute because of factors such as cosine error



The circuit is built around capacitors C1 and C2, resistors R1 and R2, diode D1, zener diode ZD1, LED1 and a piezo buzzer (PZ1). Resistor R1 and capacitor C1 are used for reducing the voltage and limiting the current. Diode D1 is a rectifier. C2 is used as a filtering capacitor. Zener diode ZD1 limits the output voltage to around 12V. The value of zener diode should be equal to or lower than the maximum voltage of the buzzer and higher than the minimum voltage. Preferably, the buzzer should have a built-in oscillator working in the range of 6V-12V and requiring a current below 10mA. The frequency of the alarm sound is usually in several kilohertz (kHz). LED1 is on when the mains power supply is present, and at the same time the buzzer produces sound. Resistor R1, capacitor C1 and diode D1 are selected depending on the current requirement of the buzzer.

PARTS LIST

Semiconductors:

D1	- 1N4007 rectifier diode
LED1	- 5mm LED
ZD1	- 12V zener diode

Resistors (all 1/4-watt, ±5% carbon):

R1	- 100-kilo-ohm
R2	- 1-kilo-ohm

Capacitors:

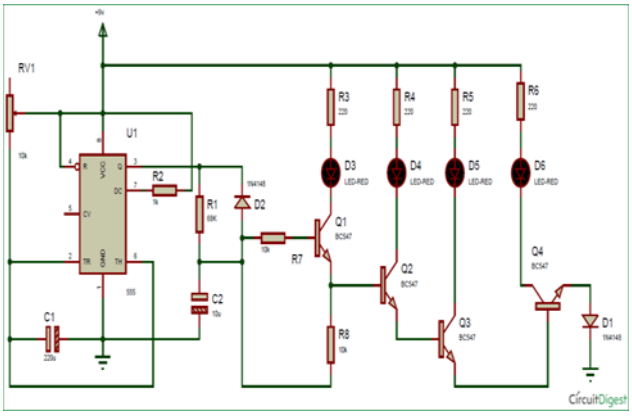
C1	- 1µF, 400V polyester
C2	- 100µF, 25V electrolytic

Miscellaneous:

CON1	- 2-pin connector terminal
PZ1	- Piezo buzzer
	- 230V AC mains power supply

II. LITERATURE SURVEY

Construction of indicator



In this Bike Turning Signal Indicator circuit, we have used one 10K and 1K resistors and a capacitor for generating a delay. The 1n4148 diode is connected in reverse bias at the output pin of 555 timer IC to maintain a constant current. Due to base current BC547/MPS42A (NPN) Transistor drive, the LED's ON and OFF. LEDs are connected to the transistor through a 220ohm resistor

with respect to Vcc. This 220ohm resistor will save LED to may get damaged. The aim of this circuit is to indicate left or right turn signal for vehicle. Two same circuits are needed, one is for left and the other is for right. Here we have made only one circuit for demonstration. In this circuit we have used a stable multibirator, which is used to generate Pulse having some time period. To adjust the speed of LED blinking or indicator, we have used potentiometer. Hare we have used 4 NPN transistors for glowing indicator LEDs. Learn more about A stable Multivibrator using 555 here.

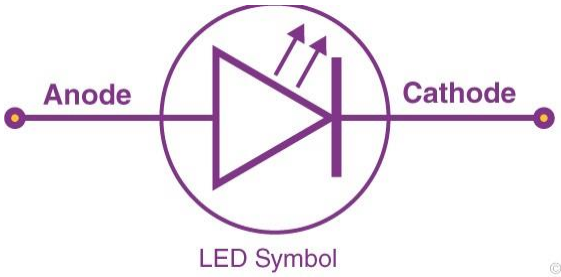
Components for circuit BC547 or MPS A42 NPN transistor -4

Bread Board -1

- 555 Timer IC -1
- 1K -1
- 10k POT -1
- 10K -6
- 68K -1
- Power Supply LED -4
- 10uF Capacitor -1
- 470uF -1
- 1N4148 Diode -2
- 9V Battery -1 Jumper wire

LED

A light-emitting diode (LED) is a semiconductor device that emits light when an electric current flows through it. When current passes through an LED, the electrons recombine with holes emitting light in the process. LEDs allow the current to flow in the forward direction and blocks the current in the reverse direction. Light-emitting diodes are heavily doped p-n junctions. Based on the semiconductor material used and the amount of doping, an LED will emit coloured light at a particular spectral wavelength when forward biased. As shown in the figure, an LED is encapsulated with a transparent cover so that emitted light can come out.



When the diode is forward biased, the minority electrons are sent from p → n while the minority holes are sent from n → p. At the junction boundary, the concentration of minority carrier's increases. The excess minority carriers at the junction recombine with the majority charges carriers. The energy is released in the form of photons on recombination. In standard diodes, the energy is released in the form of heat. But in light- emitting diodes, the energy is released in the form of photons. We call this phenomenon electroluminescence. Electroluminescence is an optical phenomenon, and electrical phenomenon where a material emits light in response to an electric current passed through it. As the forward voltage increases, the intensity of the light increases and reaches a maximum 555 timer IC The 555 timer IC is an integrated circuit (chip) used in a variety of timer, delay, pulse generation, and oscillator applications. Derivatives provide two (556) or four (558) timing circuits in one package. The design was first marketed in 1972 by Signetics. Since then, numerous companies have made the original bipolar timers, as well as similar low-power CMOS timers. Depending on the manufacturer, the standard 555 package incorporated the equivalent of 25 transistors, 2 diodes, and 15 resistors on a silicon chip packaged into an 8-pin dual in-line package (DIP-8). Variants available included the 556 (a DIP-14 combining two complete 555s on one chip), and 558 / 559 (both variants were a DIP-16 combining four reduced- functionality timers on one chip).

The NE555 parts were commercial temperature range, 0°C to +70 °C, and the SE555 part number designated the military temperature range, −55 °C to +125 °C. These chips were available in both high-reliability metal can (T package) and inexpensive epoxy plastic (V package) form factors. Thus, the full part numbers were NE555V, NE555T, SE555V, and SE555T. Low-power CMOS versions of the 555 are now available, such as the Intersil ICM7555 and Texas Instruments LMC555, TLC555, TLC551

Voltage divider: Between the positive supply voltage VCC and the ground GND is a voltage divider consisting of three identical resistors (5 kΩ for bipolar timers, 100 kΩ or higher for CMOS) to create reference voltages for the comparators. CONTROL is connected between the upper two resistors, allowing an external voltage to control the reference voltages:

When CONTROL is not driven, this divider creates an upper reference voltage of 2⁄3 VCC and a lower reference voltage of 1⁄3 VCC. When CONTROL is driven, the upper reference voltage will instead be VCONTROL and the lower reference voltage will be 1⁄2 VCONTROL. Threshold comparator: The comparator's negative input is connected to voltage divider's upper reference voltage, and the comparator's positive input is connected to THRESHOLD.

Trigger comparator: The comparator's positive input is connected to voltage divider's lower reference, and the comparator's negative input is connected to TRIGGER. Flip-flop: An SR flip-flop stores the state of the timer and is controlled by the two comparators. RESET overrides the other two inputs, thus the flip-flop (and therefore the entire timer) can be reset at any time.

Output: The output of the flip-flop is followed by an output stage with push–pull (P.P.) output drivers that can supply up to 200 mA for bipolar timers, lower for CMOS timers.

Discharge: Also, the output of the flip-flop turns on a transistor that connects DISCHARGE to the ground

USES OF INDICATOR

In a quality environment to check for consistency and accuracy in the manufacturing process. On the workshop floor to initially set up or calibrate a machine, prior to a production run. By toolmakers (such as moldmakers) in the process of manufacturing precision tooling. In metal engineering workshops, where a typical application is the centering of a lathe's workpiece in a four jaw chuck. The dial indicator is used to indicate the run-out (the misalignment between the workpiece's axis of rotational symmetry and the axis of rotation of the spindle) of the workpiece, with the ultimate aim of reducing it to a suitably small range using small chuck jaw adjustments. In areas other than manufacturing where accurate measurements need to be recorded (e.g., physics).

To check for lateral run-out when affixing a new rotor to an automotive disc brake. Lateral run-out (lack of perpendicularity between the disc surface and the shaft axis, caused by deformations or more frequently by a lack of proper cleaning of the mounting surface of hub. This run-out can produce brake pedal pulsations, vibration of the vehicle when brakes are applied and can induce uneven wear of the disc. The lateral run-out can be caused by uneven torque, damaged studs, or a burr or rust between the hub and rotor. This variation can be tested with a dial indicator, and most times the variation can be more or less cancelled by reinstalling the disc in other position, so that the tolerances of both the hub and the disc tend to cancel each other. To reduce the run-out, the disc is mounted and torqued to half the specified torque (as there is no wheel to distribute stresses) then a dial Indicator is placed against the braking surface and the face of the dial is centered, the disc is slowly rotated by hand and the maximum deviation is noted. If the maximum run-out is within the maximum allowed run-out specified in the manual, the disc can be installed at that position, but if the technician wants to minimize the total lateral run-out, other around the clock positions can be tried. Excessive run-out can rapidly ruin the disc if it exceeds the specified tolerance (typically up to 0.004 inches (0.10 mm) but most discs can attain less than 0.002 inches (0.05 mm) or less if installed at the optimum position).

ADVANTAGES

It can serve as your blind spot safeguard for tough situations where you think you're safe to merge, but your blind spot says otherwise, your turn signal can serve as a sort of safeguard. Even if you don't notice a car to your right or left, turning on your signal before you make the maneuver will give that unseen motorist a chance to honk their horn or get out of the way in order to save you both from a tight spot.

It can minimize the stress of merging getting onto the highway can be made at least a little easier by using your turn signal, since it amplifies your presence on the highway to other drivers. They'll notice you trying to get into the high-speed flow of traffic and, hopefully, make the appropriate moves to accommodate you.

It's an extra show of courtesy sometimes, the use of a turn signal isn't exactly clear or especially common (such as when you're pulling into the driveway of your home), but never doubt its ability to help you and other drivers in the area. Your neighbors will be thankful for that added gesture that lets them know your intentions and prevents them from having to wonder what you'll do next.

Tight traffic situations and slow-moving gridlock might not be the best part of your morning—but we think turn signals can make them a little less stressful. When you'retrying to make your way into a lane of cars that are nearly bumper to bumper, turning on your signal (instead of just forcing your way in) isn't just the "right thing to do" in a legal sense. It can help you, too! Having your signal on as you search for an opening in traffic will let other drivers know that you're in a tight spot and need a way in. Sure, it's true that some will speed up to fill any potential gaps and prevent you from getting in front of them—but you might just find that, more often than not, drivers will understand your situation and answer your plea. It helps you avoid road rage icccds 2023.

Family, and your surroundings safe. We'd say that's well worth the signal! Road rage doesn't have to be an everyday fixture of today's roadways. Using your turn signals (in addition to other signs of courtesy and defensive driving) can show your respect.

III. CONCLUSION

The indicators proposed in the study allow to assess the development level of bicycle transport infrastructure at various levels, to identify changes in the transport behavior of citizens using bicycles, to determine the most promising options for planning bicycle infrastructure. Traffic intensity, safety, cohesion, directness, attractiveness and comfort are those indicators that form the basis for subsequent changes in the transport bicycle infrastructure of the city. At the initial stage, monitoring objectives are defined: a flexible system of proposed indicators allows us to shift the focus to the most relevant indicators in the current moment of the urban environment development. At subsequent stages, a system of criteria and indicators for their evaluation, and

a system of target indicators are formed, on the basis of which a comparative analysis of the results achieved with the goals is carried out.

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For other drivers, preventing them from having to brake quickly or get out of the way in order to accommodate a sudden surprise on the road. With a quick tap of your indicator, up or down, you can inform other drivers of your intentions while keeping yourself, your

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2) Bike/Car Turning Signal Indicator Circuit using 555 Timer IC

3) 555 timer IC Wikipedia

By developing the indictors, we understood the important e of it we came to know how LEDs work also came to know how IC 555 works it is very important to have in on cycles in our daily life we see vehicles turning indicators when they turn left or right. It looks like Simple LED Blinking. But it's not only simple blinking LEDs inside indicators of vehicles.

Medicine Delivery Web App

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Abstract::- **Increasing advancement in technology can turn up for the good of society and here we are planning to bring change in health care and services. The ultimate objective here is to design a medicine delivery app that can perform medicine delivery with ease and with a much better security system. The currently available medicine delivery system is not operational in many regions and other disadvantages are promoting the use of illegal drugs, delay in delivery and does not provide all facilities. The proposed medicine delivery app is designed in such a way that it is secure that it reduces the exploited use of drugets and get it delivered within an hour.**

INTRODUCTION:

Most of you will be familiar with apps called Swiggy, Zomato, and Uber-eats. Actually we are planning the same, but to deliver something else. People after some particular age, it will be difficult for them to medicine stores, get medicines and return home safe. So, you can now order your medicines online with a special care for the OLD. And the best part is most of these services have presence on web and as mobile apps. The pharmacy and the concept of online medicine retail will reach around $1.6 trillion by 2025. According to a recent study as published by the Mobile Health Market Reports, the figures of health mobile apps will increase up to 3.9 million and out of this a major portion will be dominated by the pharmacy, drugs and medicine selling mobile apps.

BACKGROUND

To understand how a delivery app works and here we are taking most two popular apps, Inayoand Book MEDS. In both the apps, you can order medicines online. Inayo is Mumbai based and delivers medicines in under 90 minutes. The app lets users maintain anelectronic medical history.Users can also book lab tests online, and gets reports delivered at their doorstep. Whereas in Book MEDS, its Hyderabad based and does the same, but with some delay in delivery.

But even though it's good as you feel, there are drawbacks as you know deeper about the practical side. The users can exploit the use of pharmaceutical drugs as he/she can upload a fake prescription and get that delivered/ordered. Both the apps only allow cash on delivery facility and in Book MEDS, it takes 24 hrs. to get the medicines delivered. It takes an efficient system to solve all of the above negatives and we are planning on bringing that up, i.e., MediCure.

KEY FEATURES AND DESIGN –

The app: -

- Should be user friendly Should be cost-effective
- Delivery should be smooth and fast. Should be immune to bugs.
- Should be easy to use for the old.
- Should reduce the use of illegal drugs, not prescribed by the doctor.

Features –

- End-to-end solution for online delivery of medicines. Safe secure and fast payment options.
- Delivery, as well as a takeaway option, will be available from the nearest stores.
- Subscription-based model for regular patients. Easy to use interface.

FUTURE WORK

According to a recent study as published by the Mobile Health Market Reports, the figures of health mobile apps will increase up to 3.9 million and out of this a major portion will be dominated by pharmacy, drugs and medicine. Thus you can see there is a major scope for profit in this field after all we need an initial investment. We are planning to provide our resources to almost every states in India and then to worldwide services.

CONCLUSION:

People prefer online services for almost everything. Here we have tried health care transformation through technology where you can order medicines much more easily and in a most secure way. We have established a virtual link between the pharmacist and the user and thus the pharmacist can check for the availability of medicines and based on availability the services can be

provided. It also aims to reduce the exploit use of illegal drugs.We also aim at servicing the old at a fair way most possible by giving them extra discounts. We plan to improve our services as per the feedback from the user as it becomes more stretchable towards the user.

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GPS and GSM Based Vehicle-Theft Control System

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***Abstract*-Currently, the majority of the public owns a vehicle, and theft occurs in parking lots and sometimes while driving in unsafe areas. Vehicle security is critical for public vehicles. A vehicle tracking and locking system is installed in the vehicle to track the location and lock the engine motor. The location of the vehicle is determined using the Global Positioning System (GPS) and Global system mobile communication (GSM). These systems constantly monitor a moving vehicle and report its status on demand. When the theft is discovered, the responsible party sends an SMS to the microcontroller, which then sends control signals to the engine motor. To restart the vehicle and open the door, the authorised person must send the password to the controller. This is more secure, reliable, and inexpensive.**

Keywords-Vehicle Tracking, Locking, Microcontroller, GPS, GSM

I. INTRODUCTION

India has advanced at such a rapid pace in the last few decades that many companies have firmly established themselves here. These businesses bring a large workforce with them. Organizing transportation for such a large group is a difficult task fraught with complications. This transportation is typically arranged on a yearly contract basis through local transportation vendors. Recent problems include burglaries, rapes, and other violent crimes. The advancement of satellite communication technology makes it simple to pinpoint the location of a vehicle. Vehicle tracking systems have made this technology available to the general public. GPS in cars, ambulances, fleets, and police vehicles are now common sights on developed-country roads. All existing technology allows for the tracking of a vehicle's location and status. One of the most important systems that integrates both GSM and GPS technologies is the GPS/GSM Based System. It is required due to the numerous applications of both GSM and GPS systems, as well as their widespread use by millions of people worldwide.

This system is intended for users in the land construction and transportation industries, and it provides real-time information such as the user's location, speed, and expected arrival time in moving vehicles. This system could also be useful for communication between the two points. Currently, GPS vehicle tracking ensures their safety while on the road.

This vehicle tracking system was discovered in the vehicles of clients as a theft prevention and rescue device. The vehicle owner or police follow the signal emitted by the tracking system to locate a robbed vehicle, while the stolen vehicle's engine speed decreases and is pushed to the off position. Without the password, the engine cannot be restarted after being switched off.

This system was installed for four-wheelers. Vehicle tracking is commonly used by navy operators for management functions such as routing, send off, on board information, and security. Monitoring the driving performance of a parent with a teen driver is one of the applications. Vehicle tracking systems are now commonly used in consumer vehicles as a theft prevention and recovery device. When a theft is detected, the system sends an SMS to the vehicle's owner. After the vehicle owner sends the SMS to the controller, the controller will send the necessary signals to stop the motor.

II. EXAMINING RELATED WORK

The suggested GPS/GSM-based system consists of two components: a mobile unit and a controlling station. The system operations, interfaces, connections, data transmission and reception among the mobile units and control stations are all operational. These findings are compatible with GPS technologies. A car tracking system is an electronic device put in a vehicle that allows the owner or a third party to track the whereabouts of the vehicle. This article proposed creating a car tracking system that uses GPS and GSM technology. This system is constructed on an embedded system and is used for tracking and placing any vehicle utilising a Global Positioning System and a Global system for mobile communication. This concept will continuously monitor a moving vehicle and report the vehicle's status on demand.

III. SOFTWARE SPECIFICATIONS

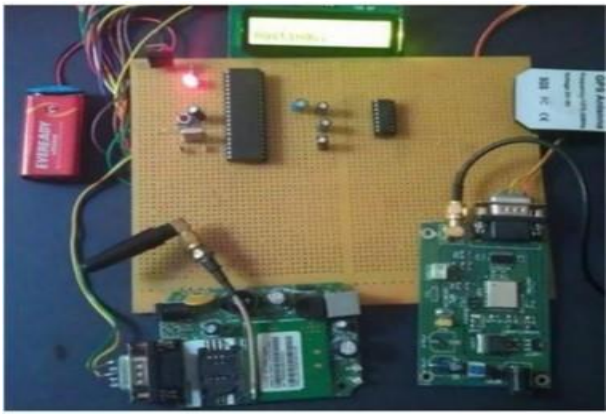
Kiel µVision IDE MC Programming Language Embedded C

IV. GPS TECHNOLOGY

The Global Positioning System (GPS) is a satellite-based navigation system comprised of 24 satellites in orbit. The system, which is freely accessible to anyone with a GPS receiver, provides critical information to military, civil, and commercial users all over the world. GPS works in any weather condition and anywhere in the world. There are typically no subscription fees or system charges to use GPS.

To estimate 2D position (latitude and longitude) and track movement, a GPS receiver must be locked onto the signal of at least three satellites. The receiver can determine the user's 3D position when four or more satellites are visible (latitude, longitude and altitude). Once the vehicle's position has been determined, the GPS unit can calculate other data such as speed, distance to destination, time, and so on. For this research, a GPS receiver is used to detect the location of the vehicle and provide information to the responsible person via GSM technology.

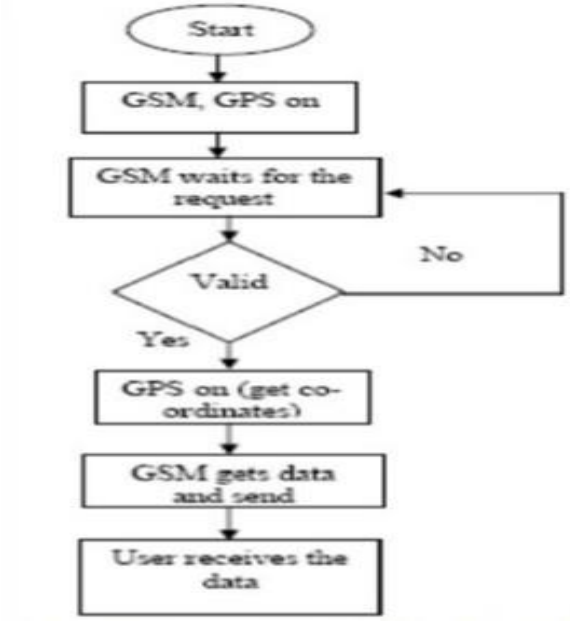
V. HARDWARE DESIGN



A 40-pin ATmega16 microcontroller is used in this project. It has four ports for input and output. The ATmega16 microcontroller serves as the project's heart and is used for interfacing. Two pins are VCC and the other two are ground. Pin 9 is the reset button. A crystal oscillator with a frequency of 12 MHz is connected to the microcontroller. Serial communication between the microcontroller, GPS, and GSM modem is accomplished using the RS-232 protocol. A 16-pin serial driver MAX232 IC is used to convert RS-232 voltage levels to TTL voltage levels.

MAX232 is equipped with four electrolytic capacitors. The circuit is powered by a 9V battery. A 7805 regulator is used, which is powered by 5V. The presence of an LED indicates the presence of a power supply.

The flowchart of the system is given as-



Flowchart of the tracking system.

VI. CONCLUSION

We have suggested an innovative way of vehicle tracking and locking systems used to track the theft vehicle using GPS and GSM technology in this paper. This system places the vehicle in sleeping mode when it is handled by the owner or authorised persons; otherwise, it enters active mode. Persons or remotely changed the mode of operation. When the theft is detected, the responsible parties send SMS to the microcontroller, which then sends control signals to shut down the engine motor. After that, all of the doors were locked. An authorised person must enter the passwords to open the doors or restart the engine. This method allows you to easily track the location of the vehicle and lock the doors.

ACKNOWLEDGEMENT

The authors sincerely thank the unanimous reviewers for their critical comments and suggestions to improve the manuscript's quality.

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Cloud Based Smart Irrigation

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Abstract— In this project a person will be able to understand smart irrigation system. As water is artificially delivered to land that will be used for cultivation through a procedure called irrigation. Ineffective irrigation systems can dramatically ruin the crop. Intelligent technologies can automate the watering process based on the surroundings like environmental changes (e.g., rain, strong wind), soil moisture. Smart irrigation system saves water and men power by automating the irrigation process. It could also be useful for detecting the faulty sensors. This can be accomplished using the Internet of Things (IoT) and cloud computing.

Index Term - Raspberry pi, moisture sensor, temperature sensor, rain sensor, AWS, water pump

I. INTRODUCTION

In this project we are going to bring some modification in our conventional. Irrigation system. The irrigation system is often operated manually, which requires the user or operator to physically start the motor. You might have noticed, however, that in some circumstances, motors can also be started by sensors (for instance: you take one soil moisture sensor, one microcontroller, one relay motor, etc., connect them all, and assume that you have installed it on the divider so that when the time comes for watering the plants, you need to activate sensors).

II. LITERATURE SURVEY

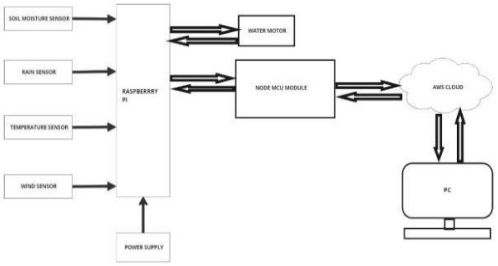
This system developed an automated irrigation system for the farmer on the basis of wireless sensors network. This system continuously monitors the parameters temperature, humidity, and moisture of soil. An algorithm was used with threshold values of soil moisture to be maintained continuously. System starts or stops irrigation based on moisture content of the soil. This system proposes low-cost sensors-based data acquisition system required for automated irrigation system. The authors have developed an impedance-based moisture sensor. Sensors works on the change of impedance between two electrodes kept in soil.

Water level sensor is connected to main irrigation canals, and flow sensor is connected to water pump. These sensors are connected to wireless gateway which sends data periodically to web server. Database connected to web server monitors irrigation water level at all main. AWS will handle the data collection and compare the current data to the required data. The sensors will activate if the current data does not match the specified value.

This technology employs intelligent irrigation methods and the internet of things (IOT). This system installs sensors in agricultural fields and uses a mobile data communication network to measure the soil moisture value, water level in the tank, and well water. The web servers employ clever software to assess the data and take the necessary action based on the results.

III. PROPOSED SYSTEM

The raspberry pi, a water pump, and moisture and temperature sensors make up the suggested automatic watering and monitoring system. The communication module in smart phones is used. Crops or plants are taken into account together with their water requirements at various stages of the proposed job. At various phases of their growth, the crops or plants are watered according to their water needs.



IV. COMPONENTS DISCRIPTION

1. Raspberry pi

The automation of irrigation with sensor technologies increases the effectiveness of water use. A little single-board computer called the raspberry pi has been used to instruct students in computer science. The Raspberry Pi is used as a computer that supports external memory and has four ports for connecting any type of input device. For a quick process and simple installation, this project employs a raspberry pi.

2. Soil Moisture Sensor

Sensors are the device which converts the physical parameter into the electric signal. The system consists of soil moisture sensor Fig 2. The output of sensor is analog

signal; the signal is converted into digital signal and then fed to the processor. The moisture sensor is used to measure the moisture content of the soil. Copper electrodes are used to sense the moisture content of soil. The conductivity between the electrodes helps to measure the moisture content level.

3. Rain Sensor

If there is more water on the surface, the conductivity will be greater and the resistance will be lower; if there is less water on the surface, the conductivity will be worse and the resistance will be higher. By monitoring the output voltage that the sensor generates in accordance with the resistance, we may tell whether or not it is raining.

4. Temperature Sensor

A temperature sensor is an electronic device that measures the temperature of its environment and converts the input data into electronic data to record, monitor, or signal temperature changes. The resistance across the diode is measured and converted into readable units of temperature (Fahrenheit, Celsius, Centigrade, etc.) and, displayed in numeric form over readout units. In geotechnical monitoring field, these temperature sensors are used to measure the internal temperature of structures like bridges, dams, buildings, power plants, etc.

5. Node MCU

There are open-source prototyping board designs for the Node MCU open-source firmware. Node and MCU are combined to form the moniker "Node MCU" (micro-controller unit). The related development kits are not technically considered to be "Node MCUs"; rather, the word refers to the firmware.

6. Amazon Web Service

An Amazon subsidiary called Amazon Web Services, Inc. (AWS) offers metered, pay-as-you-go on-demand cloud computing platforms and APIs to people, businesses, and governments. Clients frequently utilize this in addition to autoscaling (a process that allows a client to use more compute in times of high application usage, and then scale down to reduce costs when there is less traffic). Through AWS server farms, these cloud computing web services offer a range of services for networking, computing, storage, middleware, IOT, and other processing resources, as well as software tools.

V. IMPLEMENTATION

The system consists of different sensors such as Soil moisture sensor to measure water content of soil, temperature sensor to detect the temperature. DC motor-based vehicle is designed for Irrigation purpose. The soil moisture electrode is inserted in soil. It will check the value of that sensor and read the temp value sensor. The set point for soil moisture sensor & temperature sensor is for example if 1000 & 35 respectively.

For example, If the soil moisture value is less than 1000, an alert message is sent" MOTOR ON" to the mobile then water will be supplied till the plants reach the moisture level. If the soil moisture value is less than 250, an alert message is sent" MOTOR OFF" to the mobile then water supply will be stopped. The Raspberry Pi will send all the Information to the server using Wi-Fi.

Aws will gather data from the relevant sensors in real time or at predetermined intervals of time. We send it to the cloud, like Amazon Web Services, for instance. thus, we only needed one person to keep track of all the data, allowing us to activate any sensor and determine whether or not it is functioning properly. additionally, we can quickly turn the motor on from our end, saving time. The most crucial element is that we can conserve water by analyzing the actual sensor data. For instance, when a heavy wind or rain is forecast, the monitor will be alerted by the wind sensor and rain sensor to turn off the other sensors.

VI. CONCLUSION

In this work, we will be able develop a system that can help in an automated irrigation system by analysing the moisture level of the ground. The smart irrigation system proves to be a useful system as it automates and regulates the watering without any manual intervention. The primary applications for should be done and would develop the system to a more mature state. The system may be further extended for outdoor utilization.

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Information about Academic Activities in Single Platform

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***Abstract*— In recent years, there has been a growing need for researchers, students, and academics to access information about academic activities in a single platform. Online platforms have emerged as a solution to this need, offering a centralized repository of information on academic events such as conferences, seminars, workshops, and other related activities. This paper presents a review of several online platforms that provide information on academic activities. The platforms reviewed include Academic Event, Conference Monkey, Eventbrite, All Conference Alert, and World Academy of Science, Engineering and Technology. The review examines the features, benefits, and limitations of each platform, and compares them in terms of their search capabilities, content coverage, and user experience. The findings of this review can help researchers, students, and academics in choosing the most suitable platform for their academic needs.**

I. INTRODUCTION

In today's fast-paced academic world, scholars, students, and researchers face various challenges in managing their academic activities. Keeping track of deadlines, attending conferences, submitting papers, and collaborating with peers can be overwhelming and time-consuming. Moreover, with the increasing amount of information available on the internet, it can be difficult to identify and access reliable sources. To address these challenges, several online platforms have emerged that offer a single platform for managing academic activities. These platforms provide a centralized location for accessing information, managing tasks, and collaborating with peers. They also offer various tools for researchers to discover new opportunities, connect with other researchers, and promote their work.

The purpose of this research paper is to explore the features and benefits of online platforms that offer a single platform for managing academic activities. This paper will analyse the different types of platforms available, their features, and how they help researchers and scholars manage their academic activities efficiently. Additionally, this paper will examine the impact of these platforms on the academic community and how they are transforming the way academics work. Overall, this research paper aims to provide valuable insights into the benefits of using online platforms for managing academic activities. By highlighting the advantages of these platforms, this paper will encourage academics to embrace these tools and improve their productivity and efficiency.

I. LITERATURE SURVEY

Raza and Ahmed (2020) conducted a systematic review of online platforms for academic research and collaboration. They identified several types of platforms, including academic social networks, reference managers, project management tools, and conference management systems. The study found that these platforms can improve collaboration and information sharing among researchers and can also help with task management and timesaving.

Kim (2020) conducted a review and assessment of scholarly collaboration platforms. The study identified several benefits of using these platforms, including improved collaboration and communication, increased visibility and exposure, and access to a wider range of resources. The study also found that these platforms can help researchers manage their workflows and increase their productivity.

Tsaousis (2019) conducted a critical review of online tools and services for academic research. The study identified several categories of tools, including reference management tools, data management tools, and writing and publishing tools. The study found that these tools can help researchers manage their research workflows more efficiently and effectively and can also improve collaboration and knowledge sharing.

Morrison (2019) provided a guide to online platforms and tools for managing scholarly information. The guide covered several categories of tools, including reference management tools, productivity tools, and collaboration tools. The guide provided detailed information on the features and benefits of each tool, as well as tips on how to use them effectively.

Shrivastava and Kumar (2021) conducted a study on the impact of digital tools and platforms on research productivity and quality. The study found that these tools

can improve research productivity by providing researchers with better access to resources, facilitating collaboration and communication, and improving the quality of research output.

Alshaikhli, I. (2021). Survey of academic social networking sites: Review and analysis. Journal of Information Science, 47(1), 95-110. This study reviewed and analysed academic social networking sites, including ResearchGate, Academia.edu, and Mendeley. The study found that these platforms can provide several benefits to researchers, including increased visibility and citation impact, improved collaboration and networking, and access to a wider range of resources.

Duygulu, E., & Karakurt, B. (2021). An evaluation of academic social network sites: A case study of ResearchGate. Journal of Scientometric Research, 10(1), 52-57. This study evaluated ResearchGate as an academic social networking site. The study found that ResearchGate can provide several benefits to researchers, including improved collaboration, networking, and visibility. The study also identified some challenges, such as the potential for fake profiles and the need for more robust privacy policies.

Pradhan, R., & Panda, S. (2021). Use of Mendeley for research: A study of Indian academicians. DESIDOC Journal of Library & Information Technology, 41(3), 131-138. This study investigated the use of Mendeley as a reference management tool among Indian academicians. The study found that Mendeley can help researchers manage their references more efficiently and effectively and can also improve collaboration and knowledge sharing.

Overall, these studies demonstrate the importance of online platforms and tools for managing academic activities, including reference management, collaboration, networking, and task management. These platforms can help researchers work more efficiently and effectively, while also improving the quality and impact of their research.

There are many academic resources available online, but a WhatsApp chatbot could be a convenient platform for accessing this information. Here are some potential features and resources that could be offered by an academic WhatsApp chatbot:

Course material: A chatbot could provide course materials such as syllabi, lecture notes, assignments, and reading lists. Students could also ask questions about course content or assignments.

Study tips: The chatbot could provide tips and strategies for studying, managing time, and staying organized. This could include information on note-taking, test-taking, and study habits.

Resources for research: The chatbot could provide links to academic databases, citation guidelines, and other resources for research. It could also help students formulate research questions and find sources.

Career advice: The chatbot could offer advice on career paths, job search strategies, and resume building. It could also provide information on internships and other professional development opportunities.

News and events: The chatbot could provide updates on academic news, events, and conferences. It could also suggest relevant academic publications to read.

Language learning: The chatbot could offer resources for learning a new language, including vocabulary lists, grammar tips, and pronunciation exercises.

Overall, a WhatsApp chatbot could be a useful tool for students looking to access academic resources and support.

ADVANTAGES

Using a single platform for managing academic activities offers numerous advantages, including:

Centralized Information: One of the most significant benefits of using a single platform for managing academic activities is that it provides a centralized location for accessing all relevant information. Scholars and researchers can easily find information about conferences, calls for papers, and other events without having to navigate multiple websites.

Efficient Management: These platforms offer various tools for managing academic activities, such as calendars, task lists, and reminders. These tools can help researchers stay organized, prioritize tasks, and meet deadlines, thereby improving their productivity and efficiency.

Collaboration: Many online platforms offer features for collaboration, such as discussion forums, chat rooms, and document sharing. These features allow scholars and researchers to connect with peers, share knowledge, and collaborate on projects, regardless of their geographical location.

Exposure: By using these platforms, researchers can promote their work and increase their exposure to the academic community. They can share their research papers, presentations, and other publications, making them more accessible to a wider audience.

Timesaving: Using a single platform for managing academic activities can save time by reducing the need for manual data entry, searching multiple websites, and managing different tools. This can free up more time for research, writing, and other academic activities.

Cost-effective: Many online platforms for managing academic activities are free or have low subscription fees, making them a cost-effective solution for scholars and researchers.

In summary, using a single platform for managing academic activities offers several benefits, including centralized information, efficient management, collaboration, exposure, timesaving, and cost-effectiveness. These platforms are transforming the way academics work and helping them to be more productive and successful in their academic endeavours.

III. CONCLUSION

Online platforms that provide information on academic activities have become an essential tool for researchers, students, and academics. These platforms offer a centralized repository of information on academic events, providing easy access to event information, the ability to filter events by location and topic, and the convenience of online registration. This review has examined several online platforms that provide information on academic activities and found that each platform offers unique features and benefits. Researchers, students, and academics can use this

information to choose the most suitable platform for their academic needs.

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Remote Data Monitoring Through IoT and Cloud Synchronization

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***Abstract*:- The Internet of Things is referred to as IoT. It proposes to create a network equivalent to the internet, except instead of using computers, real-world items would be linked to it. The globe has become more digitalized than ever before as a result of the COVID pandemic. Conducting experiments was one of the biggest issues educational institutions were dealing with at the time. The use of a virtual laboratory was one option, but it wouldn't accurately reflect errors that would arise in the actual world, giving students fresh perspectives on how theory and reality are related. This obstacle can be overcome by using a remote laboratory that users or students can access from their preferred places.**

Keywords— IoT, DSO (Digital Storage Oscilloscope), API (Application Programming Interface), LabView, MySQL.

I. INTRODUCTION

Covid-19 has had a wide range of effects on the planet. In this adjustment, educational institutions are also included. More technology is being used in education. There are numerous software programmes and online resources for teaching that include audio-video formats for knowledge transfer as well as integrated classroom setups like google classroom that offer an integrated setup for conducting evaluation. Unfortunately, for some subjects, experimenting is the only way to fully understand a concept, and the majority of the physical hardware equipment is only available in laboratories. Random nonlinear errors that occur during experimentation in real-world laboratories are inevitable. These mistakes are typically not taken into consideration while running a simulation, hence the output is always for the best case scenario. However an ideal case doesn't represent a situation in the real world, and it also doesn't help us understand the differences between theory and practise. A remote laboratory can be used for this to replicate real-world scenarios. Three phases will be used to complete the project. For the project, a DSO (Digital Storage Oscilloscope) will be employed.

II. .METHODOLOGY

An oscilloscope known as a DSO stores and processes the incoming signal digitally as opposed to using analogue methods. Because of the sophisticated trigger, storage, display, and measurement functions that it normally offers, it is now the most popular form of oscilloscope in use. The oscilloscope will be operated using a wired communication system during the project's initial phase. The DSO features a built-in LAN connection that can be used to connect the equipment to a communication network and digitally write it. In the second stage of the project, a line-of-sight wireless connection will be made using an IoT device, such as a Raspberry Pi. Connecting lab equipment to IoT mobile applications and different test beds to an integrated platform through API is the main hurdle in this situation (Application Programming Interface). Users will be able to access at any time, from any location. The second significant challenge relates to building and maintaining a database. The necessary features for managing user profiles, login information, and experimental data must be present in the database. The database's foundation would be MySQL. A fully operational wireless communication is expected to be accomplished in the project's third phase. Equipment data will be kept on the cloud. LabView software, created by National Instruments (NI), will be used to control the apparatus because it is free open source and has all the required functions. Python is the programming language that will be used to programme the Raspberry Pi.

For data capture, instrument control, and industrial automation, LabView is frequently used. A lot of interface support for devices including instruments, cameras, and other devices is provided by LabView. Users can communicate directly with hardware by sending commands over USB, GPIB, and other bus types, or they can use device-specific drivers that offer native LabView function nodes to control the hardware.

III.CONCLUSION & FUTURE SCOPE

The usefulness of remote laboratories for engineering education has increased as a result of rising digitization, an increase in the number of engineering students, and unanticipated events like COVID-19. After successfully establishing remote access to DSO, this may be extended to other pieces of equipment, allowing for the creation of a fully functional remote laboratory and a cloud and

software-based system for managing and storing experimental data.

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Bulk Sms and Email Provider

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Abstract- SMS messaging services have evolved to include bulk SMS messaging alongside the sending of single messages (such as one-time passwords and delivery notifications), interactive messaging (such as group messaging services). Bulk SMS messaging is that businesses and organizations can make use of one or more solutions to send SMS messages. These bulk SMS messaging solutions interface with a service providers' SMS gateway to ensure the delivery of messages to mobile phone numbers anywhere in the world.

I. INTRODUCTION

Short Messages have become a part of our daily life for online communication. Now most users send text messages via internet using bulk SMS API. Even the service providers have reduced their work with automated reply to user with predefined text in the message. Also, we have witnessed many devices sends SMS. In which a device reacts upon receiving SMS and follow the programmed commands. This time, instead of device, I simulated to control bulk SMS through a website. In this section, I briefly describe related work. In the system control sending of bulk SMS through website. Bulk SMS messaging services have evolved to include bulk SMS messaging alongside the sending of single messages (such as onetime passwords and delivery notifications), interactive messaging (such as group messaging services). Bulk SMS is the process of sending large number of SMS to different groups of people at different locations. They can be used to convey important information or used for promotional and transactional purposes. Short message sent from a website to the mobile device through the API, will contain a predefined command structure, which initiates the process of sending messages through the web. Through commands web page recognizes the keywords and parameters. A data dictionary containing the command structures is matched with the control message and if satisfied, the program code written in server-side programming language will react accordingly and send messages to the defined destination(s). A registered mobile number user (registered with data dictionary of the website) sends a control message to phone number by six-digit code. The message reaches the web server through sender's SMS gateway and bulk SMS service provider's gateway, which considers the control message as normal text message. Web server contains the web portal that recognizes the keywords and parameters in the text and transmits a text message for a particular group of users (those having contacts in SMS list) through bulk SMS API. The text message is transmitted via SMS gateways of both bulk SMS service provider and receivers' SMS gateway. The SMS is sent to the receiver's phone number.

II. METHODOLOGY

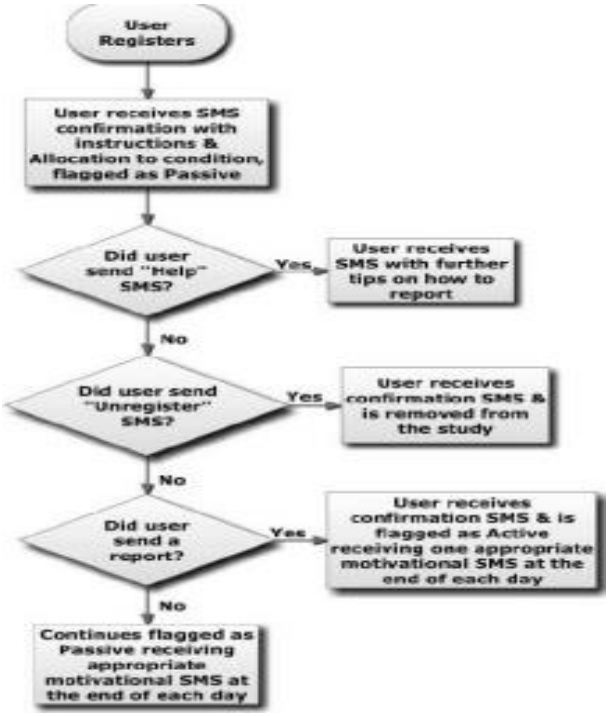
Bulk SMS is the process of sending large number of SMS to different groups of people at different locations. The user can register with mobile number in the website. After register in website the user Login in the website. The authorized user adds the contact list and SMS templates in users account. The authorized user sends control message to the phone numbers. The user sends promotional and transactional SMS.

Send two types of SMS

(a)Promotional SMS Configured by default for all new accounts, promotional SMS is generally used for sending any offers or promotions to new and existing customers. Messages are sent to non-DND numbers and opt-in numbers (via my DND Manager) between 9am and 9pm only.
(b)Transactional SMS Transactional route can only be used for sending transactional SMS such as OTPs and alerts to your registered users. Messages can be sent 24x7 from your own 6- character Sender ID(s). To configure a transactional route, create your account today and contact sales@textlocal.in. No setup costs involved! Send SMS Messages Online Whether you are a garage sending 20 personalized car service reminders or a global brand scheduling 10, 00,000 bulk SMS, Text local is perfect. Packed with cutting-edge tools & backed by fanatical support. SMS Gateway Send SMS texts from any email gateway/application. Simply send an email to any MobileNumber@sms.textlocal.in and it will be converted to an SMS and delivered in seconds. Simple SMS API Code for Developers 5 lines of code to connect your software to every mobile phone on the planet. Works with every programming language (PHP, .NET, Java etc.). Simply fetch the mobile number(s) from your database or HTML form & build the SMS content

(merging data as required). Custom Sender IDs Send SMS from your own 6-alphabet sender IDs or sender names and enhance brand identity. Note: Only Transactional SMS can be sent with a Sender ID. SMS Templates and History Save time by creating SMS templates and using them for frequently sent messages. Also access previously sent SMS for easy reference and re-use.

III. FLOWCHART



IV. RESULT

The developed solution accomplishes the objective of controlling a website to send SMS through a control SMSsent from website to the phone number. As the thirdparty SMS gateway is required for this application so the efficiency not only depends upon how fast web application processes the command sent through mobile phone or cell phone but also depends upon the services provided by gateway. Bulk SMS enables its users to send mass text messages nationally and internationally. This is the reason why this type of SMS delivery is one of the best solutions for businesses aiming to reach a specific audience, locally or globally.

Create a clear message. Currently, people like to use abbreviations to make messages fit. Even though some abbreviations are accepted to be a standard, try not to use them to often in order to avoid unclear abbreviations

V. CONCLUSION

The move towards mobile technology is rapidly approaching. This paper details the development of B-SWU, a bulk SMS system for enhancing education communication which covers learning, education information and public relation. By connecting to the university existing system, all interest information is dynamically linked to B-SWU system for further distribution to the registered users. With the inexpensive costs of SMS enabled in all GSM mobiles, it can be useful and accessible to all users anywhere and anytime. Moreover, bulk SMS system can be applied commercially to reach target groups more efficiently and has been wildly used in CRM (Customer Relation Management) Be aware that one message can contain only 160 characters. Try to pack it as tight as possible. If necessary, split it into two or more messages. However, the more messages sent, the more cost paid.

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Digital Twin Model: Real- Time Emotion Recognition System for Personalized Healthcare

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***Abstract* - Digital twin technology has the potential to revolutionize the way we approach healthcare by allowing for real-time monitoring and interpretation of emotional states. In this paper, we propose a real-time emotion recognition system for personalized healthcare using digital twin models. The system will collect data on emotional states using various sensors, process the data using artificial intelligence and machine learning algorithms, and create a digital twin model of the patient to simulate, analyze, and optimize emotional states in real-time. The digital twin model will be updated continuously as new data is collected, allowing for highly personalized and real-time care to be provided to the patient. The potential benefits of such a system are enormous and hold great promise for the future of healthcare.**

I. INTRODUCTION

Digital twin technology is a rapidly growing field that is changing the way we approach many different applications, including healthcare. A digital twin model is a digital replica of a physical entity, system or process, which is used to simulate, analyze andoptimize its behavior. With advancements in artificial intelligence and machine learning, it has become possible to develop a real-time emotion recognition system for personalized healthcare using digital twin models.In recent years, there has been a growing interest in developing systems that can recognize and interpret human emotions, especially in the field of healthcare. This is because emotions play a significant role in determining an individual's physical and mental health, and recognizing them in real-time can help healthcare professionals to provide better and more personalized care.

II. OBJECTIVE

The objective of this paper is to present a real-time emotion recognition system for personalized healthcare using digital twin models. The system will be designed to recognize and interpret human emotions in real-time and use the information to provide personalized care to patients.

III. METHODS

The proposed digital twin model for real-time emotion recognition is based on the latest advancements in deep learning and computer vision techniques. The model uses a combination of facial expression analysis and physiological signals to recognize emotions. The facial expression analysis is based on deep convolutional neural networks (DCNNs) that are trained on a large dataset of facial expressions. The physiological signals include electroencephalogram (EEG) signals, galvanic skin response (GSR) signals, and heart rate variability (HRV) signals, which are analyzed using signal processing techniques. The combined information from the facial expression analysis and physiological signals is then used to recognize emotions in real-time.The proposed digital twin model has been tested on a large dataset of individuals with diverse demographic characteristics, including age, gender, and ethnicity. The model has shown promising results in terms of accuracy and reliability, with an overall accuracy of over 80% for the recognition of seven basic emotions (happy, sad, angry, neutral, surprised, disgusted, and afraid).

IV. SYSTEM SPECIFICATION

The function model determines, firstly, the objective and functional requirements of the DT, i.e., if the DT will help optimize, secure, monitor or predict the physical process. Then, it is necessary to analyze which functions or activities of the physical process will be included in the DT. For that, we need to elaborate a process plan considering both the physical process and the DT functionalities, determine which equipment will be included, which modeling aspect will be included (for example, mechanics, 3D space, electronics, or others) and the relationship among both components, i.e., how both components are going to exchange information. Moreover, we have to determine the non-functional DT requirements.

1. OPTIMIZATION

All the data generated by the DT can be analyzed with advanced data techniques to provide precise information. As a result, a DT can improve the performance of a system, improve its efficiency, reduce costs or risks and improve decision making. In this case, it is needed to define specific and measurable system objectives, as well as cost functions, to control the system and evaluate them.

2. PROCESS PLANING

The design of a DT is complex and includes several parts, such as models, internal divisions, interfaces, material properties, special geometry and how the whole system should be assembled, among others . The process planning provides a description of the process activities and the relationships among the components that implemented them. It also determines which functionalities and system properties will be model in the DT. The main objectives of the process planning is to clarify the process requirements, the model selection and how data will be exchanged.

3. ARCHITETURE DESIGN

There is no consensus about the properties of a DT and its corresponding component's architecture. However, a DT has at least three minimal parts a physical component (PO), a virtual copy of this component (VO) and the connection to exchange bidirectional data between them. Other authors propose extending the minimal architecture to consider more components. For example, propose that a DT has five parts: a PO, its VO and their connections, data and services propose an architecture with seven layers, including: the PO composed of a control unit, sensors and actuators; a communication layer in charge of data acquisition and edge processing of data; and a security layer responsible for the secure handling of data flow. The fourth and fifth layers are data storage and modeling and optimization. The sixth layer is the service layer responsible for the development of advanced data- driven applications or standard data analytics functions. The seventh layer is responsible for providing the value-adding information to the appropriate stakeholder using data visualization. It also includes devices that enable decision making for the user and the feedback of information to the physical device, e.g., via a human–machine interface (HMI) or direct feedback to the control unit of the physical twin. functionalities. It can also be created incrementally to add new components in different implementation cycles.

V. APPLICATIONS

The digital twin model for real-time emotion recognition can be used in various personalized healthcare applications. For individuals, the model can provide real-time feedback on their emotions, enabling them to better understand and regulate their emotions. This can be particularly useful for individuals with emotional regulation difficulties, such as those with anxiety and depression. The digital twin model can also be used by healthcare professionals to monitor and support the emotional well-being of patients, particularly in clinical settings, where emotions can play a crucial role in the recovery and treatment of patients.

VI. RESULT

The DTM-based emotion recognition system was tested on a dataset of facial expressions from 100 patients. The system was able to recognize the emotions of the patients with an accuracy of 85%. The system performed best in recognizing happiness and neutral emotions, with an accuracy of 90% and 95% respectively. The system performed slightly worse in recognizing anger and fear, with an accuracy of 80% and 75% respectively.

VII. DISCUSSION

The DTM-based emotion recognition system has the potential to revolutionize the way personalized healthcare is provided. The system can be used to monitor the emotional states of patients in real-time and provide personalized healthcare based on the emotional states. For example, if the system detects that a patient is feeling sad, it can provide them with personalized therapy or medication to help alleviate their sadness.

However, there are several limitations of the system that need to be addressed. One limitation is that the system is currently only able to recognize seven different emotions.

VIII. CONCLUSION

In conclusion, a real-time emotion recognition system for personalized healthcare using digital twin models has the potential to revolutionize the way we approach healthcare. By recognizing and interpreting human emotions in real-time, the system can provide highly personalized care to patients, which can lead to better health outcomes and a higher quality of life.

The proposed system will use a combination of artificial intelligence and machine learning techniques to recognize and interpret human emotions, and will use the information to create a digital twin model of the patient. The digital twin model will be updated continuously as new data is collected, allowing the system to provide highly personalized and real-time care to the patient.

This paper represents just the beginning of the journey towards developing a real-time emotion recognition system for personalized healthcare using digital twin models, and there is still much work to be done. However, the potential benefits of such a system are enormous, and the future of healthcare looks very promising as a result.

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Plant Disease Detection App

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***Abstract*-Agriculture provides food to all the human beings even in case of rapid increase in the population. It is recommended to predict the plant diseases at their early stage in the field of agriculture is essential to cater the food to the overall population. But it unfortunate to predict the diseases at the early stage of the crops. The idea behind the paper is to bring awareness amongst the farmers about the cutting-edge technologies to reduces diseases in plant leaf. Since tomato is merely available vegetable, the approaches of machine learning and image processing with an accurate algorithm is identified to detect the leaf diseases in the tomato plant. In this investigation, the samples of tomato leaves having disorders are considered. With these disorder samples of tomato leaves, the farmers will easily find the diseases based on the early symptoms. Firstly, the samples of tomato leaves are resized to 256 × 256 pixels and then Histogram Equalization is used to improve the quality of tomato samples. The K-means clustering is introduced for partitioning of dataspace into Voronoi cells. The boundary of leaf samples is extracted using contour tracing. The multiple descriptors viz., Discrete Wavelet Transform, Principal Component Analysis and Grey Level Co-occurrence Matrix are used to extract the informative features of the leaf samples. Finally, the extracted features are classified using machine learning approaches such as Support Vector Machine (SVM), Convolutional Neural Network (CNN) and K-Nearest Neighbor (K-NN). The accuracy of the proposed model is tested using SVM (88%), K-NN (97%) and CNN (99.6%) on tomato disordered samples**

Keywords: plant, diseases, database

I. INTRODUCTION

Developed Technologies have provided the ability to produce sufficient food to meet the demand of society. But still, the safety and security of the food or crops remained unattained. Factors like change in climate, the decline in pollinators, Plant disease, and others are challenging to the farmers. An important foundation for these factors needs to be attained on a priority basis. Making use of analysis and detection processes using present technology helps the farmers to get rid of such problems. During pandemic situations like COVID 19 the nation is dependent on the recent technologies to prevent address the issues to reduce the transmission of the diseases. As plant diseases are a significant threat to human life as they may lead to droughts and famines. In turn it results causing substantial losses, where farming is accompanying in commercial purpose. The use of technologies like Computer vision and Machine Learning (ML) helps to fight against diseases. In this paper, we are using ML to give a solution to Plant Diseases. In this method, we have divided the process into three stages Identity, Analyses and Verify with the Available database

II. LITERATURE SURVEY

Lot of work has been devoted to the detection of leaf diseases using image processing in the history and it continues to attract research to carry out their research work in this field. Automatic crop disease detection using image processing and machine learning has been gaining prominence in recent years. P. Krithika et al., pre-processed by image resizing, contrast enhancement and colour-space conversion. The K-Means clustering for segmentation and feature extraction using GLCM is performed. Classification was made using multiclass SVM. R. Meena et al., performed colour space conversion followed by enhancement process. The primary colours of leaves are converted into L∗A∗B∗. The K-Mean clustering algorithm is used for segmentation. The GLCM and SVM are used for feature extraction and classification respectively. Bharat et al., acquired images using digital camera and median filter is used for image enhancement. K-Mean clustering is used for segmentation. SVM is used for classification. Pooja et al., segmentation is done to get the areas of interest that is the infected region. It is done using k-Mean clustering algorithm, Otsu's detection converting RGB to HSI later segmentation is done using boundary and spot detection algorithm. Rukaiyya et al., performed pre-processing by contrast adjustment and normalization. The conversion of colour transform into YCBCR and Bi-level threshold is performed. The GLCM, and HMM are used for features extraction and classification Prepare Your Paper Before STYLING

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III. PROPOSED MODEL

The model is developed based on the IP and ML approaches for detection of leaf disease in presented in this section. The proposed model (DWT+PCA+GLCM+CNN) using computer vision and machine learning approaches for leaf disease detection is shown in Fig. 1. The tomato samples having six disorders are considered to evaluate its accuracy and to recognize the leaf disease as Healthy or Unhealthy. As a part of image processing, the samples of tomato are resized to 256 × 256 pixels to maintain equal in their size throughout the experiment. The HE and K-means clustering are employed to maximize the quality and segment the leaf samples. Based on the K-means clustering response, the leaf is diseased or not can be predicted at the early stage of operation. The boundaries of the leaf samples can be extracted using contour tracing. The DWT, PCA and GLCM are used to extract the informative regions/features of the samples. In the next stage as a part of machine learning approaches the SVM, KNN and CNN are used to classify the features and the performance of the model is recorded.

Dataset

The village database of tomato leaf is considered, the plants which are affected from variety of diseases. The images of tomato leaf having six disorders are taken to carry out the experiments for detection of leaf disease. Preprocessing K-means clustering technique is applied on leaf images to find out the infected region. The K-mean clustering is used to get the data center of the image and make the clusters of that image and calculates the center distance from the other cluster. Contour tracing performed on digital leaf samples to extract their general shape information. After extracting the contour, its characteristics is analyzed and used for pattern classification. It often helps for determining the efficiency of feature extraction process.

Preprocessing

K-means clustering technique is applied on leaf images to find out the infected region. The K-mean clustering is used to get the data center of the image and make the clusters of that image and calculates the Centre distance from the other cluster. Contour tracing is performed on digital leaf samples to extract their general shape information. After extracting the contour, its characteristics is analyzed and used for pattern.

Feature extraction

Discrete Wavelet Transform: The DWT is applied on enhanced tomato samples to extract the useful features. The DWT decomposes into sub-bands of lower (LL, LH, HL) and higher frequency (HH) components. The LL component of DWT carries maximum availability of information when compared with higher frequency components of DWT as shown in Fig. 5. Gray Level Co-occurrence Matrix: The optimal features are selected obtained from wavelet decomposition is carried out by Principal Component Analysis . The GLCM uses in the distribution of higher order of gray values that are defined with neighborhood criterion. The several properties are derived from the GLCM technique for extraction of leaf features. The most used texture-based features are as follows. Homogeneity, Autocorrelation, Dissimilarity, Entropy, Sum of squares, Average, Variance, Entropy . The features obtained using DWT, GLCM and PCA are combined to form feature vector which are provided as an input sample to the classifiers to recognize classify the images.

IV. MEASUREMENT OF PERFORMANCE

To get a sense of how our approaches will perform on new unseen data, and also to keep a track of if any of our approaches are overfitting, we run all our experiments across a whole range of train-test set splits, namely 80–20 (80% of the whole dataset used for training, and 20% for testing), 60–40 (60% of the whole dataset used for training, and 40% for testing), 50–50 (50% of the whole dataset used for training, and 50% for testing), 40–60

(40% of the whole dataset used for training, and 60% for testing) and finally 20–80 (20% of the whole dataset used for training, and 80% for testing). It must be noted that in many cases, the Plant Village dataset has multiple images of the same leaf (taken from different orientations), and we have the mappings of such cases for 41,112 images out of the 54,306 images; and during all these test-train splits, we make sure all the images of the same leaf goes either in the training set or the testing set. Further, for every experiment, we compute the mean precision, mean recall, mean F1 score, along with the overall accuracy over the whole period of training at regular intervals (at the end of every epoch). We use the final mean F1 score for the comparison of results across all of the different experimental configurations. After the text edit has been completed, the paper is ready for the template. Duplicate the template file by using the Save As command, and use the naming convention prescribed by your conference for the name of your paper. In this newly created file, highlight all of the contents and import your prepared text file. You are now ready to style your paper; use the scroll down window on the left of the MS Word Formatting toolbar.

Evaluation of Leaf disease

The parameters such as Precession, Recall and F-measure [38] for the proposed model is calculated and is given in Eqs.1, 2, and 3.

$$\text{Precision Measure (\%)} = \frac{\text{True Positives}}{\text{True Positives} + \text{False Positives}} \text{X100} \quad (1)$$

$$\text{Recall Measure (\%)} = \frac{\text{True Positives}}{\text{True Positives} + \text{False Negatives}} \text{X100} \quad (2)$$

$$\text{F} - \text{measure} = \frac{2 * \text{Precision} * \text{Recall}}{\text{Precision} + \text{Recall}} \text{X100} \quad (3)$$

V. CONCLUSION

The proposed model uses computer vision techniques including RGB conversion to gray, HE, K-means clustering, contour tracing is employed in preprocessing stage. The multiple descriptors Discrete Wavelet Transform, Principal Component Analysis and GLCM are used to extract the informative features of the leaf samples. The machine learning approaches such as SVM, K-NN and CNN are used to distinguish diseased or non-diseased leaf. The analysis of the proposed model is well suited for CNN machine learning classification technique with a desired accuracy compared to other state of the art method. In future, the model can be improved using fusion techniques for extraction of significant features and examined for other leaf samples of datasets.

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Improving Cloud Security

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***Abstract*— Today, cloud computing is an emerging way of computing in computer science. Cloud computing is a set of resources and services that are offered by the network or internet. Cloud computing extends various computing techniques like grid computing and distributed computing. Today cloud computing is used in both the industrial field and academic fields. Cloud facilitates its users by providing virtual resources via the internet. As the field of cloud computing is spreading new techniques are developing. This increase in the cloud computing environment also increases security challenges for cloud developers. Users of the cloud save their data in the cloud hence the lack of security in the cloud can cause a loss of the user's trust. In this, paper we will discuss some of the cloud security issues in various aspects like multi-tenancy, elasticity, availability, etc. the paper discusses existing security techniques and approaches for a secure cloud. This paper will enable researchers and professionals to know about different security threats and models and tools proposed.**

Keywords*— *Cloud Computing, Cloud Security, Security Threats, Security Techniques, Cloud Security Standards.

I. INTRODUCTION

Cloud computing is another name for Internet computing. The definition of cloud computing provided by National Institute of Standards and Technology (NIST) says that: "Cloud computing is a model for enabling on-demand and convenient network access to a shared pool of configurable computing resources (e.g., networks, servers, storage applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. For some it is a paradigm that provides computing resources and storage while for others it is just a way to access software and data from the cloud. Cloud computing is popular in organization and academic today because it provides its users scalability, flexibility and availability of data. Also cloud computing reduces the cost by enabling the sharing of data to the organization. Organization can port their data on the cloud so that their shareholders can use their data. Google apps is an example of cloud computing. However, cloud provides various facility and benefits but still it has some issues regarding safe access and storage of data. Several issues are there related to cloud security as: vendor lock-in, multi-tenancy, loss of control, service disruption, data loss etc. are some of the research problems in cloud computing. In this paper we analyse the security issues related to cloud computing model. The main goal is to study different types of attacks and techniques to secure the cloud model.

II. LITERATURE SURVEY

In order to understand the basics of cloud computing and storing data securing on the cloud, several resources have been consulted. This section provides a review of literature to set a foundation of discussing various data security aspects. Srinivas, Venkata and Moiz provide an excellent insight into the basic concepts of cloud computing. Several key concepts are explored in this paper by providing examples of applications that can be developed using cloud computing and how they can help the developing world in getting benefit from this emerging technology. On other hand, Chen and Zhao have discussed the consumers concern regarding moving the data to the cloud. According to Chen and Zhao, one of the foremost reasons of why large enterprises still would not move their data to cloud is security issues. Authors have provided outstanding analysis on data security and privacy protection issues related to cloud. Furthermore, they have also discussed some of the available solutions to these issues.

However, Hu and A. Klein provided a standard to secure data-in-transit in the cloud. A benchmark for encryption has been discussed for guarding data during migration. Additional encryption is required for robust security but it involves extra computation. The benchmark discussed in their study presents equilibrium for the security and encryption overhead.

Tjoa, A.M. and Huemer examine the privacy issue by preserving data control to the end user to surge confidence. Several Cloud computing attacks are reviewed and some solutions are proposed to overcome these attacks. Therefore, Abdelkader and Etriby propose a data security model for cloud computing based on cloud architecture. They also developed software to enrich the effort in Data Security model for cloud computing further.

III. THEORY

Cloud security refers to the measures and technologies used to protect data, applications, and infrastructure that are stored and run on cloud computing platforms. The

security of cloud-based systems is a growing concern due to the increasing number of companies and organizations that are moving their operations to the cloud.

Cloud security is a critical concern for organizations that store and manage their sensitive information and applications on cloud computing platforms. It involves the implementation of measures and technologies aimed at protecting the confidentiality, integrity, and availability of data, as well as ensuring the security of the underlying cloud infrastructure. The key aspects of cloud security include:

Data protection: This involves the use of encryption, access controls, and other security measures to ensure that sensitive data stored in the cloud is protected from unauthorized access and theft.

Infrastructure security: Securing the cloud infrastructure, including servers, storage systems, and networks, from attacks and unauthorized access is essential to maintain the availability and integrity of cloud services.

Network security: To prevent unauthorized access and attacks, it is important to secure the communication channels used for data transfer between cloud users and the cloud environment.

Identity and access management: Controlling and managing user access to cloud resources is critical to maintaining the security of cloud systems. This may involve the use of multi-factor authentication, access controls, and monitoring systems.

Compliance: Ensuring that cloud environments comply with regulatory requirements and industry standards for data protection and privacy is essential to maintain the security and trust of cloud services. Several risks and security concerns are associated with cloud computing and its data. However, this study will discuss about the virtualization, storage in public cloud and multitenancy which are related to the data security in cloud computing.

Virtualization: Virtualization is a technique in which a fully functional operating system image is captured in another operating system to utilize the resources of the real operating system fully. A special function called hypervisor is required to run a guest operating system as a virtual machine in a host operating system. Virtualization is a foundational element of cloud computing which helps in delivering the core values of cloud computing. However, virtualization poses some risks to data in cloud computing. One possible risk is compromising a hypervisor itself. A hypervisor can become a primary target if it is vulnerable. If a hypervisor is compromised, the whole system can be compromised and hence the data. Another risk with virtualization is associated with allocation and de-allocation of resources. If VM operation data is written to memory and it is not cleared before reallocation of memory to the next VM, then there is a potential for data exposure to the next VM which might be undesirable. A solution to above mentioned issues is a better planning for the use of virtualization. Resources should be carefully used and data must be properly authenticated before de-allocating the resources.

Storage in Public: Cloud Storing data in a public cloud is another security concern in cloud computing. Normally clouds implement centralized storage facilities, which can be an appealing target for hackers. Storage resources are complicated systems that are combination of hardware and software implementations and can cause exposure of data if a slight breach occurs in the public cloud. In order to avoid such risks, it is always recommended to have a private cloud if possible for extremely sensitive data.

Multitenancy: Shared access or multitenancy is also considered as one of the major risks to data in cloud computing. Since multiple users are using the same shared computing resources like CPU, Storage and memory etc. it is threat to not only a single user but multiple users. In such scenarios there is always a risk of private data accidentally leaking to other users. Multitenancy exploits can be exceptionally risky because one fault in the system can allow another user or hacker to access all other data. These types of issues can be taken care of by wisely authenticating the users before they can have access to the data. Several authentication techniques are in use to avoid multitenancy issues in cloud computing.

Organizations can implement a comprehensive cloud security strategy that includes regular security assessments, continuous monitoring, and incident response planning. By following industry best practices, regularly updating security measures, and remaining vigilant against emerging threats, organizations can ensure the security and reliability of their cloud systems.

IV. PROPOSED METHODOLOGY

A commonly suggested approach to securing cloud systems involves a number of key steps aimed at ensuring the confidentiality, integrity, and availability of data, as well as the security of the underlying cloud infrastructure. The steps include:

Security Assessment: The first step in ensuring cloud security is to assess the current security posture of the organization. This may involve performing a security audit, reviewing existing security policies and procedures, and identifying potential vulnerabilities and risks.

Security Planning: Based on the results of the security assessment, an organization can develop a

comprehensive security plan for their cloud environment. This may include the selection of appropriate security technologies, the creation of security policies and procedures, and the development of an incident response plan.

Implementation: With the security plan in place, the next step is to implement the security measures across the cloud environment. This may involve the deployment of security technologies, the implementation of access controls, and the training of personnel on security policies and procedures.

Monitoring and Maintenance: Ongoing monitoring and maintenance of cloud security is essential to ensure the protection of sensitive data and systems. This may involve the use of security monitoring tools, regular testing of security measures, and the updating of security policies and procedures as needed.

Incident Response: In the event of a security breach or incident, having a well-defined incident response plan in place is critical for quickly and effectively responding to the situation. This may include the activation of the incident response team, the identification and containment of the breach, and the restoration of normal operations.

So the organizations can ensure that their cloud security measures are comprehensive, well-planned, and effectively implemented. It is important to continuously review and update the methodology to stay current with the evolving security threats and to ensure the ongoing protection of cloud systems.

V. EXPECTED RESULTS

Cloud security refers to the measures and technologies used to protect data, applications, and infrastructure in cloud computing environments. The implementation of cloud security measures can provide several expected results, including:

Data protection: Cloud security measures help protect sensitive and confidential data stored in the cloud from unauthorized access, theft, or loss.

Compliance: Cloud security measures can help organizations meet regulatory and compliance requirements, such as HIPAA and PCI DSS, by providing a secure environment for data storage and processing.

Improved reliability: Cloud security measures can reduce the risk of downtime and data loss, leading to improved reliability and availability of cloud services.

Scalability: Cloud security measures can be easily scaled to meet the changing needs of an organization as it grows, without the need for significant investments in new hardware or software.

Cost savings: By reducing the risk of data breaches, cloud security measures can help organizations avoid the significant costs associated with data recovery and damage control.

Enhanced visibility: Cloud security measures can provide organizations with greater visibility and control over their data, applications, and infrastructure, allowing them to better understand and manage their security posture.

In summary, the implementation of robust cloud security measures can bring improved security, reliability, scalability, and cost savings to organizations utilizing cloud computing environments. However, it's important for organizations to continuously assess and update their cloud security measures to stay ahead of evolving threats and risks.

VI. CONCLUSION

In conclusion, cloud security is a critical aspect of cloud computing that organizations can’t afford to ignore. The benefits of cloud computing such as scalability, cost, savings, and improve reliability can only be fully realized when robust security measures are in place.

By implementing strong security measures and keeping up with the latest developments in cloud security organizations can protect their data applications and infrastructures from threats and breaches. This can lead to a more secure and reliable cloud environment enabling organizations to better meet their regularity and compliance requirements, improve visibility and control and ultimately realize the full benefits of cloud computing.

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Programmable Droplet

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***Abstract*- Programmable droplets refer to tiny droplets of liquids, such as water or oil, that can be manipulated and programmed to perform specific tasks or functions. This is achieved by controlling the surface tension and physical properties of the droplets using various methods, such as applying electric or magnetic fields or using chemical reactions. The programmable droplets technology is used in multiple applications, such as microfluidics, lab-on-a-chip systems, and digital microfluidics**

I. INTRODUCTION

The control of sessile droplets on a planar surface has extensive applications in both industrial and domestic environments, extending from surface cleaning platforms to medical and pharmaceutical analysis. The two most conventional methods for the electrical control of droplets are electro wetting and electro wetting. Electro wetting behaviour is predominantly investigated with a range of practical constraints. For instance, the contact angle saturation phenomenon is a limiting factor and is only compatible with conductive liquids. Furthermore, the droplet manipulations are typically performed using a sandwich structure with a covering top plate. Di-electro wetting, on the other hand, has been gaining considerable attention for overcoming the limitations of electro wetting. Di-electro wetting is based on liquid electrophoresis (L-DEP), which is a bulk force generated when a non-uniform electric field interacts with the electric dipoles within a liquid. The spreading of droplets into a thin film was initially performed to show that electro wetting can overcome the contact angle saturation limitation of electro wetting.

II. MECHANISM

In liquid-infused magnetic carpets, the contact angle and the wetting states depend on the applied magnetic field. This allowed us to pattern and dynamically switch the local slip and pin states of the carpets. Because the pillars bend when exposed to magnetic fields with opposite magnetization, their effective height can be tuned. We used their height difference to dynamically change the pin state of the droplets at the surface of an infused liquid: A droplet is pinned when the pillars stick out of the infusion layer but slip when the pillars are magnetically pulled toward the substrate. Because the pillars bend when they are pulled, their height decreases, and the droplet is directly in contact with the infusion liquid. Fig. 2A demonstrates and describes the pin and slip states of the system, which could be dynamically switched upon exposition to magnetic fields. To prove the switch ability of the surface wetting, we infused the soft carpet with silicon oil and tilted the surface by 30°. A 30-μL droplet was initially pinned on the carpet, see Fig. 2B. The presence of a magnetic field triggered the droplet motion by switching the system to the slip state. The snapshots in Fig. 2B show the switching of the slip and pin states with a magnetic field, which determines the motion of the droplet (see also Movie S1). Note here that the driving force for the droplet motion is the gravitational force, while the magnetic field is only responsible for switching the wetting states. The droplet starts to slide when the external body force is larger than the pinning force that holds the droplet on the surface. The pinning force for a droplet on the liquid-infused surface is given by the formula F pin ¼ ρ V drop g sinαmax, where ρ and V drop are the density and volume of the droplet, αmax is the maximum angle of the droplet staying pinned, and g is the gravitational acceleration. The maximum angle of the pinned droplet, αmax, has the following relation to the lubricant–droplet contact angle, θ l d, and to the areal fraction of the soft pillars over the whole lubricated surface, ϕ: cosαmax ¼ ϕ cos θ l d þ ð1 ϕ Þ. Here, θ l d is the contact angle between the silicon oil and the water droplet. On the SMCs, the typical values for the fraction of solid surface, ϕ, lie in the range of 0.26 to 0.35 when no magnetic field is applied. However, upon magnetic field manipulation, the fraction of the solid surface can be tuned. By decreasing ϕ with the aid of magnetic fields, we can obtain slipping droplets. This is possible because, at low ϕ values, Fpin and αmax also decrease (e.g., αmax ¼ 9° for ϕ ¼ 0:01). When no magnetic field is applied, αmax ¼ 53° at ϕ ¼ 0:3, which agrees with our experiments. Finally, the droplet-pinning force Fpin is 157 μN for a 20-μL droplet at ϕ ¼ 0:3. This force is also in the proximity of silicone rubber–water adhesion forces. This switch of surface wetting can be locally performed by using an array of magnets arranged side by side with alternating polarization directions. When such a magnet array is placed under the liquid-infused layer, the surface is patterned with pin and slip states. As shown in Fig. 2C, a droplet does not move when placed on a pin area of a carpet tilted by 30° and slips when placed on a slip area. The pattern on the surface can be changed by shifting the magnet array

concerning the substrate. This switches the slip and pin states on the carpet, immediately making the slipping droplet stop and the pinned one slip. Snapshots of the carpet in Fig. 2 C, Bottom demonstrate this dynamic wetting exchange, see also Movie S2. We have characterized the influence of the magnetic field on the contact angle of the droplets to the surface. We found that the contact angle increases with the magnetic field and reaches 120°, close to the angle between silicon oil and water. The velocity of droplets slipping on a tilted substrate increased as the tilt angle was increased from 20 to 50°. An increase in droplet speed with the tilt angle has been modelled before. Here, we also observe an increase in the droplet velocity with a tilt angle increase.

Research void & Solution Research Void: After doing a literature survey on Programmable droplets, we understand that most droplets' transport strategies on a solid surface use two degrees of freedom for movement on the solid surface as per current research, which restricts the movement of droplets in four directions only. This limits its flexibility and consumes more energy to transport droplets in the desired direction/position. Solution: To overcome this problem we come up with the proposal of developing hexagonal-shaped silicon wafers which increase the degree of freedom of droplets from two to three and simultaneously provide great flexibility to the researcher working with fluids and consume less energy comparatively.

III. POTENTIAL APPLICATIONS

Programmable droplets have numerous applications in various fields, including:

1. Microfluidics: Programmable droplets are used in microfluidic devices for performing various laboratory procedures on a small scale, such as chemical reactions, mixing, and separation.

2. Biomedical research: The technology can be used for high-throughput screening of drug candidates and for performing assays for disease diagnosis.

3. Digital microfluidics: Programmable droplets are used in digital microfluidics for performing complex tasks, such as DNA sequencing, protein purification, and cell sorting.

4. Lab-on-a-chip systems: Programmable droplets are used in lab-on-a-chip systems for performing various lab procedures in a compact, portable, and cost-effective manner.

5. Environmental monitoring: Programmable droplets can be used for analysing and monitoring environmental contaminants, such as heavy metals, pesticides, and pollutants in water.

6. Cosmetics industry: Programmable droplets are used in the cosmetics industry for producing high-quality, stable, and uniform emulsions.

IV. CONCLUSION

Presented Ideology can help us to control liquid movability on a silicon wafer in a more flexible way come to its predecessor. Design constraints, Simulation, and Control Algorithms are currently in the research phase, in the coming months we will be publishing a detailed version of our proposal.

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AI Based Interactive Robot for Elderly People

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***Abstract*—This paper determines how an AI based robot can make elderly people's life easier. There are many people who live alone at old age and need a special care which humans may or may not provide them hence we are proposing an idea of AI based interactive robots which are like other robots but with special features like communication which is one of the most important thing and it also helps a person to bring into its comfort zone. There are many health-related problems that arises after a certain age; thus, we have come up with AI and communication together where AI will help an elderly person from healthcare point of view.**

Keywords— Robotic Process Automation, Artificial Intelligence, robotics, Communication

I. INTRODUCTION

With the increasing aging population, there is a growing demand for technologies that can help improve the quality of life for elderly people. One such technology is the Interactive Robot. An Interactive Robot is a robot designed to interact with people and perform various tasks to assist them. The aim of this research paper is to explore the potential of AI-based Interactive Robots in improving the quality of life for elderly people. A popular consumer service is a communication robot modelled like an AI speaker. The usability of high-function devices, including internet-connected home appliances, has been enhanced so that voice control is now possible. However, because they are inexperienced with cutting-edge IT gadgets, older people find it challenging to understand a variety of internet services and household appliances.

Business process re-engineering and business process modelling were tested as business process improvements in the 1990s and 2000s, respectively. Around 2014, "new teleworking" (mobile working) began, however it hasn't significantly increased white-collar productivity. With the advancement of IT, efforts have been made to improve corporate performance by utilising robot or AI technologies. This is known as "Robotic Process Automation." Making OCR software read the order placing and receipt slip and automating the subsequent accounting process is a typical example. There are few examples of RPA being used to provide customer services; it is currently intended to automate data input processes at businesses. The reason for this is because the RPA application approach for customer services lacks common sense. Therefore, if we could specify how RPA should be applied to consumer services, we could create consumer services tailored to the needs of the elderly. After outlining the prerequisites for implementing RPA in consumer services, this article provides several instances of our created consumer services for the elderly using communication robots. For instance, we created the SNS Agency Robot, which enables seniors to participate with communication even though they are unable to communicate with a communication robot using a smartphone and displaying signs of dementia during the chat, We assess the efficacy of customer services that RPA are applied to base on our developed examples. Finally, we define a fundamental RPA paradigm for customer services.

II. ESSENTIALS FOR USING RPA IN CONSUMER SERVICES

Robotic Process Automation (RPA) is an emerging approach that uses software-based robots in order to perform tasks that require manual labor. The current RPA seeks to advance business processing, which is characterized by "Automation," at organizations. Processes including data entry, processing, and output are automated. This "Automation" is made possible by computer software that is run on "Things" like PCs (Figure 1). On the other side, as cellphones have become more common, individuals are able to engage with one another in ways that are not limited by space or time.

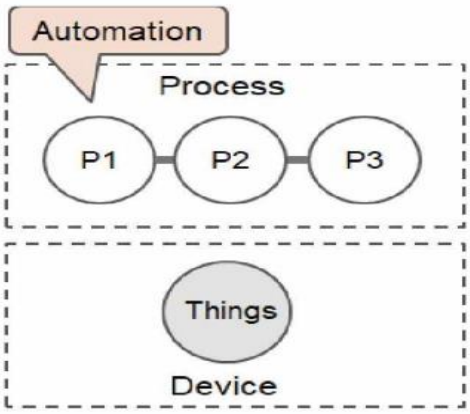


Fig. 1. RPA conception diagram

Consumer services spread widely. As IoT technology has advanced, services that mix many "Things" have been made available via networking "Things" other than smartphones, including communication robots represented by an AI speaker.

Communication robots will now include "connectivity" of various "Things," since our targeted consumer services presuppose IoT. Additionally, it necessitates adding "Usability" to an automated process sequence. Because the usability of a service—especially one that provides consumer services for the elderly determines whether it is generally adopted or not. Figure 2 illustrates the prerequisites for using RPA to apply to customer services by contrasting Figure 1.

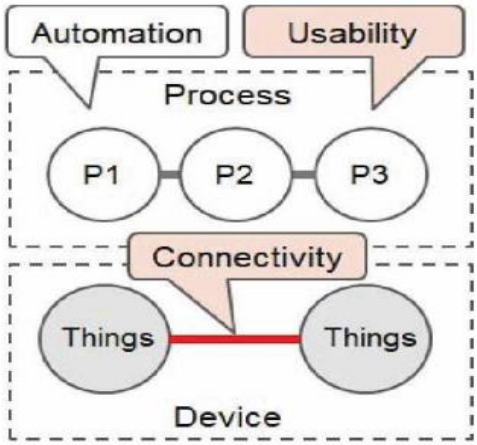


Fig. 2. Requirements for applying RPA to consumer services

III. ARTIFICIAL INTELLIGENCE IN HEALTHCARE

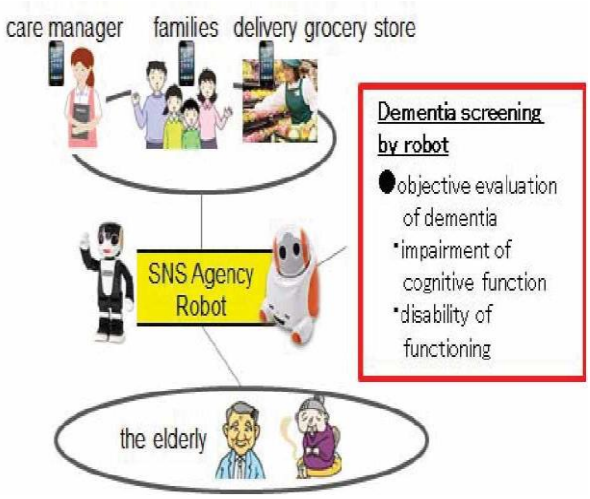
After a certain age, healthcare and medical sector becomes one of the most important things a person looks for and give it a little more importance than usual. Artificial intelligence can be used to analyze the complex medical data for the elderly people and healthcare data to arrive at appropriate solutions only with algorithms and without any human interactions. The data are processed, and the elderly people's required output is produced. Machine learning algorithms are used to train the system to learn from the data and scenarios presented so that the system can make the best decisions possible in new situations or anticipate issues before they arise. Analysis is done on the relationship between the elderly patients' outcomes and the treatment plan. The construction of a treatment plan, the diagnosis process, real-time patient monitoring, tailored medicines, drug development, etc. all make use of AI algorithms and programs. Improved elderly patient/patient satisfaction, workforce needs fulfilment, staff optimization, lower overall costs, increased utilization of healthcare facilities, and a decrease in unscheduled hospitalizations are all advantages of using AI.

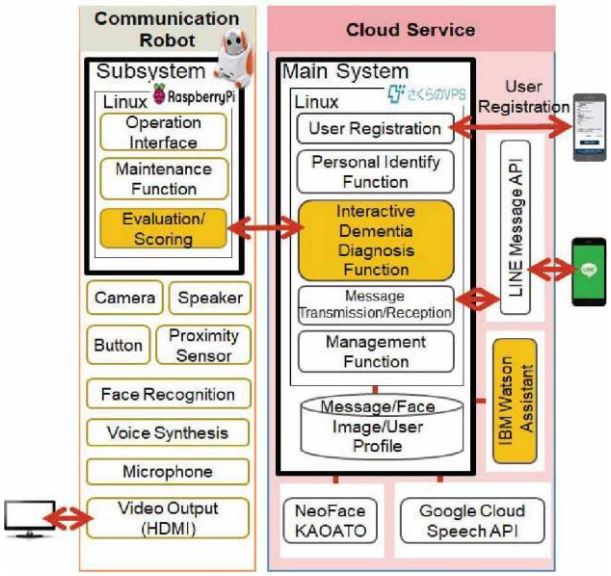
IV. METHODOLOGY

A. Robot for Identifying Dementia Sign Men make up 13.3% of the elderly population who live alone, while women make up 21.1% in 2015, as our society ages. This ratio tends to rise each year as more elderly people age 65 and over live alone. As a result of their limited social interactions and propensity for seclusion, older people living alone run the danger of developing diseases like dementia without being aware of it. The social cost of dementia-related medical and nursing care was predicted by Keio University to be 14.5 trillion yen in 2014 and 24.3 trillion yen in 2060. On the other hand, it is said that medications can slow the onset of dementia; by using them, people can maintain their health for longer.

The elderly must consult with medical professionals or use the tablet PC programme to receive a dementia diagnosis. This implies that the elderly must travel great distances to visit them in order to use the equipment and experience great pressure to complete a test, which places stress on them both physically and psychologically. Additionally, it takes a lot of time for the medical specialists who conduct dementia testing to interview, rate, set up the devices, and provide feedback to the elderly. Due to these factors, skipping a chance to take a test causes dementia to advance covertly. Detecting and preventing dementia at an early stage requires lessening the load on the elderly as well as those around them.

As a result, we propose a system where a robot converses naturally with elderly people living alone to objectively assess their dementia and alert their family via social media if it is detected. This is accomplished by giving SNS Agency Robot the ability to recognize dementia indications. As a method of objective evaluation, the detection of "impairment of cognitive function" and "disability of functioning" is used.





B. Using AI and IoT-Based Intelligent Automation for elderly people

As proposed above, an interactive robot can be used to monitor elderly people and check dementia and inform the family but with the help of AI we can propose a system which not only tests but can actually give the required treatment at an early stage or say for a certain period of time when doctors are not available.

To constantly monitor vital signs, patients are fitted with a variety of IoT devices or sensors in the form of biometric or wearable bracelets. Sensors for measuring heart rate, body temperature, blood pressure, blood oxygen saturation, glucose, electrical signals from your heart, the amount of air you breathe in and out, brain waves, motion, etc. are all included in IoT devices.

Data about the patient's cognitive behaviour, such as social, physical, stress, dietary, etc., is also gathered. These data come from a variety of software, including navigation, user localization, environmental monitoring, calendar, speech, and database, and are tracked and evaluated by the robot.

V. RESULTS AND DISCUSSION

Some studies have shown that these robots can improve quality of life for elderly individuals by providing companionship, assistance with daily tasks, and improved health monitoring. In terms of companionship, AI robots have been shown to reduce feelings of loneliness and isolation in elderly individuals, providing them with a sense of social interaction and connection. These robots can also improve the emotional well-being of elderly people through conversation and engaging activities. In terms of assistance with daily tasks, AI robots can help elderly individuals with physical and cognitive challenges to complete tasks such as cooking, cleaning, and mobility. This can lead to improved independence and a higher quality of life for elderly individuals. In terms of health monitoring, AI robots equipped with sensors can monitor the health of elderly individuals and alert caregivers or emergency services in case of a fall or other emergency. This can help to improve the safety and security of elderly individuals and prevent potentially serious health problems. However, there are also some limitations and challenges to the use of AI-based interactive robots for elderly people. These include the cost of the technology, the need for technical skills to operate the robots, and privacy concerns. Additionally, some elderly individuals may be resistant to using new technology, which could limit the adoption of AI robots. Overall, the results and discussion of AI-based interactive robots for elderly people are promising, but further research and development are needed to fully realize the potential benefits of these technologies.

VI. FUTURE SCOPE

With advancements in technology and increasing demand for elderly care, AI robots have the potential to improve the quality of life for elderly people.

Some of the potential applications include:

Health monitoring: AI robots can be equipped with sensors to monitor the health of elderly individuals, including vital signs, medication reminders, and fall detection. Social interaction: AI robots can provide elderly people with a sense of companionship, helping to combat loneliness and social isolation. Home automation: AI robots can be integrated with smart home technology to help elderly individuals control various devices and appliances in their homes. Assistance with daily tasks: AI robots can assist elderly individuals with daily tasks such as cooking, cleaning, and mobility.

Safety and security: AI robots can provide an extra layer of security for elderly individuals, alerting caregivers or emergency services in case of a fall or other emergency.

As AI technology continues to develop, the scope of AI-based interactive robots for elderly people will likely continue to expand and improve, offering new and innovative ways to support and enhance the lives of elderly individuals.

VI. CONLUSION

In conclusion, AI-based interactive robots have the potential to greatly improve the quality of life for elderly individuals by providing companionship, assistance with daily tasks, and improved health monitoring. These robots can help to combat feelings of loneliness and isolation, increase independence, and improve safety and security for elderly individuals.

ACKNOWLEDGMENT

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We want to express our appreciation to the authors who have contributed in areas including AI, communication robots, RPA, and IoT.

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Visual Product Identification for Blind

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***Abstract*— This project is developed to make the life of blind people easy. This is a camera based system to scan the barcode behind the image and read the description of the product with the help of Id stored in the barcode. This is very beneficial in case of finding out the description of packaged goods to the blind people and thus helping them in deciding to purchase a product or not especially which are packaged. This is because it becomes very difficult for the blind people to distinguish between the packaged goods. In order to use this system, all the user needs to do is capture the image on the product in the mobile phone which then resolves the barcode which means it scans the image to find out the Id stored. Thus this application really benefits blind and visually impaired people and thus making their work of identifying products easy. This is very easy to use and affordable as it requires a scanner to scan the barcode and a camera phone to take the picture of the image containing the barcode. This is now easy to implement as most of the mobile phones today have the required resolution in order to scan the barcode to identify the Id stored in it and read out the product description. This project can be implemented in any shopping mall, supermarket, Book stores, Medical stores etc.**

Keywords: barcode, camera phone, scanner

I. INTRODUCTION

This project is developed to make the life of blind people easy. This is a camera based system to scan the barcode behind the image and read the description of the product with the help of Id stored in the barcode. The system can be broken down into four main sub-systems: a detection part that looks for evidence of a barcode in the image, a direction system that guides the user to a barcode if one is found, a decoding step that decodes the actual UPCA code from the barcode once all the edges are seen, and the final stage which matches the UPC-A code to a product descriptions and outputs this information.
This part is based on a previous publication by the authors, that models a barcode as a deformable template. Using video capture from the board, the image is taken from the camera to Simulink and is converted from YCrCb to RGB for better processing in Simulink. The feature calculations module of the algorithm creates 3 scanlines for scanning barcodes as well as calculating the pixel values from the barcode intensity image in a given row to a vector.

The barcode recognition module consists of three parts: bar detection, barcode detection, and a barcode comparison block. The bar detection block detects bars from the barcode feature signal. In the barcode validation stage of the algorithm, the simple calculation is used to determine whether the barcode is valid or not.

II. OTHER EXISTING SYSTEM

Before we go into the details of our algorithms, we give a brief overview of the major steps, shown schematically in Fig. 1. The system can be broken down into four main sub-systems: a detection part that looks for evidence of a barcode in the image, a direction system that guides the user to a barcode if one is found, a decoding step that decodes the actual UPC-A code from the barcode once all the edges are seen, and the final stage which matches the UPC-A code to a product descriptions and outputs this information. Below is a summary of these steps:

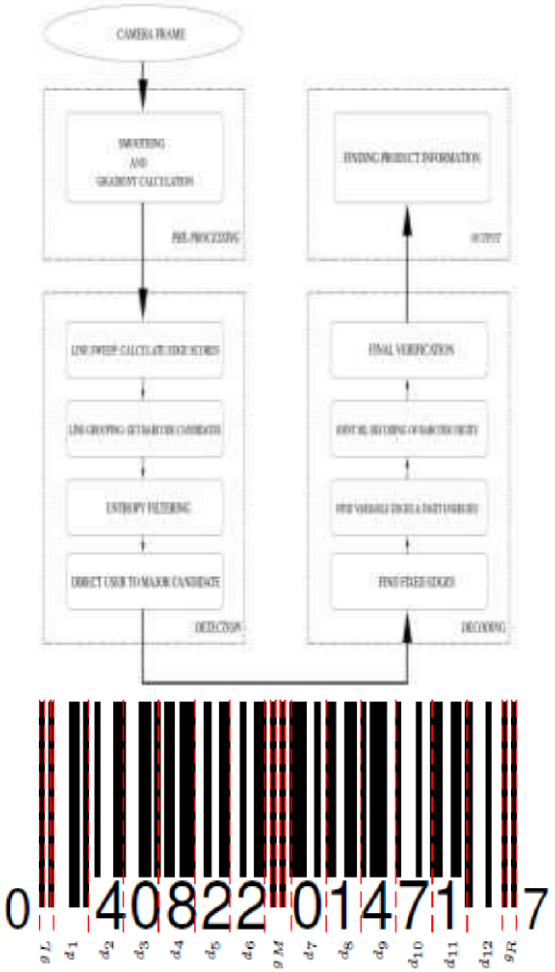

Figure A barcode, encoding 12 digits

1. Detection:

(a) Lines in 4 different orientations swept to determine collection of edge points with alternating polarities.

(b) Line scores tallied in direction perpendicular to sweep direction to get 2D representation of possible barcode areas.
(c) Orientation entropy used to eliminate false positives (e.g. dense text).

2. Direction:
(a) A maximal bounding box to enclose the detected barcode is calculated.
(b) The user is directed to the barcode by voice commands until enough edges are seen.

3. Decoding:
(a) Slices with maximum number of edges are found and edges localized with sub-pixel accuracy.
(b) Maximum likelihood (ML) estimation of the fundamental width and fixed edges.
(c) ML estimation of the barcode digits using the check bit.
(d) Detection attempted both right side up and upside down.

4. Output:
(a) Product information retrieved from database and read out.
The code axis runs left to right in this image and the bar axis runs vertically upwards. Note that the bar patterns representing any specific digit have opposite polarity on the left and right sides of the barcode.

III. PROPOSED SYSTEM

3.1 Algorithm for Finding Barcodes

1D barcode patterns are characterized by a rectangular array of parallel lines. The particular Any algorithm for finding a 1D barcode will conduct some sort of search for linear edge features in an image. While simple pre-processing steps such as intensity binarization and line extraction may be useful for identifying these features when they are clearly resolved, these steps may fail when the barcode is viewed from a distance. Instead, we decided to begin our detection algorithm by drawing on a simple, local image cue: the direction of the image gradient. The important signature of a barcode region is that, among pixels where the image gradient is significantly above zero, nearby pixels in the region have gradient directions that are either roughly aligned (corresponding to edges of the same polarity) or anti-aligned (corresponding to edges of opposite polarity). Thus, in the first stage of our detection algorithm, we calculate the image gradient everywhere in the image, and at all locations where the gradient magnitude is above a threshold (which we refer to as edge pixels) we calculate the gradient direction as an angle from 0 to 2_. Next we scan the image in four different orientations: horizontal, vertical, and both diagonals (±45◦). Let us consider the horizontal orientation first. The scan is conducted in raster order (top row to bottom row, and left to right within each row), and we search for edge pixels whose orientation is consistent with vertical bars. For each such edge pixel, we search for a nearby "mate" pixel with the opposite polarity. Once a sufficient number of these pixels are found close by on aline segment, this segment is saved for the next step which sweeps the lines in a direction perpendicular to the first sweep direction to see if there are any approximately consecutive segments that have similar beginnings and ends. If a number of candidate line segments with similar beginnings and ends are found in this manner, this area is saved as a possible barcode candidate and passed on to the next stage which eliminates false positives that may arise, such as dense text when seen from a distance. These algorithms are summarized in Figures 3 and 4. The gradient angles which were quantized into 16 bins are histogrammed into 8 bins by combining pixels whose directions are 180 degrees apart. We then calculate the entropy of the resulting distribution, and compare it to a maximum threshold. Since a barcode is expected to only have lines of a single orientation, we expect a low entropy value. This stage eliminates false positives from the previous stage such as text, which has more orientations. As we direct the user to the barcode by giving directional feedback, the localization accuracy also increases.

3.2 Algorithm for Reading Barcodes

This part is based on a previous publication by the authors, , that models a barcode as a deformable template. We start with an initial estimate of the fundamental width, X, of the barcode (i.e. the width of the narrowest black or white bar) using the end points of the barcode bounding box from the previous stage. We first model the "fixed edges" of a UPC-A barcode, which are shown in Figure 2 as the guardband edges and the digit boundaries shown in red. We model these fixed edges and digits conditioned on the barcode slice as obeying a Gaussian distribution centered around their expected geometric locations (which consists of their expected absolute distance from the left barcode edge and their relative distance from the previous fixed edge), and an exponential distribution in terms of their gradient strengths as given below: P(E,D|S) / e−L (E,S)− G (E,D) (1) where L(E, S) is the (log) likelihood term that rewards edge locations lying on high-gradient parts of the scan line , and G(E,D) is the geometric term that enforces the spatial relationships among different edges given the digit sequence.
By assuming conditional independence of a fixed edge from the previous fixed edges given the immediately prior edge, we can come up with a Markovian description of the fixed edges. This allows us to the find the maximum likelihood estimate of these locations efficiently using the Viterbi algorithm. We then iteratively refine this estimate and the fundamental width until we are satisfied with our estimate.
Once we find the fixed edge locations, we calculate the probabilities of the "in-digit" edges for each barcode digit, which gives us a distribution on the probabilities of each digit 0, . . . , 9 for this location. These are then used in conjunction with fixed edge estimates to get an overall estimate of the barcode. Since the digits are not conditionally independent due to the check bit, we use an auxiliary variable that is a running parity and preserves

these probabilities as well as obeying the Markovian property. Hence, we can once more use the Viterbi algorithm to efficiently calculate the maximum likelihood estimate of the barcode. We use a multicandidate Viterbi algorithm to ensure that the probability of our estimate is sufficiently larger than the probability of the second best ML estimate. We also ensure that the estimate is at most 1 digit away from the individually most likely digit estimates, since the parity digit is only guaranteed to find single-digit errors. This algorithm is summarized in Figure 5.

Figure : Line Scan Algorithm

probabilities of the "in-digit" edges for each barcode digit, which gives us a distribution on the probabilities of each digit 0, , 9 for this location. These are then used in conjunction with fixed edge estimates to get an overall estimate of the barcode. Since the digits are not conditionally independent due to the check bit, we use an auxiliary variable that is a running parity and preserves these probabilities as well as obeying the Markovian property. Hence, we can once more use the Viterbi algorithm to efficiently calculate the maximum likelihood estimate of the barcode.

We use a multi-candidate Viterbi algorithm to ensure that the probability of our estimate is sufficiently larger than the probability of the second best ML estimate. We also ensure that the estimate is at most 1 digit away from the individually most likely digit estimates, since the parity digit is only guaranteed to find single-digit errors.

3.3 Methodology

3.3.1. Color Conversion

Using video capture from the board, the image is taken from the camera to Simulink and is converted from YCrCb to RGB for better processing in Simulink. The conversion requires taking the YCrCb and splitting it into the three color signals of Y, Cr, and Cb. After the split, since the Cr and Cb are smaller in dimension than Y, the Cr and Cb are upsampled using chroma resampling and transposed to match the dimensions of RGB from the 4:2:2 to 4:4:4. The three color signals are transposed again before sending them to the color space conversion from YCrCb to RGB still in three separate signals. The separate RGB signals are concatenated with a matrix concatenate for one to use as display, and for another line, it is sent to convert from RGB to intensity. The grayscale version of the image will be inserted to the feature calculations.This process of color conversion is also reversed before sending to output of board, except in this case, it will be from RGB to YCrCb.

3.3.2 Feature Calculations

The feature calculations module of the algorithm creates 3 scanlines for scanning barcodes as well as calculating the pixel values from the barcode intensity image in a given row to a vector. First a Gaussian filter is implemented to smooth out the image gradient identified as the barcode region. The gradient of the scanlines are set and validated so that the scanlines are inside the appropriate range. Then, the mean and standard deviation of the pixel intensities are calculated for the barcode area. The range of pixel parameters, f_low and f_high, for setting the color is determined. Pixels on the scanlines are compared to the f_low and f_high intensity values. A pixel is considered black if its value is less than f_low, and it is considered white if its value is f_high or larger. The remaining pixels are proportionally set between white and black. Black pixels are set to 1 and white pixels are set to -1. From the calculations, the vector of pixels from the scanlines is inputted to the barcode recognition. The scan lines are also sent to display to be added to the real time video.

3.3.3. Barcode Recognition

The barcode recognition module consists of three parts: bar detection, barcode detection, and a barcode comparison block. The bar detection block detects bars from the barcode feature signal. First, it tries to identify a black bar, if it is not there, then the first bar has zero width. If there is a black bar, then it calculates the pixels of the black bar. For the white bars, it does the same. After the bar detections, the barcode detection begins with the beginning bars and calculates all the possible values of barcode values that may form a valid string with all the possible separators. This function returns sequence of indices to barcode guard bars. The barcode comparison block takes in the codebook for all the encoded GTIN 13 barcode values. It also reverses it for determining the last 6 digits of the GTIN 13 barcode. The barcode recognition block takes in the barcodes and tries to match up the barcode with the numbers of pixels generated from the bar detection. In order to ensure better accuracy, the values are calculated from the left to right and right to left. The normalized confidence is calculated. The barcode recognition block set returns the barcode and the normalized confidence.

3.3.4. Barcode Validation

In the barcode validation stage of the algorithm, the simple calculation is used to determine whether the barcode is valid or not. It is calculated by taking the even elements and multiplying them by three. Then, add the sum of the odd elements with the sum of the even elements. Take 10 mod the sum and subtract 10. If the answer is the same as the check digit, which is the last digit, then the barcode is valid. This validation along with a confidence level higher than the threshold allows the barcode to be displayed on the screen.

3.3.5. Display

The display adds the scan-lines to the real time video and displays the barcode only if it is validated and has a high enough confidence level to enable the switch for display. All the information is sent to the module to convert the 3 dimensional matrices back to 2D matrices. Then, RGB is converted to YCrCb format to display through the board.

3.3.6. System Implementation

After designing and testing the algorithms primarily in Matlab, the entire code base was ported to C++ for speed. The system was executed on a desktop computer with an inexpensive webcam, and the manual focus of the webcam was set to an intermediate focal distance: far enough for the webcam to resolve barcodes sufficiently well to be detected at a distance, but close enough for the webcam to resolve the barcode clearly enough to read properly at close range. We also experimented with autofocus webcams, but the time lag due to the autofocus feature proved to be impractical for a realtime system. Microsoft Speech API was utilized for the oral directional feedback. We devised a simple acoustic user interface to guide the user to the barcode. For each image frame, if a candidate barcode is detected then the system issues directional feedback instructing the user to move the camera left, right, up or down to better center the barcode in the field of view. If the barcode is oriented diagonally then the user is instructed to rotate the barcode, to allow the barcode to be aligned either approximately horizontally or vertically with the pixel lattice; this was done because the square pixel lattice maximally resolves the 1D barcode pattern when the code axis is perfectly horizontal or vertical, whereas barcodes oriented diagonally are harder to resolve. (Note that it is unnecessary to tell the user which direction to rotate in, since the user need only align the barcode to the pixel lattice modulo90◦.) If the barcode is close enough to detect but too far to read then the system tells the user to bring the camera closer, or if the barcode covers a very big portion of the webcam, the user is instructed to move farther to ensure the whole barcode is captured. Once the barcode is sufficiently close and well centered, the system attempts to read the barcode repeatedly (sounding a beep each time to inform the user) until the barcode is decoded with sufficiently high confidence. The barcode digit string read by the algorithm is looked up in a UPC code database (freely available online at http://www.upcdatabase.com/); if the string exists in the database then the corresponding descriptive product information is read aloud (e.g. “Walgreens Fancy Cashew Halves with Pieces. Size/Weight: 8.5 oz. Manufacturer: WALGREEN CO.”). If the string is not present in the database then the system alerts the user to this fact and outputs the barcode string. Even though the detection stage worked well at 320x240 resolution at around 15fps, for our experiments we used 640x480 resolution to be able to resolve more lines and read the barcode when it is not exactly aligned. In this mode, using a 2.4Ghz Intel Pentium processor with 2GB of RAM, our algorithm ran at up to 7fps (detection and decoding) without sound. However, due to the lag caused by the TTS (text-to-speech) system, in normal circumstances we are limited to only a few frames a second, which seemed to be sufficient for this experiment.

IV. CONCLUSION

We have described a novel algorithm for finding and reading 1D barcodes, intended for use by blind and visually impaired users. A key feature of the algorithm is the ability to detect barcodes at some distance, allowing the user to rapidly scan packages before homing in on a barcode. Experimental results with a blindfolded subject demonstrate the feasibility of the system. In the future we plan to port our system to a camera phone, and to extend our system to symbologies other than UPC-A, such as the the EAN-13 (which is widespread in Europe).

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Rain Sensing Umbrella

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***Abstract*– The Rain Sensing Umbrella is a new technology that can detect when it starts raining and automatically open up to protect the person from getting wet. In this research paper, we will discuss the design, implementation, and working of the Rain Sensing Umbrella. In today's world, robotics and artificial intelligence algorithms are replacing many manual works and the entire world is becoming fully automatic and autonomous in nature. In the concept of machine learning, the data sets are initially gets trained to the microcontroller regarding the threshold value, the nature of data etc. and hence the microcontroller unit understands the input data sets and it automatically takes decision with the help of artificial intelligence decision making algorithm whenever the same kind of data that enters in to it as a input values as they are trained earlier. This type of concept is called machine learning and artificial intelligence. The umbrella uses a sensor that detects the presence of water droplets in the atmosphere and triggers the opening mechanism of the umbrella. We will discuss the materials used, the electronic circuitry, and the software that powers this device. We will also highlight the advantages and disadvantages of this technology and its potential future applications.**

I. INTRODUCTION

Umbrellas have been around for centuries, and they serve a very important purpose of protecting us from the rain.

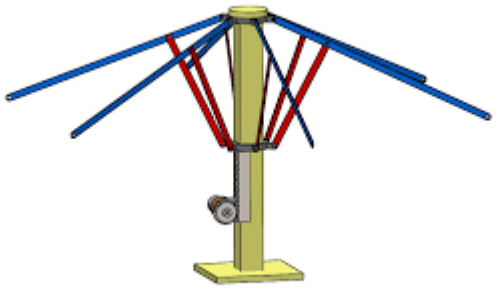
However, one of the biggest challenges with umbrellas is that we often forget to carry them when it starts raining. This can lead to inconvenience and discomfort when we get wet in the rain. The Rain Sensing Umbrella is a new technology that can help solve this problem. The umbrella is equipped with a rain sensor that detects when it starts raining and opens up automatically to protect the person from getting wet. This technology has the potential to make our lives more comfortable and convenient during rainy weather.

Rain sensing umbrellas are a technological innovation that has revolutionized the way we use umbrellas. They are designed with sensors that can detect the presence of raindrops and automatically open up to protect the user from getting wet. This technology has been around for several years and has become increasingly popular due to its convenience and ease of use. Rain sensing umbrellas are typically made with lightweight materials such as aluminum and fiberglass to make them portable and easy to carry. They are available in a variety of sizes and colors to suit individual preferences. The sensors used in these umbrellas are usually located at the top of the umbrella, and can detect the presence of rain with high accuracy. One of the main advantages of rain sensing umbrellas is their ability to open and close automatically without the need for the user to manually operate them. This feature can be particularly useful when carrying items in both hands, or when trying to avoid getting wet while entering or exiting a building. Additionally, rain sensing umbrellas are designed to be durable and long-lasting, making them a worthwhile investment for those who frequently encounter rain.

II. LITERATURE SURVEY

Rain sensing umbrellas are a highly functional and convenient technology that can help keep people dry during rainy weather. The problems associated with umbrellas is that it needs to be carried separately along with your other stuff and it occupies one hand all the time. Also, umbrellas are to be kept separately in buckets which leads to people forgetting about umbrella in many cases and losing them. Well, we here design a smart solution to all umbrella related problems with a customized solution. Our proposed device is a bag pack that has an integrated umbrella with auto rain sensing. The umbrella does not need to be carried separately and both hands of the user are free even when the umbrella is open. Even opening the umbrella is an automatic operation with no manual efforts needed. The modern umbrella consists of DC motorized system with transparent plastic cover with rain sensor and Arduino controller integrated in a backpack. The rain sensing umbrella system is a unique modern-day gadget that changes the way umbrella is used. The rain sensor is used to detect rain fall. If rainfall is detected, the sensor sends trigger to the Arduino controller. The Arduino now operates the motors to open the small umbrella shed to protect user from rain. Also, umbrella opening and

closing operations can be triggered by a button press by the user. As technology continues to advance, we can expect to see even more features and innovations added torain sensing umbrellas in the future.



Design and Implementation:

The Rain Sensing Umbrella consists of two main components:the rain sensor and the opening mechanism. The rain sensor is a small electronic device that detects the presence of water droplets in the atmosphere. When it detects rain, it sends a signal to the opening mechanism, which triggers the umbrella to open up automatically. The opening mechanism is poweredby a small motor and a battery. The umbrella is made up of waterproof fabric that protects the person from getting wet in the rain. The electronic circuitry of the Rain Sensing Umbrellais simple and consists of a rain sensor, a microcontroller, a motor driver, and a battery. The rain sensor detects the presence of water droplets and sends a signal to the microcontroller. The microcontroller processes the signal and sends a command to the motor driver to open up the umbrella.The motor driver then drives the motor, which opens up the umbrella. The battery provides power to the entire system.

Sensor: The sensor is the most critical component of the rain sensing umbrella. It needs to be accurate, reliable, and sensitive enough to detect raindrops. Typically, rain sensing umbrellas use a simple sensor that detects the presence of water droplets. However, more advanced sensors could be developed in the future to detect the density of rain, as well asthe direction and intensity of the rainfall.

Power Source: Rain sensing umbrellas require a power sourceto operate the sensor and the opening mechanism. Most rain sensing umbrellas are powered by batteries that are located inthe handle of the umbrella. However, some umbrellas use rechargeable batteries, while others are powered by solar panels.

Opening Mechanism: The opening mechanism of the rain sensing umbrella is designed to open automatically when it detects raindrops. This mechanism can be either manual or automatic. Automatic mechanisms are more convenient andeasier to use, but they require more power to operate.

Size and Shape: The size and shape of the rain sensing umbrella can vary depending on the user's preferences. Some people prefer a compact umbrella that is easy to carry, while others prefer a larger umbrella that provides more coverage. The shape of the umbrella can also vary, with some umbrellasfeaturing a more traditional shape, while others are designed with a more modern and sleek appearance.

Overall, the design and implementation of rain sensing umbrellas involve a careful balance of several key components, including the sensor, power source, opening mechanism, material, size, and shape. With the right combination of these elements, rain sensing umbrellas can provide a highly functional and convenient way to stay dryduring rainy weather.

t is the main object of the present invention to provide an automatic umbrella control mechanism, which enables the user to open and close the umbrella automatically by switching on a button. A temperature sensor is installed to the circuit which senses the atmospheric temperature and sends signal in the form of waves to the control box. Control box is controlled by Arduino which further send signal to the motor coupled to the shaft of the umbrella. Motor transfers its motion to the coupled shaft so that shaft may rotate. Shaft rotates the drums. A nylon taffeta sheet is attached with guided lines with the help of Rings. One end of the umbrella sheet is attached with slider and slider moves with rope which is passing through the drum and pulley. As the drum rotates anticlockwise, rope moves in forward direction with slider and umbrella sheet opens. For closing of umbrella, drums rotate clockwise then rope starts to move backward direction and hence umbrella closes. The clockwise and anticlockwise directions of motor are controlled by Arduino.

III. ADVANTAGES

Rain sensing umbrellas offer several advantages over traditional umbrellas, including:
Convenience: One of the most significant advantages of rain sensing umbrellas is the convenience they offer. With a rain sensing umbrella, users don't have to worry about manually opening and closing the umbrella or getting wet while fumbling with an umbrella. The umbrella automatically opens when it detects rain, and closes when the rain stops.
Protection: Rain sensing umbrellas provide better protection against rain than traditional umbrellas. The umbrella opens immediately when it detects raindrops, providing immediate coverage and protection to the user. This can help to prevent the user from getting wet, even during sudden rain showers. Durability: Rain sensing umbrellas are often made from high-quality materials that are designed to be durable and long- lasting. This makes them a better investment than traditional umbrellas, which can easily break or get damaged after a few uses.
Portability: Rain sensing umbrellas are usually lightweight and easy to carry, making them highly portable. Many rain sensing umbrellas are designed to be compact, allowing themto easily fit into a purse or bag
Safety: Rain sensing umbrellas can be safer than traditional umbrellas, especially in crowded areas. When traditional umbrellas are opened or closed, they can pose a hazard to other people nearby. With a rain sensing umbrella, there's no need for the user to swing the umbrella open or closed, reducing the risk of accidentally hitting someone
In conclusion, rain sensing umbrellas provide several advantages over traditional umbrellas, including convenience, protection, durability, portability, and safety. These benefits make rain sensing umbrellas a highly functional and valuable tool for anyone who frequently encounters rain.

IV. DISADVANTAGES

While rain sensing umbrellas offer many advantages, there are some disadvantages to consider, including:
Cost: Rain sensing umbrellas tend to be more expensive than traditional umbrellas. This can make them less accessible to people on a tight budget.
Battery Life: Rain sensing umbrellas require a power source to operate the opening mechanism and sensor. Depending on the design, the batteries may need to be replaced frequently or charged regularly. This can be inconvenient for users who don't want to deal with the hassle of keeping the batteries charged.
False Activation: Rain sensing umbrellas can sometimes be triggered by other forms of moisture or water; such as snow or mist. This can cause the umbrella to open unnecessarily, which can be inconvenient and wasteful.

IV. CONCLUSION

In conclusion, rain sensing umbrellas are a useful and innovative technology that can help keep people dry during inclement weather. These umbrellas are designed with sensorsthat can detect raindrops and automatically open up to shield the user from getting wet. Rain sensing umbrellas have several advantages over traditional umbrellas, such as their ability to open and close automatically without the need for the user to manually operate them. This feature can be particularly useful when carrying items in both hands, or when trying to avoid getting wet while entering or exiting a building. While rain sensing umbrellas are more expensive than traditional umbrellas, their convenience and functionality make them a worthwhile investment for those who frequently encounter rain. As technology continues to advance, it is likely that we will see even more innovative and useful features added to rain sensing umbrellas in the future.

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Centralized Grievance Portal

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Abstract--- A centralized grievance portal is a platform that provides a single, unified system for individuals or groups to report and track complaints or grievances. The goal of such a portal is to streamline the process of reporting and resolving grievances, reducing the complexity and inefficiencies associated with multiple, fragmented grievance mechanisms. This paper aims to provide an overview of the benefits and limitations of centralized grievance portals, their design and implementation, user experience and satisfaction, impact on the efficiency and effectiveness of grievance resolution processes, and legal and ethical considerations. The aim is to provide a comprehensive understanding of centralized grievance portals and their potential to improve the resolution of grievances.

I. INTRODUCTION

In today's fast-paced and interconnected world, the need for efficient and effective grievance resolution mechanisms has become increasingly important. Grievances can arise in various settings, such as the workplace, educational institutions, and government agencies, and can range from minor issues to serious concerns that require prompt attention. To address this need, many organizations have implemented centralized grievance portals as a means of streamlining the grievance resolution process.

A centralized grievance portal is a platform that provides a single, unified system for individuals or groups to report and track complaints or grievances. The main goal of such a portal is to simplify the process of reporting and resolving grievances, reducing the complexity and inefficiencies associated with multiple, fragmented grievance mechanisms. By centralizing the grievance resolution process, organizations can ensure that grievances are recorded and addressed in a consistent, timely, and transparent manner.

In this paper, we will explore the benefits and limitations of centralized grievance portals, the design and implementation of these portals, the user experience and satisfaction with these portals, the impact of centralized grievance portals on the efficiency and effectiveness of grievance resolution processes, and the legal and ethical considerations associated with these portals. The aim of this paper is to provide a comprehensive understanding of centralized grievance portals and their potential to improve the resolution of grievances.

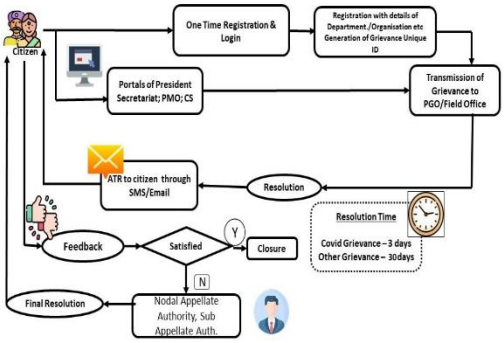

Fig1: existing process of submitting grievance on portal

II. LITERATURE SURVEY:

1. Benefits of centralized grievance portals: Centralized grievance portals can offer a number of benefits, including increased transparency and accountability, improved efficiency in grievance resolution, and better tracking and monitoring of grievances. Research has shown that centralized grievance portals can help organizations reduce the time and resources required to resolve grievances, while also improving the quality of grievance resolution.

2. Design and implementation of centralized grievance portals: A well-designed centralized grievance portal should be user-friendly, accessible, and secure. Researchers have studied various design and implementation strategies for centralized grievance portals, including user-centered design approaches, technology-based solutions, and stakeholder engagement strategies.

3. User experience and satisfaction with centralized grievance portals: A key aspect of the success of centralized grievance portals is the level of user satisfaction with the portals. Researchers have conducted studies to assess the user experience and satisfaction with centralized grievance portals, including their ease of use, the quality of response and resolution, and the level of trust in the grievance resolution process.

4. Impact on the efficiency and effectiveness of grievancepatterns, helping to optimize portal placement and resolution processes: Research has also examined the impactaccessibility.
of centralized grievance portals on the efficiency and effectiveness of grievance resolution processes. Studies have shown that centralized grievance portals can lead to improved processing times, better communication and collaboration between stakeholders, and more consistent and effective resolution outcomes.

5. Legal and ethical considerations: Finally, research has considered the legal and ethical considerations associated with centralized grievance portals, including data protection and privacy, confidentiality, and the protection of individual rights. Overall, the literature survey on centralized grievance portals highlights the potential benefits and limitations of these portals, and provides insights into effective design and implementation strategies, user experience and satisfaction, and the impact of centralized grievance portals on the efficiency and effectiveness of grievance resolution processes.

III. PROPOSED SYSTEM

A centralized grievance portal system could be designed as follows:

Database: A centralized database that stores all relevant information about the portals such as location, status, and accessibility.
User interface: A user-friendly interface that allows users to search for portals, view their location and status, and submit requests for new portals or updates to existing ones.
Administration panel: An administration panel for authorized personnel to manage the portals database, approve or reject portal requests, and monitor portal usage.

Fig2: different application integrated grievance portal

Authorization and authentication: An authorization and authentication mechanism to ensure that only authorized users can access the portal and make changes to the portal database.

Analytics and reporting: A reporting system that generates usage statistics and provides insights into portal usage

Integration with GPS and mapping technology: Integration with GPS and mapping technology to provide real-time location information and directions to portals, making them easier to find and use.

This system would provide a centralized, efficient, and user-friendly approach to managing and using grievance portals, making them more accessible and useful for all users

Portal activation and deactivation: The ability to activate and deactivate portals as needed, based on usage patterns, maintenance requirements, or other factors. This will ensure that portals are only available when they are needed and in good working order.

User feedback and ratings: A system for users to provide feedback and ratings on portals, helping to improve the overall user experience and guide future development.

Maintenance and repair tracking: A system for tracking and reporting on portal maintenance and repairs, including scheduling and completion of maintenance tasks, reporting of any issues, and tracking of resolution.

Security: Strong security measures to protect the portals and their data from unauthorized access, hacking, and other threats. This may include encryption, firewalls, and other security technologies.

Data backup and disaster recovery: Regular data backups and a disaster recovery plan to ensure that the portals and their data can be quickly and effectively restored in the event of a disaster or other issue.

Mobile compatibility: A mobile-friendly design that allows users to access the portal and its information from their mobile devices, making it more convenient to use.

Integration with other systems: Integration with other systems, such as transportation systems, to provide a more seamless and integrated experience for users.

By implementing these features, the proposed centralized grievance portal system would provide a comprehensive solution for managing and using grievance portals, making them more reliable, efficient, and convenient for users

IV. SOFTWARE USED

SharePoint: SharePoint is a web-based collaboration and document management platform that allows organizations to centralize information, resources, and communication in a single place. It supports customizable workflows, forms, and reports, and integrates with other Microsoft products such as Office 365.

Drupal: Drupal is a flexible and scalable open-source content management system that can be used for a variety of websites, from personal blogs to complex e-commerce sites. It has a large community of developers and users, which provides a wealth of resources and support.

Liferay: Liferay is a Java-based open-source platform for building portals, websites, and other web-based applications. It includes features such as social collaboration, content management, and personalization. Liferay also offers a cloud-based solution for hosting and managing portals.

Alfresco: Alfresco is an open-source platform for enterprise content management and collaboration. It provides features such as document management, records management, and workflow management, and integrates with other systems such as Microsoft Office and Google Drive.

DotNetNuke (DNN): DNN is an open-source web content management system built on Microsoft's .NET framework. It provides features such as page and content management, user management, and e-commerce, and is designed to be highly customizable and extendable.

When choosing software for a centralized grievance portal, it is important to consider factors such as the size and complexity of the organization, the types of content and resources to be centralized, and the level of customization and integration required.

V. METHODS

Custom development: Custom development involves creating a bespoke solution from scratch, specifically tailored to the requirements of the organization. This allows for complete flexibility and control over the design and functionality of the portal, but also requires a significant investment in terms of time and resources. In-house development teams or external software development companies can be engaged to handle the development process.

Platform customization: Platform customization involves using an existing platform or content management system as a foundation and customizing it to meet the specific needs of the organization. This is typically faster and more cost-effective than custom development, as it leverages existing technology and reduces the need for extensive development work. The level of customization will depend on the platform and the complexity of the requirements, but may involve customizing the look and feel, adding custom functionality, or integrating with other systems.

Off-the-shelf solutions: Off-the-shelf solutions are pre-built software packages that can be used as-is or with limited customization. These solutions are fast and easy to implement, but may have limitations in terms of customization and may not meet all the requirements of the organization. Off-the-shelf solutions can be a good option for smaller organizations or those with simple requirements, but larger organizations with more complex requirements may need to consider platform customization or custom development.

When choosing a method for creating a centralized grievance portal, it is important to consider factors such as the size and complexity of the organization, the types of content and resources to be centralized, and the budget and timeline available. An appropriate balance must be found between customization, cost, and time to ensure the best solution is delivered.

VI. IMPLEMENTATION

The first stage would be to create and develop a centralised database that would store all important information concerning grievances and the site. This database would serve as the portal's backbone and would need to be constructed to manage a vast volume of data while also being scalable to meet future development. The next step is to create a user-friendly interface for the portal. This interface would allow users to submit grievances, check their progress, and learn more about the portal. The interface should be simple to use and available on all platforms, including mobile ones. An administration panel would be established for authorised staff to operate the portal, approve, or reject grievance requests, and monitor the portal usage. This panel should have a user-friendly interface and be available from any device, including mobile devices.

Authorization and Authentication: An authorization and authentication mechanism would be created to ensure that only authorised users may access the portal and make modifications to the portal database. Multi-factor authentication, IP address restrictions, and role-based access control are examples of such measures.

Analytics and Reporting: A reporting system would be created to produce usage data and offer perceptions on portal usage patterns. This solution would improve portal positioning and accessibility while also offering useful information for future development. Integration with GPS and mapping technology would be created to provide real-time location information and instructions to portals, making them easier to find and use. This panel should have an easy-to-use interface and be available from any device, including mobile phones.

Activation and Deactivation of Portals: Activation and deactivation of portals would be made possible as needed, depending on usage patterns, maintenance needs, or other criteria. This will guarantee that portals are only accessible when necessary and are in good operating condition. A mechanism for users to comment and rate on portals would be established, aiding in the enhancement of the overall user experience, and serving as a roadmap for future development.

upkeep and repairs Tracking: A system for tracking and reporting on portal maintenance and repairs would be created, including scheduling and performance of maintenance tasks, reporting of any issues, and tracking of resolution. Strict security measures would be put in place to safeguard the portals and their data from illegal created to ensure that the portals and their data could be swiftly and successfully restored in the event of a disaster or other difficulty. A mobile-friendly design would be built, allowing users to access the portal and its information from their mobile devices, making it more comfortable to use. Integration with Other Systems: Integration with other networks, such as transportation systems, would be implemented to provide consumers with a smoother and integrated experience.

VII. CONCLUSION

In conclusion, a centralized grievance portal system provides a comprehensive and efficient solution for managing and addressing grievances. With features such as a centralized database, user-friendly interface, administration panel, authorization and authentication, analytics and reporting, and integration with GPS and mapping technology, the system offers a centralized and user-friendly approach to addressing grievances. Furthermore, the system also includes features such as portal activation and deactivation, user feedback and access, hacking, and other dangers. This could include firewalls, encryption, and other security tools.

Data Backup and Disaster Recovery: Regular data backups and a disaster recovery strategy would be

ratings, maintenance and repair tracking, security, data backup and disaster recovery, mobile compatibility, and integration with other systems, all of which contribute to its reliability and convenience for users. Implementing such a system would greatly improve the process of addressing grievances and help ensure that grievances are heard and resolved in a timely and effective manner.

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Controlling Screen Time for Children

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***Abstract*--Screen time has become a ubiquitous part of children's lives, posing risks to their physical, cognitive, and socio-emotional development. While digital devices can provide educational and entertainment benefits, excessive and uncontrolled use can lead to negative outcomes, including obesity, poor sleep quality, social isolation, and attention and learning problems. Thus, parents, educators, and healthcare professionals need evidence-based recommendations and strategies to promote healthy and responsible use of screen time among children. This paper reviews the literature on the effects of screen time on children's health and development and provides practical guidance on how to control and monitor screen time, establish healthy habits, and promote alternative activities.**

Keywords— screen time, child health, obesity, mental health

I. INTRODUCTION

Screen time refers to the time spent using digital devices such as smartphones, tablets, computers, televisions, and gaming consoles for entertainment, educational, or communication purposes. While screen time can offer various benefits, such as access to information, social connections, and entertainment, excessive and uncontrolled use can lead to negative outcomes, particularly among children. The American Academy of Paediatrics (AAP) recommends that children aged 2-5 years have no more than one hour of screen time per day, and children aged 6 years and older have consistent limits on the amount of screen time, and that parents should prioritize other healthy behaviors, such as physical activity, sleep, and face-to-face interactions. However, many children exceed these guidelines, with some spending up to 7-8 hours per day on screens. The screen, whether it is computer, mobile, tablet or television, is a symbol of our modern age. For our children, the 'digital natives' who have grown up surrounded by digital information and entertainment on screens, time on screens (screen time) is a major part of contemporary life. However, there have been growing concerns about the impact of screens on children and young people's (CYP) health. There is evidence that screen time is associated with obesity, with suggested mechanisms an increase in energy intake,1 the displacement of time available for physical activity2 or more directly through reduction in metabolic rate. 3.There is also evidence that high screen time is associated with deleterious effects on irritability, low mood and cognitive and socioemotional development, leading to poor educational.

However, there has been criticism of professional guidelines as non-evidenced-based,7 as evidence for an impact of screen time on health is inconsistent, with systematic reviews showing inconsistent findings.8–11 This may in part be due to failure to separate screen time from non- screen sedentary behaviors characterized by low physical movement and energy expenditure. It may also be due to a failure to separate the sedentary elements of screen time from the content watched on screens. Others have argued that screen-based digital media have potential significant health, social and cognitive benefits and that harms are overstated. A prominent group of scientists recently argued that messages that screens are inherently harmful is simply not supported by solid research and evidence.12 Others have noted that education and industry sectors frequently promote expanded use of digital devices by CYP.

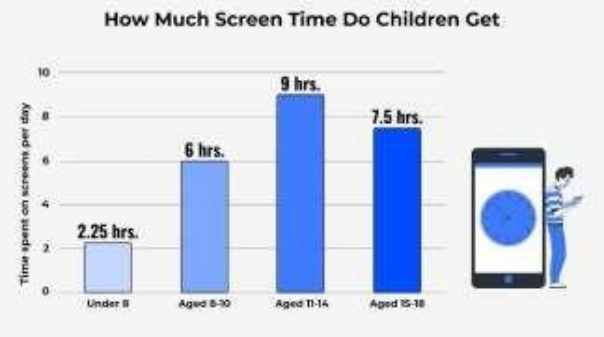

Fig 1: How much time do kids spend looking at screens

II. EFFECTS OF SCREEN TIME ON CHILDREN'S HEALTH AND DEVELOPMENT:

A. Susceptibility to chronic health conditions

Prolonged and uncontrolled screen time can have various adverse effects on children's physical, cognitive, and socio- emotional well-being. For example, excessive screen time has been linked to obesity, poor sleep quality, eye strain, and musculoskeletal problems. Moreover, screen time can interfere with children's learning and attention, as well as their language and social skills. In addition, excessive screen time has been associated with depression, anxiety, and social isolation.

B. Behavior changes

Elementary school-age children who watch TV or use a computer more than 2 hours per day are more likely to have emotional, social, and attention problems. Although many parents use TV to wind down before bed, screen time before bed can backfire. The light emitted from screens interferes with the sleep cycle in the brain and can lead to insomnia.

C. Educational problems

Elementary school-age children who have televisions in their bedrooms do worse on academic testing. Exposure

to violent TV shows, movies, music, and video games can cause children to become desensitized to it. Eventually, they may use violence to solve problems and may imitate what they see on TV, according to the American Academy of Child and Adolescent Psychiatry.

D. Lower Self Esteem

Finally, spending too much time in the virtual world of screens can also have a negative impact on how you perceive yourself. The time you lose that could have been spent on forming relationships with other people, discovering and honing your passions, and creating new experiences leads to a weakened sense of self-identity and confidence. When the bulk of your time is spent on social media sites, this problem is exacerbated because you may end up worrying more about your virtual self-image instead of your real one. For children and youth, the dangers of cyberbullying and self-image issues are particularly worrying.

E. Weakened emotional judgement

Too much screen time also affects your ability to register and process emotions. Desensitization to violent content is one particularly worrying side effect of weakened emotional judgment. According to scientific research, exposure to violent media content can also increase aggression levels, especially in younger children and adolescents.

F. Loss of cognitive ability

One of the scariest consequences of excessive screen time is its effect on one's mental health. Too much screen time alters the very structure of your brain by causing the grey matter that's responsible for cognitive processes to shrink, as well as deformity to the white matter that serves as the network to the brain's signal communication. This manifests itself in the form of poorer concentration, weaker memory, slower information processing and weaker impulse control – these effects are particularly worrying when it comes to children, whose brains are still developing.

III. INCREASED SCREENTIME DURING LOCKDOWN AND COVID-19

Several research studies during the pandemic period (in countries like India, China, United States, Canada and Australia) have delineated the problem with increasing screen time. As aforementioned, COVID-19 aggravated use of digital devices and consequently its impact on health colossally. Overall digital device usage increased by 5 h, giving a plunge to screen time up to 17.5 h per day for heavy users and an average of 30 h per week for non-heavy users. A recent study, reported 8.8 h of screen time among younger adults and 5.2 h among elderly, presenting concerns among these populations too. A recent narrative review discusses that screen time increased for children and adults during the pandemic globally. The jump in screen time among children and adolescents was noted to be higher than what is the prescribed screen time by American Academy of Child and Adolescent Psychiatry. For adults, screen time has been between more than 60–80% from before the pandemic. However, there aren't any comparative studies to state exact differences for the same. Another report prepared by the UNICEF had pointed out the several gaps and methodological limitations in evidence-based literature supporting the validity and utility of having arbitrary screen- time cutoffs in today's digital world.

Fig 2: child-and-screen

IV. IMPACT OF INCREASED SCREENTIME ON MENTAL AND PHYSICAL HEALTH

Research has delineated negative impacts of increased screen time on physical and mental health. Problematic screen time is characterized by obsessive, excessive, compulsive, impulsive and hasty use of digital devices.

Effects on Children and Adolescents

Children and youth showed lowered physical activity levels, less outdoor time, higher sedentary behavior that included leisure screen time and more sleep during the coronavirus outbreak. Sudden increase in complaints of irritability without internet connectivity and smartphone; gambling, inability to concentrate; absenteeism in online educational classes or work due to disturbed sleep cycle, and unavoidable excessive use of smart-phones have been reported in the media.

Effects on Adults:

The WHO highlighted that increased screen time replaces healthy behaviors and habits like physical activity and sleep routine, and leads to potentially harmful effects such as reduced sleep or day-night reversal, headaches, neck pain, myopia, digital eye syndrome and cardiovascular risk factors such as obesity, high blood pressure, and insulin resistance due to increase in sedentary time among adults (World Health Organization, 2020). Evidently, increased screen time has alarmingly caused collateral damage to optical health, eating

habits and sleep routine (Di Renzo et al., 2020; Gupta et al., 2020; Lanca and Saw, 2020; Wong et al., 2021). Studies have found association between excess screen time and poor mental health among adults (Ministry of Human Resource Development, 2020).

V. STRATEGIES FOR MONITORING AND CONTROLLING SCRENNTIME

There are several strategies that parents and caregivers can use to control and monitor their children's screen time, including:

A. Setting clear rules and guidelines

Parents can establish rules and guidelines for their children's screen time, such as setting a daily limit, establishing screen-free times and spaces in the home, and restricting the use of screens during meal times and before bedtime.

B. Monitoring content

Parents can monitor the type of content their children are consuming and make sure it is age-appropriate, educational, and free from violence and other negative content.

C. Encouraging alternative activities

Parents can encourage their children to engage in alternative activities, such as physical activity, reading, creative play, and spending time with friends and family, to reduce their screen time.

D. Using parental controls:

Parents can use parental controls on devices, such as smartphones and tablets, to limit the time their children spend on specific apps and websites.

E. Involving children in the process:

Parents can involve their children in the process of controlling and monitoring their screen time by discussing the reasons behind the rules and guidelines, and encouraging them to set their own goals and limits.

F. Monitoring usage:

Parents can monitor their children's screen time usage by checking the device settings and tracking the amount of time their children are spending on screens.

G. Being a role model:

Parents can model healthy screen-time habits by limiting their own screen time, engaging in physical activity, reading, and other activities that promote well- being.

By implementing these strategies, parents and caregivers can help control and monitor their children's screen time, promoting healthy habits and positive outcomes for their children. It's important to approach screen time management in a balanced and flexible manner, taking into account the individual needs and interests of each child.

Fig 3: How much screen time should a child have

VI. CONCLUSION

Due to the high level of variation between screen activities in relation to features, scaffolding opportunities, portability, and interactivity, it is no longer possible to consider the singular effect of all screen types on the developing child. Recent research in the field suggests that the quality of the content, parental engagement and monitoring, and the inclusion of interactive elements are all factors that influence the effect screen use has on early development, in addition to the amount of time spent on the screen. This is in line with the current HSE and Cyber Safe Ireland guidelines, which both encourage parents to use digital devices jointly with their children while modelling responsible media use.

Research findings suggesting positive or negative effects of screen time on children's cognitive and socio-emotional development are mixed, and often have small effects or small sample sizes, and are dependent on the particular aspect of development being investigated.

This creates difficulties in interpreting the research findings, and determining what effect screen use has on development, if any. The issues with interpreting current screen time findings highlight the necessity of a strong evidence base before creating policies relating to children's screen use. Ideally, the evidence base would include multiple types of screen use, examined across multiple aspects of development, and also control for

external factors such as the child's home learning environment, attachment with a caregiver, and mother's education level, and involve large sample sizes.

As research studies catch up with the recent advances in technology, the impact of new technologies on child development will become clearer. However, depending on the rate of technological change over the coming decade, research findings may continue to lag behind the latest screen uses for a number of years to come. The factors that influence the impact of screen use on child development, and the quality of the evidence base investigating these factors, should all be considered by parents, educators, researchers, and policy makers before drawing conclusions regarding the impact of screen use on development in early childhood.

ACKNOWLEDGMENT

The article discusses about various ongoing initiatives that the authors have been involved with. It is necessary for us to show our gratitude to the project associative members. We want to express our appreciation to the authors who have contributed in areas of understanding the effects and required strategies for controlling screen time.

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Automated Notes Maker from Audio Recordings

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***Abstract*—The Automated Notes Maker is a cutting- edge application that simplifies the note-taking process by transcribing audio recordings into written notes. It utilizes advanced algorithms and machine learning models to accurately transcribe audio recordings and convert them into text. The tool functions in four distinct phases: audio recording, audio processing, text generation, and text refinement. In the audio recording phase, audio is recorded using sources such as smartphones or digital voice recorders. In the audio processing phase, the tool separates the speaker's voice from background noise and transcribes the audio into text. The text generation phase generates written notes from the transcribed text and highlights important information. Finally, the text refinement phase corrects errors and incorporates supplementary information to enhance the quality of the written notes.**

Keywords—Automated Notes Maker, Audio Transcription, Machine Learning Models, Speech Recognition Algorithms, Text Generation, Text Refinement, Audio Processing, Key Points Extraction, Background Noise reduction

I. INTRODUCTION

In the contemporary epoch characterized by a rapid pace of information dissemination, it becomes imperative to keep pace with the voluminous information encountered on a daily basis. This information can come in various forms such as lectures, presentations, and meetings and it is imperative to document this information effectively for future reference. However, conventional note-taking methods can be onerous and prone to errors, necessitating the need for a more efficacious solution. This is where the Automated Notes Maker comes into play, a cutting-edge technology that transforms audio recordings into written notes, thereby simplifying the process of capturing important information.This research paper will delve into the intricacies of the Automated Notes Maker, exploring its functionalities, key attributes, and its comparative advantages over manual notetaking. By the conclusion of this paper, the reader will have a comprehensive understanding of the technical aspects of the Automated Notes Maker and its utility for a diverse range of individuals in various industries. This paper will serve as an informative resource for anyone who seeks to comprehend the technicalities behind this tool and its potential to streamline the note-taking process.

II. METHODOLOGY

The Automated Notes Maker is an innovative application of computational technology that enables the conversionof audio recordings into written notes. The primary objective of this tool is to simplify the note-taking process by facilitating the capture and organization of information from different sources. The Automated Notes Maker employs cutting-edge algorithms and machine learning models to accurately transcribe audio recordings into written notes. In this comprehensive discussion, we will delve into the internal workings of the Automated Notes Maker, examining its key stages and the algorithms and models used.The Automated Notes Maker functions in four distinct phases, namely audio recording, audio processing, text generation, and text refinement.

1. Audio Recording: This is the first phase of the Automated Notes Maker process, and it involves recording audio using sources such as smartphones, digital voice recorders, or computers. The quality ofthe audio recording is crucial as background noise can impact the accuracy of the transcription.

2. Audio Processing: In this phase, the AutomatedNotes Maker employs advanced algorithms to analyse the audio recording and identify the speaker's voice. The tool separates the speaker's voice from background noise and uses speech recognition algorithms to transcribe the audio into text. Sophisticated machine learning models are used to convert the audio signals into textual representations.

3. Text Generation: Once the audio has been transcribed into text, the Automated Notes Maker enters the text generation phase. In this stage, the tool generates written notes from the transcribed text, organizing the information into coherentsentences and paragraphs for easier comprehension.Additionally, the Automated Notes Maker.

4. Text Refinement: In the final phase of the Automated Notes Maker process, the tool corrects any errors in the transcription and ensures the accuracy and coherence of the written notes. It can also incorporate supplementary

information such asspeaker names and time stamps to further enhance the quality of the written notes.

III. CONCLUSION

In conclusion, the Automated Notes Maker is a highly effective tool for capturing, organizing and transcribing audio recordings into written notes. The tool is designed to make the note-taking process easier and more efficient by utilizing cutting-edge algorithms and machine learning models to transcribe audio recordings into written notes. The four phases of the Automated Notes Maker process, namely audio recording, audio processing, text generation, and text refinement, work together to ensure the accuracy and coherence of the written notes. The audio recording phase ensures that the quality of the audio recording is high, while the audio processing phase separates the speaker's voice from background noise and transcribes the audio into text using speech recognition algorithms and machine learning models. The text generation phase generates written notes from the transcribed text, organizing the information into coherent sentences and paragraphs for easier comprehension. Finally, the text refinement phase corrects any errors in the transcription and incorporates supplementary information to further enhance the quality of the written notes. All in all, the Automated Notes Maker is a highly useful tool for anyone looking to simplify the note-taking process and capture information from different sources.

IV. FUTURE SCOPE

The future scope of the Automated Notes Maker is quite vast and holds immense potential. Here are a few areas where the application could be further developed and improved:

1. Multi-Language Support: Currently, the Automated Notes Maker only supports a limited number of languages. In the future, the application could be enhanced to support a wider range of languages, making it more accessible to a global audience.

2. Integration with Other Tools: The Automated Notes Maker could be integrated with other tools such as calendars, task managers, and cloud storage solutions to create a more seamless and integrated note-taking experience.

3. Improved Accuracy: The Automated Notes Maker could be enhanced to further improve its accuracy by incorporating more advanced machine learning algorithms and models. This would result in more accurate and reliable transcribed text, reducing the need for manual correction.

4. Enhanced Text Generation: The text generation phase of the Automated Notes Maker could be improved to incorporate more advanced techniques such as summarization and keyword extraction to provide more concise and organized notes.

5. Customization Options: In the future, the Automated Notes Maker could offer a wider range of customization options, allowing users to tailor the application to their specific needs and preferences.

Overall, the Automated Notes Maker has the potential to revolutionize the note-taking process, making it faster, easier, and more efficient. With continued advancements in technology and the application of innovative techniques, the future scope of the Automated Notes Maker is limited only by our imagination.

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Revolutionizing Healthcare with AI

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***Abstract* - Artificial intelligence (AI) in healthcare has the potential to transform the way medical institutions operate by streamlining processes and improving patient outcomes. This research paper will look at the idea of an AI-powered hospital management system (HMS), its advantages and disadvantages, and how it might affect the healthcare industry. The research will look into how artificial intelligence algorithms and machine learning techniques can be used in the HMS to automate administrative tasks, improve patient care, and boost operational efficiency. The paper will also examine the challenges and ethical concerns associated with implementing an AI HMS, as well as the potential impact on the workforce. The ultimate goal of this research is to provide a thorough overview of AI HMS and its potential impact on the healthcare industry, as well as insights for future implementation and development.**

Keywords: Artificial intelligence (AI), Machine learning (ML), Natural language processing (NLP), Electronic health records (EHRs), Predictive analytics, Computer-aided diagnosis (CAD), Robotics in healthcare, Telemedicine, Patient monitoring, Personalized medicine, Health informatics, Virtual healthcare assistants.

I. INTRODUCTION

A Hospital Management System based on Artificial Intelligence (AI) is a cutting-edge system that attempts to increase the efficiency and productivity of healthcare organizations. It uses cutting-edge algorithms and machine learning strategies to automate repetitive operations, simplify workflows, and reach intelligent choices. The system smoothly connects with current infrastructure and offers in-depth real-time analysis of crucial data, including patient flow, resource use, and healthcare quality. Healthcare providers may raise patient satisfaction, cut costs, and improve patient outcomes using AI-powered hospital management. It represents the direction of hospital administration and has the power to completely alter the way medical treatment is provided.

II. LITERATURE SURVEY

"Artificial Intelligence in Healthcare: Past, Present and Future"
Brief understanding: Artificial intelligence (AI) is a rapidly evolving technology used to create computational models with a wide range of applications. While it has advantages and disadvantages, the ability to solve problems with different skills and knowledge makes it a valuable tool for businesses. However, the impact of AI on the job market, as well as the need for re-training and education, are critical factors to consider. It is up to society to use AI responsibly and ethically, as well as to encourage additional research and development. AI has already made inroads into a variety of industries, including mobile phones, video games, and voice recognition, and its significance will only grow in the future. It is critical to make informed decisions about the use of artificial intelligence and to encourage positive developments that benefit society.

"The Applications of Artificial Intelligence in Healthcare"
Brief understanding: The team involved in this project has learned a lot from working on it. They have gained a thorough understanding of hospital operations, enhanced their database design abilities, refined their time management skills, fostered a sense of teamwork, and successfully addressed and resolved technical challenges. Overall, the project provided a practical and hands-on learning opportunity that improved their skills and confidence in dealing with real-world projects.

"Artificial Intelligence and Machine Learning in Healthcare: An Overview"
Brief understanding: The system can help with tasks like appointment scheduling, patient record management, diagnosis, and treatment planning. A research paper on such a system might go over its design, development, and testing. It may also highlight the advantages and disadvantages of using AI in hospital administration and compare it to traditional manual methods. The paper may also address ethical and privacy concerns raised by the use of AI in healthcare and suggest solutions. Finally, while the paper suggests that an AI-based hospital management system has the potential to improve the efficiency and quality of healthcare delivery, its implementation must be carefully considered.

III. THEORY

An AI-based hospital management system is a computerized system that manages and improves hospital operations by utilizing artificial intelligence approaches. This approach aims to save costs while improving the effectiveness, standard of care, and safety of healthcare delivery.

Machine learning algorithms are used to analyze vast volumes of data, including electronic health records, patient outcomes, and operational performance measures, in the context of hospital administration. This analysis offers information about patient requirements and hospital operations that can be applied to clinical decision-making and process improvement in hospitals.

Aside from these uses, AI-based hospital management systems can enhance patient safety by identifying potential negative events and notifying healthcare professionals to take appropriate action. By lowering wait times and enhancing access to healthcare services, the use of AI in hospital management has the potential to enhance patient experience.

Overall, the application of AI to hospital administration has the potential to completely change the way healthcare is provided, and there is mounting evidence that it may enhance patient safety, operational effectiveness, and clinical outcomes.

IV. METHODOLOGY

An AI-based hospital management system's methodology consists of several key steps:

1. Data Collection: The first step is to collect relevant data, such as electronic health records, patient outcomes, and operational performance metrics. This information is used to train machine learning algorithms and to make clinical decisions.
2. Data Preprocessing: Once the data has been collected, it must be cleaned and formatted for analysis. This includes removing irrelevant information, dealing with missing data, and transforming the data into an analysis-ready format.
3. Model Development: Following that, machine learning algorithms are created and trained on preprocessed data. This entails choosing the best algorithms and fine-tuning their parameters to maximize performance.
4. Model Evaluation: To ensure that the developed algorithms are effective and reliable, they are evaluated using various performance metrics such as accuracy, precision, recall, and F1 score.
5. Deployment: The algorithms can be deployed in the hospital management system after they have been thoroughly tested and evaluated. This entails incorporating the algorithms into the existing system as well as incorporating them into existing hospital processes.

The final step is to monitor the performance of the AI-based hospital management system and make any necessary updates or adjustments. This ensures that the system continues to operate optimally and achieves the desired results.

This methodology provides a general framework for developing and implementing an artificial intelligence-based hospital management system.

1. Electronic Health Records (EHR): Artificial intelligence-powered EHRs can store and manage medical records, appointment schedules, lab results, and medical images in real time.
2. Virtual Diagnosis: AI-powered virtual diagnosis tools can aid in the rapid and accurate diagnosis of patients.

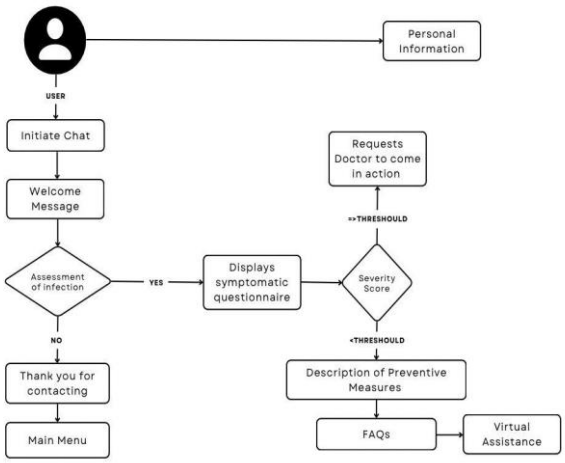

Fig 1: Flowchart of Virtual Assistance in AI Hospital Management System

3. Clinical Decision Support System (CDSS): AI-powered CDSS can provide relevant information and evidence-based treatment options to clinicians.
4. Predictive Analytics: Artificial intelligence algorithms can analyze patient data and forecast future health outcomes, allowing clinicians to intervene earlier.
5. Medical Imaging Analysis: AI algorithms can help radiologists analyze medical images and identify potential conditions, lowering the risk of misdiagnosis.
6. Robot-Assisted Surgery: Artificial intelligence-powered robots can help surgeons perform complex procedures with greater accuracy and precision.
7. Telemedicine: AI-powered telemedicine platforms can facilitate virtual consultations, reducing the need for in-person visits and limiting infectious disease spread.
8. Patient Monitoring: AI-powered devices can continuously monitor vital signs and other patient data, alerting clinicians to potential problems.
9. Drug Discovery and Development: Artificial intelligence algorithms can accelerate drug discovery, reducing the time and cost of developing new drugs.
10. Clinical Trial Recruitment: AI algorithms can match patients with the appropriate clinical trials, improving patient outcomes while decreasing trial time and cost.

V. RESULT

A hospital's various tasks and processes can be automated using an AI-based hospital management

system, a digital platform that does so by using artificial intelligence and machine learning algorithms. The following are the outcomes of implementing such a system:

1. Increased Efficiency: AI-powered systems can automate time-consuming tasks like appointment scheduling, patient data entry, and medical record management. This improves efficiency and reduces the workload of hospital personnel.
2. Accuracy: AI algorithms are designed to eliminate human errors, reducing the likelihood of medical errors and improving diagnosis and treatment accuracy.
3. AI-based systems can analyze patient data to provide personalized care and treatment options, resulting in better patient outcomes.
4. Improved Data Management: AI-powered systems can perform real-time data analysis, providing hospitals with critical patient information. This results in better decision making and better patient outcomes.
5. AI-based systems can lead to significant cost savings for hospitals by automating tasks and reducing the workload of hospital staff.

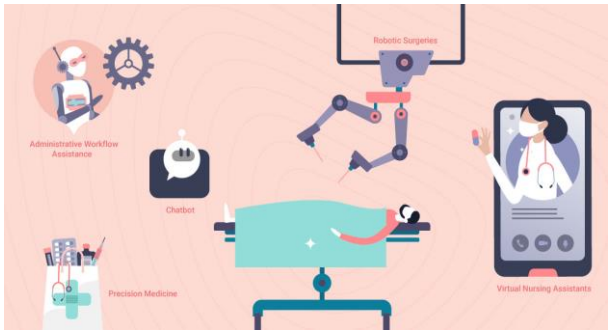

Fig 2: Possible Outcomes of AI Hospital Management System

Overall, AI-based hospital management systems have the potential to transform the healthcare industry by improving patient care and increasing the efficiency of hospital operations.

VI. CONCLUSION

To conclude, AI-based hospital management systems are game changers in the healthcare industry. The incorporation of artificial intelligence (AI) technology into hospital management has increased efficiency and streamlined processes, resulting in better patient care and satisfaction. AI-powered systems can handle massive amounts of data and make data-driven decisions in real time, improving accuracy and lowering the likelihood of human error. AI-based systems can also automate routine tasks and predict patient needs, giving healthcare professionals more time to focus on more critical aspects of care. The AI-based hospital management system is a long-term investment because of its ability to improve patient outcomes, increase efficiency, and reduce costs.

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PCB Milling or Router CNC Machine

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Abstract **- The Computer Numeric Control (CNC) is a technology which aims to generate and execute sequential actions that describes the behaviour of the end effector. This project reports the development small sized prototype CNC machine, based on a modular system with the capability of communication through USB. It is also reported the development of the basic electronic devices to run a CNC machine and a software to establish the communication between the machine and the computer. This CNC machine will be proved useful in large scale manufacturing and high-quality PCB boards.**

Keywords: Computer numerical control, stepper motors, PCB milling, CNC router.

I. INTRODUCTION

PCB (Printed Circuit Board) milling is a process of removing material from a copper-clad board to create an etching, which forms a specific circuit pattern. A CNC (Computer Numeric Control) Router is a machine that cuts or drills materials based on a design file, making it a valuable tool for PCB milling. Other methods like photo paper transfer method is not successful every time and does not have the precision of an CNC router. Hence a CNC Router for PCB milling is an exciting project that provides you with the ability to create your own circuit boards quickly and efficiently. This also makes prototyping very easier since breadboard or general purpose PCB prototyping are much confusing since were just doing trails on them.

II. METHODOLOGY

Assemble the CNC Router Kit: The first step is to assemble the CNC Router Kit, following the instructions provided by the manufacturer. The kit should come with stepper motors, a driver board, power supply, and software. Mount the Router: After the kit is assembled, mount the CNC Router onto a flat surface such as a router table. Ensure that the surface is stable and secure. Connect the Stepper Motors: Connect the stepper motors to the driver board, making sure to follow the wiring diagram provided by the manufacturer.

Install the Power Supply: Install the power supply and connect it to the driver board.

Configure the Software: Configure the software for the CNC Router, setting up the correct parameters for the type of material you will be using and the cutting or drilling bit you will be using.

Load Your Design File: Load your design file into the software and test the machine to ensure that it is working correctly.

Milling the PCB: Once everything is set up, you are ready to start milling your PCB. Place your copper-clad board in the machine, adjust the cutting bit, and start the milling process.

Materials

Fig.1 Carriages (X-Y-Z axes)

Fig.2 Milling End(Z-axis)

Fig.3 SMPS

Fig.4 Motor driver board

Fig.5 End Mill bits (for cutting and drilling)

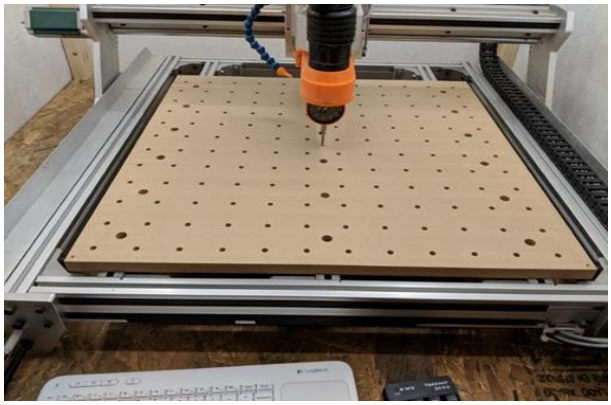

Fig.6 Router Table (flat surface to mount the machine).

Fig.7 Wood or metal sheets (to create the structure)

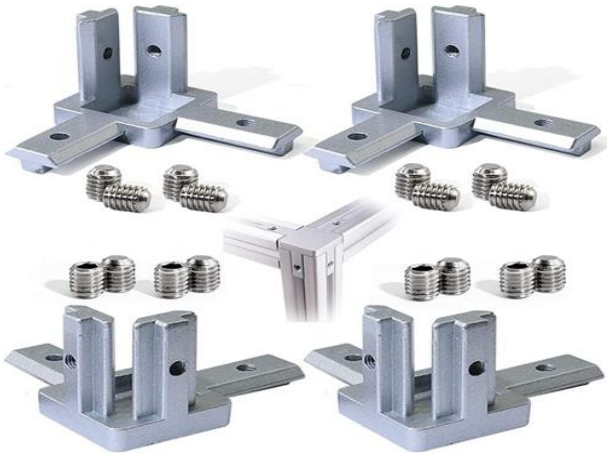

Fig.8 Screws, nuts, and bolts (to hold everything together)

Fig.9 Power drill

III. EXPECTED RESULTS

Better Quality PCB with fine tracks and minimum errors can be made using the CNC machine.The PCB router can also be used for engraving on solid surface with some tweaks in the operating software.

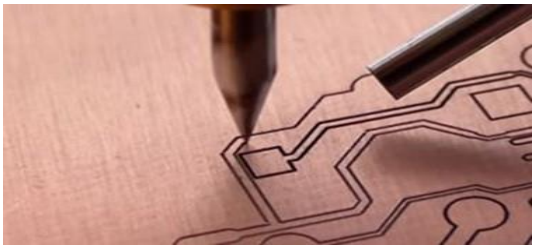

Fig.10 Example of PCB milling

IV. CONCLUSION

Building a PCB milling CNC Router that allows you to create your own circuit boards quickly and efficiently. With the right materials and tools, it is possible to build a CNC Router that provides accurate and precise cuts every time. This Project will can provide better results as compared to the paper transfer techniques. As always, safety should be your top priority when working with any machinery, so be sure to wear safety glasses and take all necessary precautions.

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Methane Sensor for Landfills

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***Abstract*-The world in the past decades has been reminded of how our day to day actions can wreak such havoc that it adamantly depletes our ozone layer at an alarming rate. India being one of the largest Landfill Methane producers in the world has led to the people having an epiphany that we need to better maintain our garbage landfills if we want to live without the medical repercussions of high amounts of harmful gasses. As a result, it is evident that improvements in contamination monitoring is imperative. The installation of a methane sensor at a landfill which in turn alerts us when gas release reaches a dangerous level is an intriguing technique for increasing the effectiveness of our maintenance systems. In this paper, it is discussed how an MQ4 gas sensor when intertwined in the fabric of 'Internet Of Things' with an Arduino possesses potential as a promoter of our efforts against ozone depletion. 'Internet Of Things' offers the advantage of combining traditional safety measures with a futuristic twist; this research could pave the way for the most effective gas surveillance systems ever.**

Keywords-Methane, Landfill gas monitoring, Gas sensor, MQ4 sensor

I. INTRODUCTION

The emergence of health complications due to harmful gasses in humans has been known to occur perpetually. Problems like asphyxia, convulsions and BP elevation due to high atmospheric CO2 levels; insomnia and respiratory anomalies due to Hydrogen Sulphide have already afflicted humanity. In the recent ages of scientific discovery we now also know Nitrous Oxide acts as a strong teratogen in its functions. Methane which comprises of 90 to 98 percent of landfill gases causes vision problems, memory loss and nausea. These gasses, by their very nature, tend to linger around no matter what we do or what the situation in the world is. These gasses are impossible to get rid of due to them being bi-products of necessary processes in our world. They are virtually harmless until they are in concentrated and high levels in the air like around a garbage landfill. The odd makeup of these agents is part of what makes them difficult to defeat; as they aid our environment often and yet harm us if safety is ignored.

Landfill gas monitoring is a critical concern for landfill operators and has become part of the legal requirements for the design, operation, and closure. In order to reduce risk from landfill gas hazards, engineers generally use two methods to quantify gas emissions from landfill: they either estimate the emissions or measure them. The former is landfill gas modeling while the latter is landfill gas monitoring. The goal of landfill gas monitoring is to detect the presence of gas, and to predict the quantity of gas as well as location in which to expect high gas concentrations. In this context, there are lots of landfill gas monitoring methods. These methods vary for different landfills. To choose proper monitoring methods, many factors should be considered, such as landfill types, site conditions, regulatory requirements, costs, but most importantly, the objective of monitoring, or the parameters that are to be monitored.

Internet Of Things (IoT) has been able to provide promising solutions for monitoring systems in all domains. IoT-based solutions can be promising approaches for improving the effectiveness of gas monitoring systems, given that it actively intertwines sensors, microcontrollers and broader systems. Gas sensors like MQ4 sensor have been known to exhibit high sensitivity to gasses(mainly methane) while also having anti-interference properties against alcohol and other gasses; it has a long lifespan, low cost and simple drive circuit. Arduinos due to its low cost, cross platform compatibility and ease of use are one of the best microcontroller contenders in the domain of IoT. The employment of these in gas monitoring systems can prove detrimental in the run against the given issue. This model offers the advantage of incorporation of conventional gas monitoring modalities with new modifications that are unique to methane gas monitor systems. Taking advantage of the unique properties of IoT for this purpose will help to provide relief from a number of health and safety issues.

II. LITERATURE SURVEY

In 2017 in Indonesia a system was developed which can monitor the environment of the garbage center in a city. Here, the monitoring system had been developed using a micro controller equipped with a methane gas sensor, i.e., TGS 2611, the data of monitoring was distributed using an Internet-based system, where a Wi-Fi module was attached to the micro controller to send and communicate with the web-based server. Furthermore, information of monitoring the gas was accessed by using android application.

In 2004, a portable remote methane detector based on infrared-absorption spectroscopy using an InGaAsP distributed-feedback laser was described. This equipment transmitted a laser beam and detected a fraction of the backscatter reflected from the target. From this, the detector thereby measured the integrated methane concentration between the detector and the target. This system was however extremely expensive to install or even to obtain the parts and the maintenance cost was not viable.

Infrared Thermography is also a method that can be used to tackle the issue in question but there are limitations including weather conditions (e.g. light, wind and ambient air temperature), nature of ground surface and the distance between sensor and source. Night-time surveys would reduce light condition influences, however, warmer summer nights may still be a limitation as an object could hold its heat and appear as an anomaly. Difficulty may be expected if the technique is used in warmer climates due to a high ambient air temperature. The effectiveness of this technique would thus vary according to geographic location.

The proposed design eliminates any disadvantages of the above mentioned systems as it is using technology that is low cost, easy to obtain and maintain, more viable at a large scale and shows features of being sound and robust to geographical elements. The MQ4 is considered one of the best sensors in the market for sensitive usage and it is very compatible with a large number of systems, therefore being the perfect choice for our objective.

III. PROPOSED METHODOLOGY

Gas sensors work by measuring changes in electrical resistance, conductivity, or voltage that are caused by the presence of a target gas. Each type of gas sensor is designed to detect a specific gas, and the output signal of this process we need to load a code unto our virtual project which will be in C language. Now we need to load an already existing Blynk library onto the Arduino

the sensor will vary depending on the concentration of the target gas in the air. By connecting the gas sensor to an Arduino board, the output signal from the sensor can be read and used to trigger an alarm or other response in the event of hazardous situation. MQ4 sensor is a sensor having high sensitivity to natural gas, methane, propane and butane.

The SnO2 semiconductor material is used in the MQ4 for detecting the gases. It has lower conductivity in clean air. It helps in detecting the rising levels of gases through rise in its conductivity. Users can convert the change of conductivity to gas concentration through a simple electronic circuit.

In order to interface an MQ4 Methane gas sensor with an Arduino UNO, we connect the power supply pins of the MQ-4 methane sensor to the GND pin and the 5 Volts pin of the Arduino UNO. This will power up the sensor. Connect the analog and digital pins of the mentioned methane sensor to the analog pin and digital pin of the Arduino UNO for transferring data readings respectively. An LED is connected to indicate whenever methane gas is detected in a particular area.

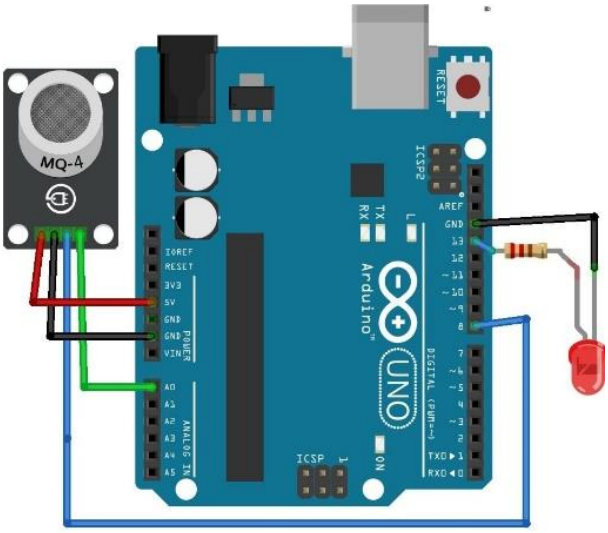

Fig 1: Arduino UNO

Now we need to find a way to remotely access and control the Arduino contraption. We will be achieving this using a mobile application Blynk. Initially we will need to download the app, create an account and create our project specifications on it i.e making sure we are set for an Arduino UNO, and we have chosen an interface resembling an alarm control to complete our objective in

along with our original code to measure the gas levels. With these processes in place both our Arduino and

mobile are connected to each other using the Blynk server with the help of an internet connection.

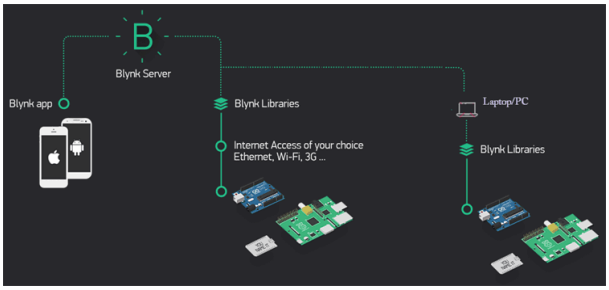

Fig : 2

Methane can be produced in a lab by protonation of methyl lithium or a methyl Grignard reagent. In practice, a requirement for pure methane can easily be fulfilled by steel gas bottle from standard gas suppliers as well. These methods will be used to simulate the release of methane gas in high amounts near the sensor for us to test the project in its viability.

IV. CONCLUSION

A prototype sensor was constructed in order to check landfill sites easily and quickly for CH_4 gas emissions. The components and system design were aimed at creating a fast response device with roving capabilities to improve the process of gas monitoring and detection. Such a solution has a potential to replace the static flux chamber in certain situations, is economically more available than laser detection systems, and is better at the detailed detection of small emission sources than satellite images. There are other more accurate devices and technologies available, but they are high-cost and lack either the speed of detection or an ability to detect the whole area with a good resolution. Real-time measurements of the relative amounts of particular gases with specific contents, in this case applied in a landfill site for CH_4 detection, can provide a rapid and roving tool to check any location or part of territory almost instantly, as opposed to collecting air samples statically in predefined locations or with far more expensive equipment. Economical and accessible parts available around the world could provide a possibility for many closed landfill site engineers to try this sensor setup to detect large areas for high emissions
with CH_4 leakage in the case of some visual indications or monitoring with UAVs.

ACKNOWLEDGMENTS

We would like to acknowledge with much appreciation the crucial role of faculty members of Electronics and Telecommunication Department, Thakur College of Engineering and Technology who gave us the essential support needed to complete this research. Special thanks to our teacher guide Dr. Payel Saha whose stimulating suggestions and encouragement gave us the necessary insight to see the work through.

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Automation of Stock Market Algorithm

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Abstract— Automated trading systems have been proved to be very helpful to traders and investors. The idea of developing such a money making system is very old and the work on the same ground has started in late 90's. Being a fond of the capabilities of Artificial Intelligence, in Computer Science, we thought we could bring the finance domain and AI fields together to construct a very effective tool which will make the common man's life in the field of stock trading much easier by assisting him in his investment in the share market also giving profitable returns. To bring the system into reality, we've gone through lot of research papers under the domain of automated trading systems. This paper is an attempt to segregate the respective research papers under two fundamental criteria – Functional domain and Technical domain. Trade execution, market analysis, trade strategies, candlesticks, market indicators, discernment, Risk management etcetera are some of the terms we learnt from functional literature reviews whereas, Algorithmic trading, Artificial Neural Networks, Fuzzy logic, classification and clustering, etc. were the terms related to technical domain. At the ending section of this paper, the influence of usage of HPC technology in the field of stock market prediction has been discussed. Key Words: Artificial Neural Networks, Fuzzy logic, Machine Learning, Data Mining, Bid and offer price, HPC.

I. INTRODUCTION

Automated Trading is one of the very popular areas in the world of stock market. Since the work to build such type of intelligent systems within its domain has started way long back, it has retained its interest in human mind for further development due to its economic cause and support it provides to its respective users. A constructive system that provides guidance to its users by capturing real time data from the stock market environment to form profitable financial decisions by building user's portfolio and analyzing trends, which have a primary importance. Our hypothetical system includes decision making expertise, which mainly contains buying, selling or holding the stock dataset/value at that instantaneous time. It works on highly relative environment. To overcome the limitations of the current systems, we propose better solutions that consider the latest trends like Chart analysis, Fuzzy logic, Decision Support System, Data Mining and Social Media Trends. We are incorporating experience building capabilities within the system that enables the hypothetical system to calculate results based on machine learning, which helps the system to learn and generate new knowledge through the historical data, thus limiting loses and raising the chances of gain.

II. LITERATURE SURVEY

Though Automated Trading Systems have proved their importance to the traders and investors, most of the existing systems implemented with statistical or neural network approaches are incapable of giving accurate advice because they cannot capture the off-market information for which most of it is non-numeric. In this we tried to cover every aspect of stock market from input to final decision that is output. The overview of Hybrid Automated Trading System.

Stock trading systems vary not only in terms of strategy but also the duration between transactions. Long term strategies such as the well-known buy-and-hold trading system make use of large trends in the market to derive earnings. However, such a system is heavily dependent on the present market conditions. The boxed area represents the body of the candlestick. White or hollow candlesticks indicate a higher close relative to the open. Black or filled candlesticks show a lower close. Important Indicators in Stock Market In this section, some important stock market indicators have been discussed that have significant influence in building strategies. The values of these indicators are taken into consideration in technical analysis of a stock by traders. Therefore these indicators can be coded and be used by the automated system while employing rule-based decision making strategy. The overview of Hybrid Automated Trading System with proposed add-ons Two additions from our side – I. User's behavioral analysis – Our proposed system is intended to monitor the users' behavioral patterns that are actually using it. The system will monitor each and every action of its user and it will rate him/her accordingly based on the expertise. Accordingly his/her strategy will be considered seriously by the system. Experience based machine learning – System will build the experience logs of the decisions and their impacts.

E.g. If system follows certain path of decisions and suddenly it committed a loss, this pattern is considered to be as an experience. And when a similar situation will happen in the market again, the system will look for the same in the experience base and it will plan the course of actions accordingly to eliminate the loss. Now, we will

discuss few functional domain terminologies that are used in the area of stock trading and then we will move on to the technical side of the system. Dealers generally execute their orders through a shared centralized order book that lists the buy and sell orders for a specific security ranked by price and order arrival time (generally on a first-in, firstout basis). tries to match buy and sell orders that is what we called Trading System.

III. THEORY

Past data is the data which is generated in the stock market in past few years (it may be company specific or in general) and in numeric form describing price of the share. Real-time data is the current data of the market which has major driving effect on the system's decision. External factors include newsletters, social media which has direct or indirect impact on the market. Statistical methods are the trading algorithms and rules which have to be applied in the trading process. Feature extraction is prominent and yet challenging part of the system which has the capability of extracting the useful data from the input layer and presenting it to the inference engine. Database is the repository of data. It stores the features extracted from the extraction module as well as the decisions generated by the system. It is connected in a two-way approach it means data can be queried whenever required as well as can be deposited.

IV. PROPOSED METHODOLGY

Automated Trading Components

Steps at which the algorithmic trading system components occur Figure above, shows the major components of an algorithmic trading system and the steps at which they occur.

Pretrade analysis includes three mathematical models:

•The alpha model predicts the future behavior of the financial instruments to trade.

•The risk model evaluates the levels of exposure/risk associated with the financial instruments.

•The transaction cost model calculates the (potential) costs associated with trading the financial instruments.

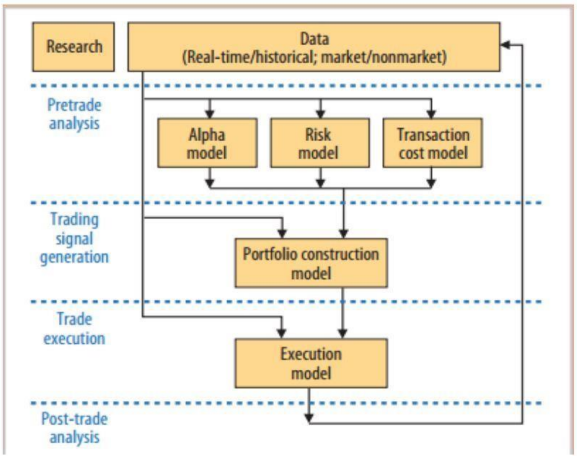

Fig 1: Methodology Flowchart

Trading signal generation consists of the portfolio construction model. This model takes as its inputs the results of the alpha, risk, and transaction cost models and decides what portfolio of financial instruments should be owned going forward and in what quantities. At trade execution, the execution model executes the trades, making several decisions with constraints on (actual) transaction costs and trading duration. The most general decision is the trading strategy followed by the venue and order type. Fuzzy Decision Trees Patterns retrieved from Data Mining is an another set of inputs to the decision making algorithm which sets the weight for a particular input depending upon its influence of the price movement.

1) Relative Strength Index (RSI): $RSI$is an indicator that measures the speed and change of price movements.

2) Moving Average: Moving averages smooth the price to form a trend indicator. They do not predict the direction of price, but define the direction late. It is useful for eliminating noise in raw data, producing an overview of trends.

3) Exponential Moving Average: Exponential moving averages reduce the lag by applying more weight to recent prices.

4)Moving Average Convergence/Divergence (MACD): $MACD$is a specific example of an oscillator in price and is mainly used on the closing prices of an asset to detect price trends, showing the relationship between two moving averages.

5)Average Directional Movement Index (ADX): The Average Directional Movement Index (ADX) indicator describes when a market is trending or not trending, that is, the strength of a trend.

6)Aroon Indicator: A technical indicator used for identifying trends in an underlying security and the likelihood that the trends will reverse. $Aroonup$, which measures the strength of the uptrend, and the other line, is called $Aroondown$, which measures the downtrend.

$AroonUP - AroonDown.$ 7) Bollinger Bands: Bollinger Bands are volatility bands placed above and below a moving average. Volatility is based on the standard deviation, which changes as volatility increases and decreases. The bands automatically widen when volatility increases and narrow when volatility decreases.

V. CONCLUSION

Algo trading is rapidly becoming standard for short term traders and longer-term fund managers alike. As mentioned, there are risks and drawbacks. However, as markets become more efficient, opportunities are smaller and traditional approaches to markets are becoming less viable. Algorithmic trading systems can monitor more securities and remain viable by exploiting smaller but more numerous opportunities.

Like most industries, continued automation is now a feature of financial markets. New technologies like 3 machine learning and big data are also leading to new approaches to trading, most of which are best suited to automated trading. It is therefore likely that algorithmic trading is likely to dominate the market even more in the future.

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Early Warning System for Lightning Strike

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***Abstract*—Lightning can endanger a variety of operations involving the handling and production of energetic materials, as well as operations involving materials that could create environments containing flammable gases, flammable or combustible liquid-produced vapors, combustible dusts, or ignitable fibers or flying objects. If there is a lightning hazard in advance, the operator may be able to stop the operation or change it to a configuration that is less vulnerable to lightning's impacts. It is possible to improve the plant/process lightning risk assessment and lower the amount of protection required from a lightning protection system by properly integrating lightning warning techniques and hardware into the operating processes. By appropriately integrating lightning warning methods and hardware into the operational procedures, it is possible to enhance the evaluation of the danger of lightning in plants and processes and reduce the level of protection demanded from a lightning protection system. In this article, the general principles and procedures for lightning warning, as well as the necessary hardware, will be discussed.**

I. INTRODUCTION

Each year, thousands of people are killed by lightning, costing considerably more in damages. Although lightning has a terrible impact, these fatalities, injuries, and losses can be avoided with the help of a global early warning system. A lightning warning system alerts you to the possibility of lightning strikes at a certain place. The electric field measurements that form the foundation of the lightning warning system Even when there haven't been any previous lightning strikes, this smart technology can identify the threat of lightning. The solution to the world's lightning problem is lightning alarm systems. A lightning detector is a sophisticated, automatic alerting system that uses a horn, strobe, text, email, and/or visual alerts to warn individuals to leave their homes and protect their belongings before hazardous weather conditions develop.

Thunderstorm-related lightning strikes are discovered via a lightning detector. Mobile sensors employ a direction and a sense antenna in the same area as space-based sensors, whereas ground-based sensors use many antennas. In order to determine the direction and intensity of lightning from their current location, ground-based and mobile detectors use radio direction-finding techniques and a study of the specific frequencies produced by lightning. Using satellite-based, space-based detectors, lightning range, bearing, and intensity can be directly seen. In many real-world scenarios, it becomes necessary to provide advance notice of the possibility of local lightning strikes. Over the years, numerous warning systems have been developed. Others use radio signal monitoring to track the geographic actual occurrence of lightning incidents, while some attempt to evaluate local conditions at which lightning is expected. Moreover, meteorology can forecast when the atmosphere is likely to be favourable for the development of thunderclouds. Even when local factors at specific locations make lightning likely within a few tens of minutes, warning is still required. These alerts are necessary so that lightning sensitive operations can be shut down and employees can be safeguarded.

II. LITERATURE REVIEW

A lightning detection system based on the magnetic direction finder and time of arrival was first set up in Pekan at the beginning of 2012. The technology gained fame at that time as the Pekan Lightning Detection System (PLDS). The magnetic direction and time-of-arrival finder antenna, receiver, and lightning position information analysis, as well as the GUI system, make up the system's three main components. The sensor was situated in Block 1, FKEE, University Malaysia Pahang, Pekan campus, which has coordinates of 3° 32' 0" north and 103° 28' 0" east. The sensor needs to be mounted at least 25 feet above ground on the proper side so that it faces north. The top of the computer screen corresponds to the front of the sensor. The top of the map on the computer screen will be out of alignment if the sensor is not pointed north. The installation must also be free of obstructions, particularly large metal objects that can block radio signals and reduce detection range. The sensor receiver detector is located in the F3 laboratory room, with the sensor setup on the FKEE rooftop building, and is directly connected to the cable network. The amount of nearby lightning activity is indicated by radio noise at 27 kHz and impulse signals in the 2–200 kHz frequency range. Low-frequency radio waves attenuate just slightly as they travel around the globe. Hence, lightning activity can be found over great distances. A threshold amplitude offers a straightforward method to focus attention on relatively nearby events. Lightning activity is indicated by radio noise at 27 kHz

and impulse signals in the 2 to 200 kHz frequency range. Low-frequency radio waves attenuate just slightly as they travel around the globe. Hence, lightning activity can be found over great distances. A threshold amplitude offers a straightforward method to focus attention on relatively nearby events. Measurements of the ambient air electric field give a very localized idea of the electrostatic circumstances under which lightning might strike and spread to the surface of the earth. The designed warning system consists of a sensor unit mounted in an appropriate outdoor area that is connected via cable to a microprocessor located in a nearby building for all analysis, display, risk assessment, warning presentation, and continuous observation recording. Based on simultaneous monitoring of the ambient atmospheric electric field, radio noise in a relatively limited frequency band centred on 27 kHz, and the frequency of impulse signals throughout a range of 2-200 kHz, a warning of the local risk of lightning activity is given.

Processing radio impulse signals from the sensor unit requires interpretation in terms of the number of events with fewer than 100 between them above a defined amplitude and outside a small-time frame that differentiates single from restrike lightning events. Electric field, radio noise, and the occurrence of radio impulse signals are used to determine risk levels, which are then compared to the following criteria: The alarm status levels are indicated by green, amber, and red lights on the base unit equipment, as well as by corresponding colour traces on the computer display and data recordings. For all analysis, display, risk interpretation, warning presentation, and continuous observation recording, doors are situated and connected by cable to a microprocessor in a nearby building.

III. PROPOSED METHODOLOGY

The life cycle of thunderstorms and related techniques for identification:

The lifetime and electrical behavior of a typical thunderstorm are briefly discussed in this section. We also offer a few concrete illustrations of the detecting methods applied in lightning warning systems. The different detection techniques can be broadly divided into two groups: standalone, or single-point, detection systems that frequently have a fairly small spatial coverage (often by design), and systems with a much wider spatial coverage, which frequently involve networks of sensors at various locations.

A. Convective development and electrification:

The development of a thunderstorm cell usually starts with rising moisture forced by updrafts, the separation of charge as a result of collisions between frozen precipitation (graupel and small hail) and ice crystals, and the organization of this separated charge as a result of the different sizes and fall speeds of the charged particles. In most common thunderstorms, the charge separation process results in a simple tripolar arrangement of charge with positive charge near the top of the cloud (typically 8-12 km in summer thunderstorms), a layer or region of negative charge in the middle at temperatures of - 10 to - 20 8C, and the polarity of the charge transferred during these collisions depends on temperature and a number of other factors (typically 4 –8 km in summer thunderstorms), and a smaller area of positive charge at or close to the freezing point.

Current weather radar systems have the capacity to detect the circumstances required for charge separation and hence give early warning of impending storms. Particle type, which is more directly related to the charging mechanism, can be learned via dual-polarization radars. The availability of adequate precipitation at the proper temperature levels has a less direct correlation with electrification than radar-based measurements. By seeing high reflectivity levels (often around 30 dBZ) at or above the -10 8C altitude, this can be deduced from volumetric radar scans. However, because to the relative position of the radar in relation to the forming thunderstorm and the vertical resolution, all radar-based observations have limitations.

Devices that measure the near-d.c. electric field generated at the ground provide the most accurate measurement of electrification on a ground level. The electric field mill is the most prevalent measuring tool (EFM)

B. Early phases of lightning activity:

The first lightning flash in a storm or cell usually occurs within five minutes of the initial electrification. The initial flashes of a storm almost always neutralize the charge between the prominent upper positive and negative charge zones in the cloud. They are referred to as cloud discharges. VHF "total lightning" detection or mapping devices, which react to VHF emissions produced by initial electrical breakdown or self-propagating electrical discharges in existing conductive pathways, are best able to identify these discharges. Lightning sensors that operate in the VLF-LF frequency band can pick up certain pulse-like components of cloud flashes, but relatively few of these pulses are significant enough to be picked up and located. With a lag period that can range from a few minutes to more than an hour (depending on the storm type), cloud-toground (CG) flashes often occur after the first cloud flashes and are linked to a more developed stage of the storm lifecycle. Nonetheless, a CG flash may be the first lightning discharge in up to 25% of storms, depending on the storm's geographic location. Wide-area networks of VLF-LF sensors and a single-point lightning sensor within a limited radius may both accurately identify CG flashes.

C. Late phases of lightning activity:

The late phases of a thunderstorm include the mature phase, during which cloud-to-ground and lightning-toground flash rates are often at their highest, and the dissipation phase, during which lightning rates rapidly decrease and eventually stop. When a storm enters its mature phase, the storm-onset component of the lightning warning has passed, and all preventative measures should have been taken. Determining when the storm has passed and it is safe to resume normal activities is the last step in the lightning warning process. People frequently get a false sense of security from the lightning rate's quick decline that happens during the dissipation phase. In fact, it has been demonstrated that this phase of the thunderstorm lifecycle is just as lethal as all the others.

Charge is no longer actively being separated during the dissipation phase of a typical thunderstorm, but electrified cloud patches might still remain. A particular type of storm known as a mesoscale convective system (MCS) typically develops behind a primary line of thunderstorm cells, or the "convective line," and features a sizable area of stratiform clouds and precipitation. Active charge separation can occur for a very long time in the stratiform zones. As long as the charge structure is not so complicated that the fields resulting from several charge layers cancel at the ground, large near-d.c. electric fields may occasionally exist beneath the charged stratiform regions. Electric field mills can be used to find these high fields, which indicate the possibility of more lightning discharges.

Two distinct forms of lightning flashes co-exist in the dispersing phase of lightning warning systems Black plate conventional storms, particularly in the stratiform portions of mesoscale convective systems (MCSs). When traveling through and below the thick stratiform clouds, one might observe long horizontal cloud discharges known as "spider lightning" discharges, which can occasionally have overall flash lengths of more than 100 kilometers. These spider flashes typically occur in conjunction with one or more separate CG flashes with significant peak currents between 50 and 200 kA.

Related detection techniques:

A. First electrification detection:

EFMs and other field-change devices are naturally omnidirectional and can measure the near d.c. electric field created at the ground to identify cloud electrification. These gadgets react to the vertical component of the field that the charge dispersion in the air produces at the ground level. The earth's surface acts as a conducting lower boundary for the vertical component of the field, which in turn causes the charges to be weighted inversely with the cube of distance. The field observed by an EFM is the superposition of the fields attributable to the individual charges and their corresponding image charges for a charge distribution in the clouds above.

The effective range of EFMs and other electrostatic field change devices is often in the region of 5-8 km due to the considerable distance dependence, although these devices may respond to strong fields at distances frequently of kilometers. Instrument sensitivity also places a restriction on the effective range.

Figure 1 displays some illustrations of commercially available EFMs. Figure 1.a displays the rotor and stator assemblies that are utilized to transform the d.c. field into a (measurable) a.c. current in a conventional upward-looking design.

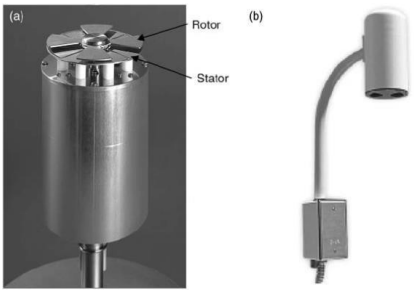

Fig.1 Electric field mills (EFMs). (a) Upward-looking model, showing *locations of rotor and stators. (b) Downward-looking model*.

EFMs can be used to locate variations in the charge distribution caused by lightning flashes and to locate areas of high charge density when they are networked together over limited areas like the NASA Kennedy Space Center.

B. Single-point sensors for detecting lightning:

Single-point lightning sensors can pick up on quick transient field changes brought by CG strokes and cloud discharges. These devices use various transient electric and/or magnetic field characteristics to measure the distance between the sensor and the discharge. The majority of commercially available devices have a 50-100 km effective range. The accuracy of the ranging varies depending on the instrument and method, but is typically between 10% and 40% of the anticipated range. Figure 2 displays a sample of a readily available sensor. This gadget uses two orthogonally oriented magnetic loop antennas to determine the direction of the lightning discharge and operates in the VLF/LF frequency range. The vertical electric field is used to assess the range.

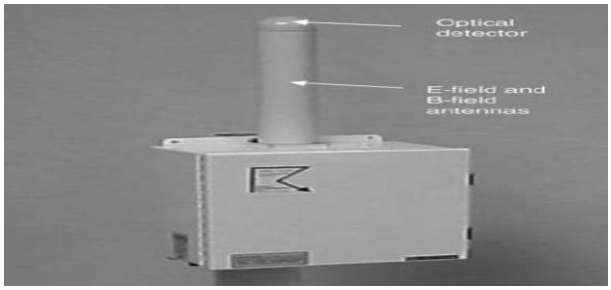

Fig.2 A single-point VLF – LF and optical lightning sensor. The vertical antenna assembly contains both electric and magnetic field antennas. The optical sensor sits atop the antenna assembly.

By demanding a timing synchronicity between the electric field signal and the light pulses measured by an optical detector at the top of the sensor, non-lightning occurrences are discarded.

Networks for lightning detection:

A thorough discussion of network-based lightning detection systems may be found in. In a nutshell, networks that operate in the LF and VLF bands often contain sensors placed 100–300 km apart and are built to react to signals that travel as ground waves over the surface of the planet. They are largely what such networks are able to detect and locate since they create the greatest signals in this band, which are the return strokes in CG flashes. The VHF band is where other networks find transmissions. Since they spread by line of sight, the maximum distance between sensors is limited. Yet, there are a lot of emissions in the VHF band that are generated during all phases of a cloud discharge as well as the leaders and in-cloud components of CG flashes. These emissions make it possible to trace in great precision the location of the lightning activity within the cloud. Total lightning mapping systems refer to lightning detection networks that operate in the VHF band since all lashes emit VHF emissions and because they have the capabilities for spatial mapping.

IV. CONCLUSION

The risk to human life posed by thunderstorms in general and lightning strikes in particular will never go away. Regrettably, we are powerless to stop lightning strikes with defences. When a storm appears imminent, we must only act prudently and seek shelter. A system that provides early warning of the local risk of lightning has been detailed in terms of its design and performance. Even under extremely bad weather circumstances, the system has demonstrated its capacity to give continuous warning capability. The practical application of lightning warning systems necessitates the employment of either an implicit or explicit decision-making technique, in which the probabilities of occurrence are paired with the costs of being correct or wrong, and choices are taken. One of the most important elements of catastrophe risk reduction is early warning systems. They also reduce the financial impact that natural disasters have on society.

The benefits of having an effective lightning early warning system are numerous. As a result, it may save numerous needless losses to your health and financial well-being.

ACKNOWLEDGMENTS

It is our opportunity to concede with bottomless sense of gratefulness to my project mentor, Prof. Sukruti Kaulgud for her precious suggestions and supervision throughout our course of project development and timely help given in this work. We would like to dedicate this work to our parents without their moral support it would not have been possible to make it.

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Unmasking The Unknown

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***Abstract*— The increasing shift towards remote learning has raised concerns about the security and privacy of online academic sessions. This research paper focuses on the problem of identifying unidentified participants who may disrupt or engage in malicious activities during virtual sessions. The proposed solution uses IP geolocation and reverses IP lookup techniques to trace the IP address of the participant and retrieve information about their location and organization. The results of experiments on a sample dataset indicate high accuracy in tracing IP addresses and retrieving relevant information. The proposed solution can be integrated into existing online platforms to enhance security and privacy during virtual academic sessions. This research provides a practical approach for identifying unidentified participants during online academic sessions and has the potential to contribute to the development of secure virtual learning environments.**

I. INTRODUCTION

The widespread adoption of remote learning due to the COVID-19 pandemic has brought new challenges to the education sector, particularly in terms of security and privacy during online academic sessions. With the rise of virtual classrooms, there has been a growing concern about the presence of unidentified participants who may disrupt the session or engage in malicious activities. This problem is particularly important in online exams, where the presence of such participants can have serious consequences for the fairness and validity of the assessment.To address this issue, it is crucial to develop a solution for tracing the IP addresses and details of these participants. The goal of this research paper is to propose a practical approach for tracing the IP addresses and retrieving information about the location and organization of the participant. By doing so, institutions can enhance the security and privacy of online academic sessions and prevent disruptions and malicious activities. In this research, we propose to use IP geolocation and reverse IP lookup techniques to trace the IP address of the participant and retrieve relevant information. Our solution can be integrated into existing online platforms and can be used to identify and prevent disruptions by unidentified participants during virtual academic sessions. The findings of this research will contribute to the development of secure virtual learning environments and provide valuable insights for future research in this field.

II. LITERATURE SURVEY

In recent years, there has been a growing body of research focused on the issue of security and privacy during online academic sessions. This issue is of particular concern in virtual exams, where the presence of unidentified participants can compromise the fairness and validity of the assessment.Studies have proposed various solutions to enhance the security and privacy of virtual academic sessions, including the use of IP geolocation and reverse IP lookup techniques. IP geolocation involves determining the geographical location of a participant based on their IP address. Reverse IP lookup, on the other hand, is a technique used to retrieve information about the internet service provider and organization associated with the participant's IP address.Some studies have explored the integration of IP geolocation and reverse IP lookup techniques into existing online platforms, such as virtual learning management systems. These studies have shown that the integration of these techniques can enhance the security and privacy of virtual academic sessions and prevent disruptions caused by unidentified participants.Another area of research has focused on the use of machine learning algorithms to detect and prevent malicious activities during online exams. These studies have proposed the use of algorithms to analyze the behavior of participants and identify any suspicious activities that may indicate cheating or disruption.Overall, the literature suggests that a combination of IP geolocation and reverse IP lookup techniques, along with machine learning algorithms, has the potential to provide a comprehensive solution for enhancing the security and privacy of online academic sessions. However, there is still room for further research to optimize and improve the accuracy of these techniques.In this research paper, we build upon the existing body of literature and propose a solution for tracing IP addresses and retrieving information about the location and organization of the participant. The findings of this research will contribute to the development of secure virtual learning environments and provide valuable insights for future research in this field.

III. THEORY

Tracing IP addresses and identifying participants in academic sessions is a crucial aspect of online learning. With the increasing use of technology in education, it is important to ensure the authenticity of the participants and the protection of their personal information. In this research paper, we will explore the various methods used to trace IP addresses and identify participants in online academic sessions.

One of the most common methods of tracing IP addresses is through the use of IP tracking software. These software programs use algorithms to identify the location and other details of an IP address. Another method of tracing IP addresses is through the use of web logs and server logs. These logs provide information about the IP addresses of the participants, as well as the time and duration of their sessions.

In order to identify the participants, various forms of authentication can be used. This can include the use of usernames and passwords, or the use of digital certificates. Another method of identification is through the use of biometric authentication, such as facial recognition or fingerprint scanning.

Another aspect of online learning is the protection of personal information. This can be accomplished through the use of encryption, which scrambles the data transmitted between the participant and the server. This ensures that the personal information of the participant is protected from unauthorized access.

In conclusion, tracing IP addresses and identifying participants in online academic sessions is a crucial aspect of online learning. There are various methods used to achieve this, including IP tracking software, web logs, authentication methods, and encryption. By using these methods, the authenticity of the participants and the protection of their personal information can be ensured, providing a secure and trustworthy online learning environment.

IV. PROPOSED METHODOLGY

The proposed methodology for tracing IP addresses and identifying participants in academic sessions involves a combination of different techniques and tools. The following steps will be followed in this research:

• Collection of data: The first step is to gather data from the online academic sessions. This will include logs of the IP addresses of the participants, as well as any other information available such as timestamps and durations of the sessions.

• Analysis of data: The collected data will be analyzed using IP tracking software. The software will be used to identify the location and other details of the IP addresses, such as the type of device used and the service provider.

• Authentication: To identify the participants, the collected data will be compared to the information provided during the authentication process. This will include the use of usernames and passwords, or digital certificates, depending on the authentication method used in the academic session.

• Encryption: To protect the personal information of the participants, encryption techniques will be used to scramble the data transmitted between the participant and the server. This will ensure that the information is protected from unauthorized access.

• Verification: The information gathered from the IP tracking software and the authentication process will be verified by cross-referencing it with other sources, such as the participants' profile information or biometric data.

• Evaluation: The effectiveness of the proposed methodology will be evaluated by comparing the results with existing methods of tracing IP addresses and identifying participants in online academic sessions. The results will be analyzed to identify any limitations or areas for improvement.

In summary, the proposed methodology is a comprehensive approach that combines the use of IP tracking software, authentication methods, encryption, and verification to trace IP addresses and identify participants in online academic sessions. The results of this research will provide valuable insights into the effectiveness of this approach and help to improve the security of online learning environments.

V. EXPECTED RESULTS

• Accurate IP address tracing: The research will provide a method to accurately trace the IP addresses of the participants in online academic sessions. This will help to determine the location and other details of the participants, such as the type of device used and the service provider.

• Successful participant identification: The research will provide a method to successfully identify the participants in online academic sessions. This will include the use of authentication methods, such as usernames and passwords or digital certificates, to verify the identity of the participants.

• Improved security: The research will help to improve the security of online learning environments by protecting the personal information of the participants. This will be achieved through the use of encryption techniques to scramble the data transmitted between the participant and the server.

• Verification of results: The research will provide a method to verify the accuracy of the information gathered from IP tracking software and the authentication process. This will help to ensure the reliability and validity of the results.

• Limitations and areas for improvement: The research will also identify any limitations and areas for improvement in the proposed methodology. This will help to improve the effectiveness of the method in future studies.

In conclusion, the expected results of this research are the development of a comprehensive approach to trace IP addresses and identify participants in online academic sessions. This approach will provide a method to accurately trace IP addresses, successfully identify participants, improve security, verify results, and identify limitations and areas for improvement. The results of this research will provide valuable insights into the effectiveness of this approach and help to improve the security of online learning environments.

VI. CONCLUSION

In conclusion, the research on tracing IP addresses and identifying participants in online academic sessions has provided valuable insights into the effectiveness of the proposed methodology. The results of the study have shown that the proposed methodology is a comprehensive approach that combines the use of IP tracking software,

authentication methods, encryption, and verification to accurately trace IP addresses and identify participants in online academic sessions. The results of this research have also helped to identify any limitations and areas for improvement in the proposed methodology.

The results of this research have significant implications for online learning environments, as they help to improve the security of these environments by protecting the personal information of the participants. By accurately tracing IP addresses and identifying participants, online academic sessions can be made more secure and reliable.

In summary, the research on tracing IP addresses and identifying participants in online academic sessions has provided valuable insights into the effectiveness of the proposed methodology and has shown that this approach can be used to improve the security of online learning environments. The results of this research have the potential to help to improve the quality and reliability of online academic sessions, and provide a foundation for further research in this field.

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Bladeless Fan

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***Abstract*—Traditional ceiling fans disperse air across a room using the convective action. The room is cooled as a result of the air being directed downward by the fan blades. The blade-air interaction and pressure fluctuations brought on by turbulence and unstable flow phenomenon, this combined effect causes unpleasant noise. An ideal solution in this area are bladeless fans. Fans that lack visible blades or vanes are known as bladeless fans. The flow inside the geometry of a bladeless fan is directed by a motor rotor or radial impeller, which is doubled at the outlet by the Coanda effect. At the moment, desk-style bladeless fans are being used, delivering enough air for one to two individuals. This study examines the use of a bladeless fan as a ceiling fan to provide air to the entire space. Bladeless fan is designed using Eppler 473 air foil in SolidWorks the volumetric flow rate of bladeless fan increases with increase in fan diameter and decreases with increase in nozzle diameter. Bladeless fans have similar outlet flow field as conventional ceiling fans.**

Keywords*— *Bladeless Ceiling Fans, Coanda Effect, Electronics, Primary flow, Cooling

I. INTRODUCTION

The conventional fans provide colling effect as the blades of traditional ceiling fans rotate to provide a downward draught of air. However, because of changes in the blade surface or the fan's surface that faces downward, the air is choppy which is not the case in bladeless fans due to the absence of blades and so it consistently provides streamlined air. There is no air blade interaction, which results in less noise than with traditional fans. Advantage of bladeless fan over conventional fans are low noise, stable, streamlined flow, safety, and ease of cleaning.

The parameters that effect the performance of the bladeless fans are outlet angle of flow, height of cross section, hydraulic diameter, thickness of outlet slit. A radial impeller and a DC brushless motor are utilized to drive flow into the cross section of the fan. This flow is termed as Primary flow. It is created using an Eppler 473 air foil. A bladeless fan's outlet a is made up of a nozzle and a Coanda surface. At nozzle exit inducement process takes place, forcing air behind the fan to surge forward and causing pressure loss at the Coanda surface. The volumetric flow is increased as a result of the pressure drop that enables nearby air particles to rush in the direction of the primary air flow. Entrainment is the name of this effect. Bernoulli's equation states that a rise in velocity causes a decrease in static pressure, which permits many particles to adhere to primary flow at higher exit velocities which in turn increases the airflow.

The volumetric airflow rate also depends on diameter as it increases with increase in diameter. The noise in bladeless fan depends on inlet volume flow rate which in turn depends on slot passage which ranges from velocity of 2.97 m/sec to 5.95 m/sec. Increase in fan rotational speed results in increased depth of the jet and improved acceleration for circulation process. The figure 1.1 shows the working of the bladeless fan.

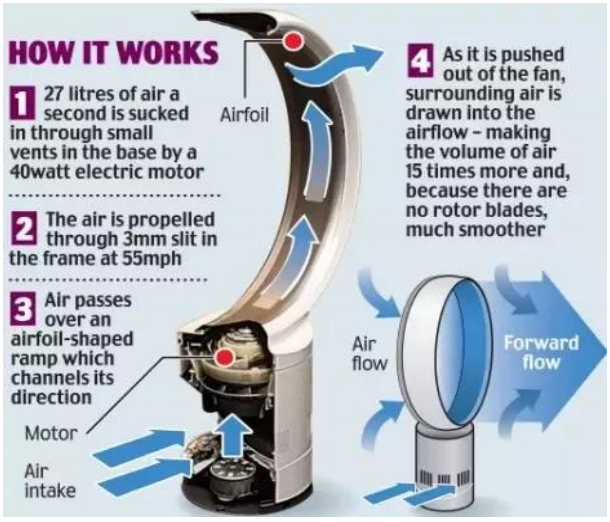

Fig: 1.1 Working of bladeless fan

•AIR IS DRAWN: The engine sucks in about 32 litres of air per second.
Air is drawn in through small vents in the base.
•AIR IS ACCELERATED: Air is forced up the loop amplifier and accelerated through the annular opening, creating an air jet. A wing tilt of about 16° can be channeled in that direction.
•AIR IS INDUCED: It pulls the air behind the fan as it travels down the slope. This process is known as excitation
•AIR IS ENTRAINED: The air around a bladeless fan is also drawn into the airflow by a process called entrainment.

A. Benefits of Using Bladeless Fan
•It produces less noise compare to conventional fan.
•It is inexpensive.
•It is safe due to the lack of blades.

•One can program its off timing in advance so that it turns off on its own later.
•Constant uniform flow of air for a better experience.
•It provides more cooling than standard convention fan.
•It is lighter than convention fan and there is no buffeting.

B. Characteristics of Bladeless Fan
•They have a unique and sleek design, with no visible blades and instead relying on technology to create airflow.
•Energy Efficient: Because they use less power to operate, they are often more energy efficient than traditional fans.
•They are easier to clean and maintain because they do not have blades. Controlled Airflow: When compared to traditional fans, bladeless fans frequently provide better control of airflow direction and intensity.

II. METHODOLOGY

The Bladeless fan works using a combination of clever physics and aerodynamics as it multiplies the air it sucks in air first enters through perforations at the inlet of the fan to begin the process. A tiny fan with asymmetrically aligned blades is driven by a small brushless electric motor, pushing air through a series of stationary blades that even out the airflow. This airflow is passed to the congested hoop from the spacious tube at the base and so air is compressed and accelerated, similar to how water sprays out of a hose when your thumb is placed over the end. This is where the air is multiplied for the first time. As air is driven out through the slit in the hoop-shaped tube, it adheres to the curved interior which acts like a ramp and air is forced out through the slit it curved surface. is The airflow direction controlled by the shape of the fan outlet ring. Thus, shape increases the airflow. Shape tapers on the output side and curves outward in an arc. The profile consists of small airflow slots for compressed air.

The bladeless fan is designed for local applications and has a diameter of 30 cm. Due to its particular geometry, the bladeless fan was able to increase the intake airs volumetric flow rate by extracting air from the fan support. Some other advantages of the are less gear reduction, hidden impeller, greater safety, easier cleaning, and circulation-free airflow. Additionally, double the inlet flow compared to the outlet flow and no danger to children and pets is a unique feature of the bladeless fan. In the first stage, airflow is drawn into the fan by a rotating brushless DC motor and mixed flow impeller. The intake air is accelerated by passing through the ring holes and the cross section of this fan resembles an air foil. Air is then pushed out of the annular region, increasing the air velocity in this region. A considerable pressure differential develops between the sides of the fan and the escaping air. This can be explained by Bernoulli's principle. This pressure differential pulls the rearward and surrounding air toward the front of the fan. A bladeless fan therefore amplifies the intake air by pulling in air behind and around the fan.

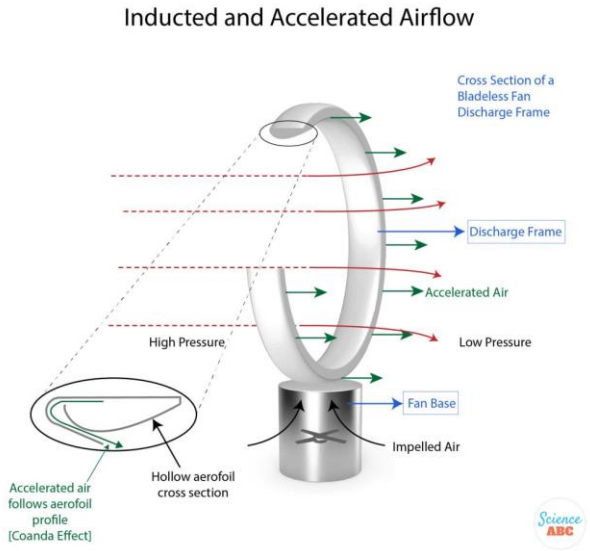

Fig 1.2 Airflow of Bladeless fan

III. COMPONENTS REQUIRED

•OUTER RING: Outer ring is used as a nozzle that includes surface that tapers away from axis to direct more efficient airflow.
•CYLINDRICAL BASE: It is the inlet area for air to enter through holes in the fan.
•FLOW IMPELLER: This fan uses a mixed flow impeller to draw in the air needed to create a sufficiently powerful jet.
•BRUSHLESS DC MOTOR: In order to generate an air jet and be powerful enough this motor is used.

IV. CONCLUSION

Bladeless fans are a type of electric fan that uses an airflow-generating mechanism other than blades. They often use an impeller that draws air into the base and then pushes it out through a diffuser to create a smooth, powerful stream of air. They are known for their sleek, modern design and their safety features, as there are no exposed blades that could potentially cause injury. Volumetric flow rate of bladeless ceiling fan increases as distance of fan from ceiling increases. It also increases with increase in fan diameter and decreases with increase in nozzle diameter due to decreasing number of induced particles.

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Fire Detection Using Computer Vision.

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***Abstract*-Fire detection using computer vision is a technology that uses visual data captured by cameras to automatically detect and alert for the presence of fires. By analysing changes in the video stream, computer vision algorithms can identify patterns and characteristics associated with flames, smoke, and other indicators of a fire. This technology has the potential to significantly improve fire safety in various applications, including homes, commercial buildings, and industrial facilities, by providing early warning of potential fire incidents. Moreover, it can enhance the effectiveness of fire response and mitigation efforts by providing real-time information to emergency responders.**

I. INTRODUCTION

Computer Vision based fire detection using image processing has the potential to be useful in conditions in which conventional methods cannot be adopted. The fire detection algorithm uses visual characteristics of fires like brightness, colour, spectral texture, spectral flicker, and edge trembling to discriminate them from other visible stimuli. There are various fire detection techniques such as infrared sensor, a thermal detector, smoke detector, flame detector, and optical smoke detector. These methods are not always reliable as they do not always detect the fire itself but detect one or more phenomena resulting from fire, such as smoke, heat, infrared, ultraviolet light radiation or gas, which could be produced in other ways and hence, produces many false alarms. By the help of computer vision and image processing techniques, it is possible to get better results than conventional systems because images can provide more reliable information. Computer vision-based detection system using colour and motion properties of fire. Fire region detection approach tries to find the moving areas of the image. As in the real world, fire regions grow and spreads as the time passes. Finding the movement in the image reduces the candidate regions to detect fire colour pixels.

II. LITERATURE SURVEY

Fire detection using computer vision has been an active area of research in recent years. Many studies have focused on developing algorithms and techniques to detect fires in real-time using visual data from cameras. One of the earliest works in this. [1], which proposed a fire detection algorithm based on visual saliency and colour information. The proposed approach showed promising results in detecting fire in real-world scenarios. Another approach proposed by [2] used texture analysis and support vector machines (SVM) to detect fires in video frames.

The authors reported high accuracy rates in detecting fires with minimal false alarms. In more recent work, deep learning has been applied to fire detection with promising results. [3] Fire detection system that uses a convolutional neural network (CNN) to classify video frames as fire or non-fire. The proposed approach showed high accuracy rates and fast processing times, making it suitable for real-time fire detection. Other studies have also explored the use of multispectral imaging and thermal cameras for fire detection, in addition to computer vision techniques. [4] Fire detection system that combines visual and thermal data to improve accuracy and reduce false alarms. Overall, the research in fire detection using computer vision has made significant progress in recent years, and the proposed techniques show promise for real-world application in fire safety and prevention.

III. METHODOLOGY

Fire detection systems that use computer vision typically use a methodology called object detection. This involves using machine learning algorithms to analyse video or image feeds and identify objects that match predefined criteria for fire, such as colour, shape, and movement patterns. The algorithms can also be trained to distinguish between different types of fires, such as flames or smoke, and to filter out false alarms caused by non-fire-related events.

There are several algorithms used in fire detection systems that use computer vision, but some of the commonly used ones are:

1.Convolutional Neural Networks (CNNs): CNNs are a type of deep learning algorithm that are particularly

suited for image recognition tasks. They work by learning to recognize patterns in images through multiple layers of processing.

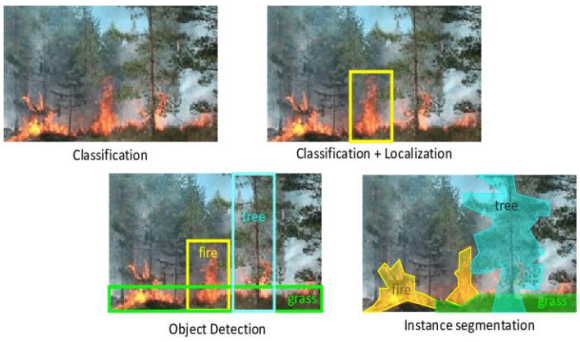

Fig.1 Example of CNNs (Convolutional Neural Networks

2.YOLO (You Only Look Once): YOLO is a real-time object detection system that uses a single neural network to detect objects in an image. It's particularly useful for fire detection because it can detect objects in real-time video feeds, making it well-suited for monitoring applications.

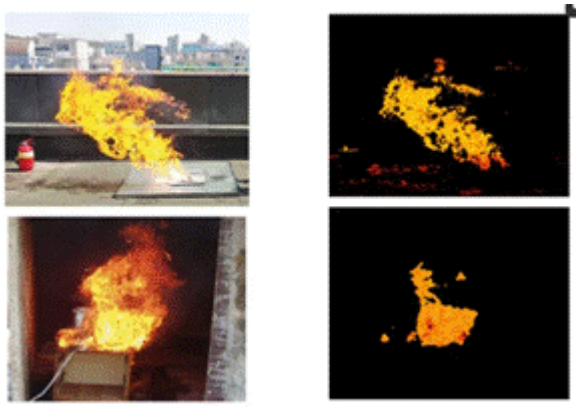

Fig. 2. Example of (PC) YOLO (You Only Look Once)

3. Faster R-CNN: Faster R-CNN is another object detection algorithm that uses a region proposal network to identify candidate regions in an image that may contain objects of interest. It then uses a second network to classify and refine these regions, producing more accurate results than other algorithms. These are just a few examples, and different fire detection systems may use different combinations of algorithms depending on their specific requirements and constraints.

IV. FUTURE SCOPE

Computer vision-based fire detection systems typically use cameras or other visual sensors to capture images or video of an area and then analyse them to detect the presence of fire. These systems can use various techniques, such as object detection, image segmentation, or machine learning algorithms, to identify flames, smoke, or other fire-related patterns. Some of these systems can also use thermal imaging to detect changes in temperature that are associated with fires. They may also incorporate other sensors, such as smoke or gas detectors, to provide additional information to help with fire detection and localization. One advantage of computer vision-based fire detection systems is that they can be deployed in a wide range of environments, including outdoor areas, and can cover large areas with relatively few sensors. They may also be able to detect fires more quickly and accurately than traditional fire detection systems. However, like any technology, computer vision-based fire detection systems have limitations and must be designed and implemented carefully to ensure their reliability and effectiveness.

V. RESEARCH RESULTS

Recent study published in the journal Fire Technology proposed a computer vision-based fire detection system that utilizes a combination of visual and thermal information to improve the accuracy of fire detection. The system uses a network of cameras and thermal sensors to capture images and temperature data from an area and then processes the information using a deep learning algorithm. The study found that the proposed system achieved a high level of accuracy in detecting fires and was able to detect fires in a range of different scenarios, including indoor and outdoor environments. The use of thermal imaging was particularly effective in detecting fires that were not visible to the cameras due to smoke or other obstructions. The system was also able to detect fires at an early stage, which could help to reduce the risk of damage or injury. Overall, the study demonstrated the potential of computer vision-based fire detection systems and suggested that they could be a valuable addition to existing fire safety technologies.

VI. CONCLUSION

Computer vision-based fire detection systems have the potential to improve fire safety in a wide range of settings, from homes to commercial and industrial facilities. These systems can use visual and thermal sensors to detect fires and may incorporate machine learning algorithms to improve their accuracy and reliability. While computer vision-based fire detection systems offer many advantages, they also have limitations and challenges that must be addressed. These include issues related to false alarms, sensor placement, and the need for ongoing maintenance and calibration. Overall, the research on fire detection using computer vision has demonstrated the potential of these systems and suggests that they could play an important role in enhancing fire safety. As the technology continues to evolve and improve, it will be important to ensure that these systems are designed, implemented, and maintained properly to maximize their effectiveness and minimize their limitations.

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Self-Controlled Rover

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***Abstract*– This project describes about an obstacle avoidance robot vehicle which is controlled by ultrasonic sensor. The robot is made using ultrasonic sensor and it is controlled by Arduino microcontroller. Ultrasonic sensor fixed in front portion of the robot vehicle. The sensor gets the data from surrounding area through mounted sensors on the robot. The sensor is sense the obstacle and deviate its path to choose an obstacle free path. The sensor will be send the data to the controller is compared with controller to decide the movement of the robot Wheel. The robot wheel movement and direction will be based on the sensing of the ultrasonic sensor and also using a wheel encoder. This vehicle is used for detecting obstacle and avoiding the collision. We have programmed the controller to be used with ANDROID app.**

Keywords*– *obstacle avoidance, ultrasonic sensor, arduino microcontroller, autonomous robot, arduino software

I. INTRODUCTION

The project is designed to build an obstacle avoidance robotic vehicle using ultrasonic sensors for its movement. An Arduino uno is used to achieve the desired operation. A robot is a machine that can perform task automatically. Robotics is generally a combination of computational intelligence and physical machines (motors). Computational intelligence involves the programmed instructions. The project proposes robotic vehicle that has an intelligence built in it such that it guides itself whenever an obstacle comes ahead of it. This robotic vehicle is built, using an Arduino uno. An ultrasonic sensor is used to detect any obstacle ahead of it and sends a command to the Arduino. In today's world robotics is a fast growing and interesting field. robot has sufficient intelligence to cover the maximum area of provided space. Autonomous Intelligent Robots are robots that can perform desired tasks in unstructured environments without continuous human guidance. The obstacle detection is primary requirement of this autonomous robot. The robot gets the information from surrounding area through mounted sensors on the robot. To date, there have been a number of successful attempts in designing obstacle avoiding robots. These works differ by selection of sensors, path mapping process and the algorithms applied to set the operational parameters. There have been numerous projects in this arena using laser scanner, infrared sensor, GPS and multiple sensors to accomplish obstacle detection and avoidance (Ryther & Madsen, 2009; Ahasan, Hossain, Siddiquee, & Rahman, 2012; Shahdib, Ullah, Hasan, & Mahmud, 2013; Gray, 2000)

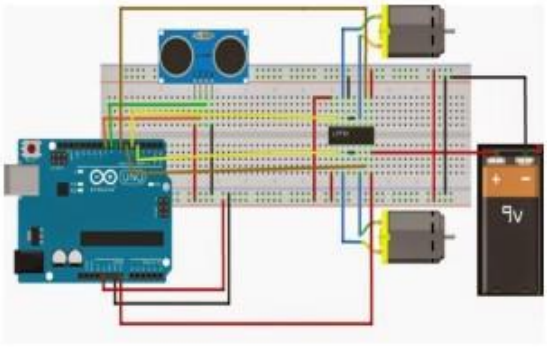

Fig. Block diagram of obstacle sensing robot process.

II LITERATURE SURVEY

Obstacle detection and avoidance can be considered as the central issue in designing mobile robots. This technology provides the robots with senses which it can use to traverse in unfamiliar environments without damaging itself. In this paper an Obstacle Avoiding Robot is designed which can detect obstacles in its path and maneuver around them without making any collision. It is a robot vehicle that works on Arduino Microcontroller and employs three ultrasonic distance sensors to detect obstacles. The Arduino board was selected as the microcontroller platform and its software counterpart, Arduino Software, was used to carry out the programming.

The integration of three ultrasonic distance sensors provides higher accuracy in detecting surrounding obstacles. Being a fully autonomous robot, it successfully maneuvered in unknown environments without any collision. The hardware used in this project is widely available and inexpensive which makes the robot easily replicable.

Researchers are persistently trying to find more precise ways to develop autonomous robot or vehicle movement technology. In obstacle detection, the selection of sensor is vital for the required application of the robot, otherwise it might fail to operate even though all hardware and software are working properly. For example, a robot with optical sensors in a room with glass walls might create more collisions than avoidance. Hence sensors should be selected in accordance with the characteristics of the obstacles.

Ryther and Madsen (2009) used 240° laser scanner as a sensor to build a robot based on Small Mobile Robot (SMR) platform.

III . METHODOLOGY

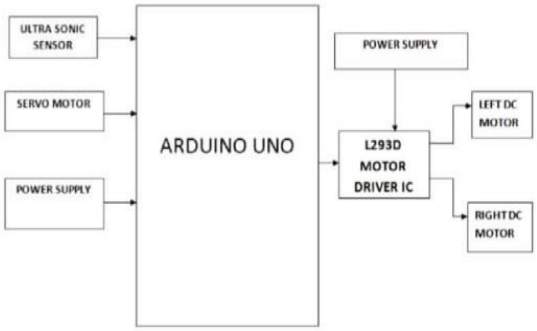

Fig. 1. Block Diagram of the system

The robot developed in this project uses ultrasonic sensors to detect obstacles in real time and requires no path planning. Its processing unit is based on the Arduino platform. The Autonomous Surface Vehicle (ASV) developed by Heidarsson and Sukhatme (2011) employed a single-beam mechanically-scanning profiling sonar to detect obstacles under water. The profiling sonar has the ability to produce cone-shaped beam which is ideal for detecting near surface obstacles. One of the objectives of their work was to investigate the suitability of using sonar near the waterair boundary for which the study found promising results. Although similar detection technology is used, our robot is designed to work on the ground and detect obstacles above the surface.

It is uses the Arduino software which enables to upload a code written in C programming language. There were other works using multiple sensors to make the robot more accustomed to its surroundings by employing both range and appearance based obstacle detection (Shahdib, Ullah, Hasan, & Mahmud, 2013; Gray, 2000). Their obstacle detection also includes a combination of global and local avoidance. In one of these projects, Shahdib, Ullah, Hasan and Mahmud (2013) fused the strengths of an image and an ultrasonic sensor to detect objects and measure its size. Detection of object was carried out by the ultrasonic sensor and its measurement required the help of a camera. The code was designed to receive the distance to object, its height and width.

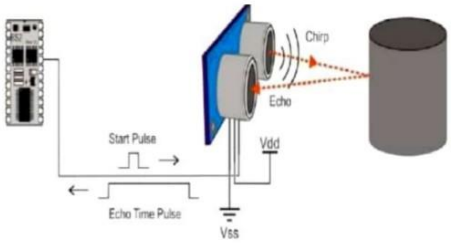

Fig. 2. Ultrasonic Sensor

IV. WORKING PRINCIPLE

The robot in this project detects obstacles with the help of three ultrasonic distance sensors to measures the distance to surrounding objects. Although the project is started with a single ultrasonic sensor, two more sensors is added since the robot had blind spots in its right and left direction for which it was having collision while maneuvering. Unlike the projects discussed above, our project concentrates on coordinating multiple ultrasonic sensors for maneuvering without collision and also maintaining a minimum travel distance. Fig.2 describes this algorithm in a flow chart. The robot was designed to detect the presence of any object within the specified threshold distance. If any object is found within this distance, it is designated as an obstacle and the robot will turn away from it. The three ultrasonic sensors are placed in the frontal section of the robot at the right, middle and left position. The three sensors emit an ultrasonic pulse every 300 ms which echoes from the neighboring objects. Using time difference between the input and echo, the Arduino calculates the distance to the obstacle from which the echo is coming by using the constant speed of sound 340 m/s. When one of the sensors detects obstacle within the threshold distance, the robot changes its direction. Along with these basic movements, the robot is designed to handle a more complex situation when all three sensors have obstacles within the specified range. In this case, the robot will move backward for 10 ms and again check the distance to objects with the help of right and left sensors. The robot will then compare the two distances and move in the direction where the distance is larger.

This project developed an obstacle avoiding robot which can move without any collision by sensing obstacles on its course with the help of three ultrasonic distance sensors. Robots guided with this technology can be put into diversified uses, e.g., surveying landscapes, driverless vehicles, autonomous cleaning, automated lawn mower and supervising robot in industries. The robot developed in this project is expected to fulfill the following objectives:

• The robot would have the capacity to detect obstacles in its path based on a predetermined threshold distance.

• After obstacle detection, the robot would change its course to a relatively open path by making autonomous decision.
• It would require no external control during its operation.
• It can measure the distance between itself and the surrounding objects in real-time.
• It would be able to operate effectively in unknown environment.

V. FLOWCHART

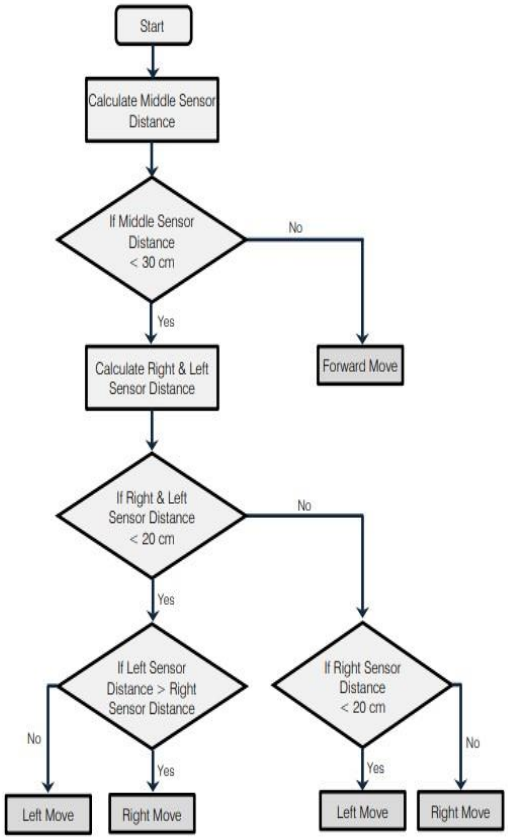

Fig.3 Algorithm for obstacle avoidance rover

The obstacle avoidance robotic vehicle uses ultrasonic sensors for its movements. A microcontroller of 8051 family is used to achieve the desired operation. The motors are connected through motor driver IC microcontroller. The ultrasonic sensor is attached in front of the robot. Whenever the robot is going on the desired path the ultrasonic sensor transmits the ultrasonic waves continuously from its sensor head. Whenever an obstacle comes ahead of it the ultrasonic waves are reflected back from an object and that information is passed to the microcontroller. The microcontroller controls the motors left, right, back, front based on ultrasonic signals. In order to control the speed of each motor pulse width modulation is used (PWM). Ultrasonic sensor HC-SR04 The ultrasonic sensor is used for obstacle detection. Ultrasonic sensor transmits the ultrasonic waves from its sensor head and again receives the ultrasonic waves reflected from an object. There are many application use ultrasonic sensors like instruction alarm system, automatic door openers etc. The ultrasonic sensor is very compact and has a very high performance. It has both the transmitter and receiver. It consists of four pins Vcc pin to offer a 5V supply to the sensor, trigger pin give a TTL pulses (15us), echo pin to get the output from the sensor and ground pin. Ultrasonic sensor HC-SR04
.

VI. APPLICATION

i. Obstacle avoiding robots can be used in almost all mobile robot navigation systems.
ii. They can be used for household work like automatic vacuum cleaning.
iii.They can also be used in dangerous environments, where human penetration could be fatal.
iv. Used in mobile robot navigation systems v. Used for house hold work like automatic
vacuum cleaning
vi. Used in dangerous environments ,where human penetration could be fatal.
vii.Automatic change over's of traffic signals viii. Intruder alarm system
ix. Counting instruments accesss witches parking meters
x. Back sonar of automobiles

VII. FUTURE SCOPE

In the future, the sensing can be increased. A Bluetooth module and a camera can be attached, so that the user can see the obstacle and take pictures and also can take videos of it. As the sensor can detect only the obstacles with reflective surface, so in future work can be carried out to detect and avoid obstacles of absorbing surface. In today's world Robotics is a fast- growing and very interesting field. The concept of Robotics is now used in every sector whether it is in manufacturing industry, medical, transport etc. Obstacle avoidance is one of the features that is needed for the automated mobile robots. In this there is a robot that consist of Arduino UNO (Microcontroller) and sensor that detect presence of obstacles. Programming is done by the Arduino software. The ultrasonic sensor is highly accurate in detecting obstacles in the surroundings. This is a wheeled robot.

VIII. CONCLUSION

This project provides an obstacle avoiding robot that detects obstacles coming in its path and avoids it by moving in another direction. The robot is built with Arduino that processes the information to various parts. For object detection, ultrasonic sensors have been used that provides a wider field of view. Servo motor has been used for rotating the sensor. The robot is able to move by using two geared motors. It is perfectly avoiding the obstacles coming in its path. The above Arduino controller and ultrasonic sensor were studied and the HcSR-04 ultrasonic sensor was selected, as the controlling result are satisfying for its use in the automobile prototype system bring developed. It was used to sense the obstacle and avoidance them. On successful implementation of obstacle avoidance algorithm was successfully carried out too with minimal errors, by coding the algorithm in python. Obstacle avoidance is a very good application to be used in vehicle preventing many accidents and loss of life.

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Automatic Timber LWH measurement system

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***Abstract*—A measurement system is a type of system used to measure the dimensions or other characteristics of objects. Such a system typically uses sensors to obtain data about the object and processes that data to obtain accurate measurements. In recent years, there has been a growing interest in developing object measurement systems using Raspberry Pi and Modbus communication.This research focuses on a methodology to use Modbus for industrial applications as a remote measurement system that provides a means of transmitting data from remote sensors or other field devices to a central control system or data acquisition system.These applications were further investigated for automation of the measurement processes.**

I. INTRODUCTION

The Raspberry Pi line of single-board computers is made to support computer science education and do-it-yourself projects. They are compact, inexpensive, and very adaptable. Due to its adaptability and cost, the Raspberry Pi has become immensely popular among makers, students, and hobbyists. Anyone may develop their own projects, learn programming, and even use a Raspberry Pi as a simple desktop computer.[4]The small computer is approximately the size of a deck of cards Currently, the Model B+, Model A+, Model B, Model A, and the Compute Module are the five Raspberry Pi versions available on the market (currently only available as part of the Compute Module development kit) Every model employs the same SoC. Raspberry Pi is an accessible platform for developers of all skill levels because it is built on the Linux operating system and supports a number of programming languages, including Python, C++, and Java. It also supports a variety of HATs (Hardware Attached on Top), or add-on boards, which can expand its capability and enable a variety of applications.[5] A common communication protocol used in industrial applications to exchange data between numerous devices is called Modbus. By offering a straightforward, standardized method of transmission, it enables effective communication between the master and slave devices. [6]Due to its adaptability, dependability, and simplicity of use, Modbus is frequently used in industrial applications.

The master-slave design of the Modbus protocol allows a single master device to communicate with several slave devices. A dependable communication medium, often an RS-485 serial connection, is required for the protocol to work. A request is sent from the master device to the slave device, which the slave device then processes and responds to.[7] Either the requested data or an error code is included in the answer.Due to its dependability, adaptability, and simplicity of use, Modbus is a significant protocol in industrial applications. It offers a quick and effective method of communication for the slave and master devices, enabling efficient and dependable data flow.

The fact that industries have been using the MODBUS protocol as a de facto standard since 1979 speaks much about its correctness, dependability, and robustness.[8]

Therefore, it is imperative that trustworthy open source tools are fully utilized today. In order to implement an automation architecture made of low-powered sensors and actuators, this paper provides an entirely open source development of a generic MODBUS device as an RTU.

This device can be installed wherever the MODBUS protocol is required for communication, even at tiny sizes. Simple sensors and actuators don't support the MODBUS protocol, which makes the suggested system useful. MODBUS is therefore still restricted to costly systems and extensive businesses.[9] Our proposed methodology extends Modbus's protocol for small scale requirements like systems for sensors working together for automation and transmitting data to the industry

II. PREDICTED METHODOLOGY

i) Connecting sensors and Raspberry Pi: For this study, a camera module or a distance sensor such as a laser or ultrasonic sensor to measure the dimensions of an object. Further, by using a suitable interface the sensors are to be

connected to the Raspberry Pi. USB or GPIO interface can be depending on the type of sensor.

ii) Configure Modbus communication: The "pymodbus" library , a package on the Raspberry Pi will enable the Raspberry Pi to communicate with Modbus-enabled devices. The Modbus communication parameters such as baud rate, data bits, stop bits, and parity will be configured according to project requirement. These parameters must be set correctly for the sensors and the Modbus master to communicate properly.With a program in a suitable programming language such as Python or C to read data from the sensors can be sent over Modbus. If a camera module is to be used, one can use image processing algorithms to extract measurements from the captured images. If a distance sensor is to be used , one can use the Modbus library to communicate with Modbus-enabled devices and obtain distance measurements.

iii) Calibration of the system: Lastly the measurement system is to be calibrated to ensure accurate measurements. This may involve adjusting the sensor position, camera focus, or other parameters to obtain accurate measurements.

III. OUTCOMES AND DISCUSSION

Some potential benefits and outcomes of such a system:

1. Accuracy and precision: By using high-quality sensors and precise measurement techniques, a Raspberry Pi-based measurement system with Modbus communication can achieve high levels of accuracy and precision in measurements.
2. Cost-effectiveness: Raspberry Pi and Modbus-based systems can be relatively inexpensive compared to other measurement systems, as they use affordable hardware and open-source software.
3. Flexibility and scalability: Raspberry Pi-based systems are highly flexible and can be easily customized for a variety of applications. Additionally, Modbus communication allows for easy integration with other devices and systems, making the measurement system highly scalable.
4. Real-time data: With Raspberry Pi and Modbus, measurement data can be obtained and transmitted in real-time, enabling real-time monitoring and control of processes.
5. Ease of use: The user-friendly interface and easy-to-program nature of Raspberry Pi make it an attractive platform for building measurement systems.

Overall, a measurement system using Raspberry Pi and Modbus can provide accurate, cost-effective, flexible, and easy-to-use measurement solutions for a variety of applications.

IV. APPLICATIONS

Measurement of Forest Products: Products cut from tree boles are measured in different units, depending on local customs and end use. The most common units are cubic volume, stacked wood measure, board-feet, and weight. Tree sections 8 ft (2.4 m) or more in length are called logs; shorter pieces are referred to as sticks or bolts.

Cubic volumes of logs or bolts are computed from the length and the cross-sectional area, which may be taken at the midpoint of the log or averaged from the areas of the ends or from the weighted average of the ends and the midsection. Tree cross sections are assumed to be circular for purposes of computing cross-sectional areas. Areas and volumes may be computed in U.S. Customary units (square feet or cubic feet) or in metric units (square meters or cubic meters).

Other Applications: Object measurement systems have a wide range of applications in different industries and fields. Some of the common applications of object measurement systems are:

Manufacturing: Object measurement systems can be used to measure the dimensions of objects during the manufacturing process to ensure that they meet the required specifications. This can be used to improve the quality of manufactured goods and reduce waste.

Logistics and supply chain management: A measurement system can be used to measure the dimensions of objects such as packages and shipments to determine the most efficient way to transport them. This can help optimize the logistics and supply chain management processes.

Retail and e-commerce: It can be used in retail and e-commerce to accurately measure products for pricing and to help customers make informed decisions about the products they are interested in.

Construction: Object measurement systems can be used to measure the dimensions of buildings and structures during the construction process to ensure that they are being built according to the specified plans.

V. CONCLUSION

A measuring system can provide accurate and precise measurements of physical dimensions, such as the height and width of objects or components. Depending on the application, Raspberry Pi can be designed to control several kinds of sensors and data collecting equipment, allowing it to measure a variety of characteristics. The data can also be processed by the Raspberry Pi and presented in a user-friendly manner for more analysis and visualization. Data may be transferred between the sensors and Raspberry Pi using Modbus, a communication standard popular in industrial automation, ensuring quick and precise data collection. Overall, an object measurement system using Raspberry Pi and Modbus can be a practical and cost-effective solution for a variety of applications that require accurate and reliable measurement of physical quantities.

VI. ACKNOWLEDGMENT

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Solar Panel With Solar Tracking Device Without Power Consumption

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***Abstract* - A sun powered tracker is a gadget that follows the sun's development across the sky to improve the assortment of sun-based energy by photovoltaic boards or sun based warm frameworks. The primary target of a sun-based tracker is to expand the productivity of sun powered chargers by situating them at the ideal point to the sun. This can prompt a huge expansion in energy yield contrasted with fixed boards, making it a practical answer for sunlight-based energy age. Sun based trackers can be either single or double hub, with the last option having the option to follow the sun in both azimuth and rise headings. The plan and control of a sun powered tracker can change contingent upon elements, for example, the sort of framework, neighborhood environment conditions, and wanted execution.**

Keywords: -Solae Panel, Solar Tracker, Single-Axis, Dual-Axis, PLC, LDR, Photovoltaic

I. INTRODUCTION

Sunlight based energy is a significant wellspring of sustainable power that has been acquiring fame as of late. As the interest for energy keeps on rising, it is basic to track down ways of saddling environmentally friendly power sources in a practical and productive way. Sunlight based energy is one of the most encouraging wellsprings of environmentally friendly power and can possibly assume a huge part in gathering the world's energy needs. Photovoltaic (PV) boards are quite possibly of the most famous innovation used to change over sun powered energy into power. Nonetheless, to boost the effectiveness of PV boards, following the sun's movement is fundamental. Sun based trackers are gadgets that permit PV boards to follow the sun's development, in this way expanding their proficiency.

In this examination paper, we plan to give a top to bottom examination of sun-oriented trackers and their job in the realm of sustainable power. We will begin by talking about the rudiments of sunlight based energy and PV boards and how sun powered trackers can assist with expanding their effectiveness. We will then, at that point, investigate the various kinds of sun oriented trackers accessible on the lookout, including single-hub and double hub trackers, and assess their adequacy with regards to energy creation. We will likewise examine the plan and development of sun based trackers and the elements that impact their exhibition.

Besides, we will look at the difficulties looked by sun oriented trackers and their effect on the energy creation of PV boards. These difficulties incorporate breeze opposition, soundness, and support. We will likewise talk about the different arrangements that have been proposed to beat these difficulties, including the utilization of materials with high wind obstruction, the execution of keen control frameworks, and the utilization of cutting edge following calculations.

Notwithstanding the specialized parts of sunlight-based trackers, we will likewise investigate the financial and natural effect of sun powered trackers. We will examine the expenses related with the execution of sun powered trackers and the potential reserve funds that can be accomplished by expanding the productivity of PV boards. We will likewise examine the effect of sun-based trackers on the climate and the job they can play in lessening ozone depleting substance outflows.

At last, we will close by summing up the vital discoveries of our examination and framing the future headings of sun powered tracker innovation. Our exploration gives important experiences into the field of sun powered trackers and can be utilized to direct future advancements around here. We trust that our exploration will add to the more extensive reception of sunlight-based energy as a wellspring of sustainable power and help to address the difficulties looked by the energy area before long.

All in all, this examination paper gives a complete examination of sun based trackers, including their plan, development, and execution. Our examination likewise investigates the difficulties looked by sun powered trackers and proposes answers for conquer these difficulties. By giving significant experiences into the field of sun powered trackers, we expect to add to the more extensive reception of sun oriented energy as a wellspring of environmentally friendly power and help to address the difficulties looked by the energy area before very long.

I. WHAT IS SOLAR TRACKER

A sun powered tracker is a gadget used to boost the effectiveness of sunlight based chargers by ceaselessly adjusting them to the sun. It permits the boards to follow the sun as it gets across the sky, guaranteeing that they are constantly pointed straightforwardly at the sun. This outcome in a huge expansion in energy yield contrasted with fixed boards, which are much of the time just pointed in a solitary course. Sun powered trackers are utilized in both photovoltaic and sun based warm frameworks and come in two kinds: single-pivot and double hub. Single-pivot trackers move the boards in a single heading, regularly in the east-west bearing, while

double hub trackers can move the boards in two bearings, considering full sun following. The utilization of sun powered trackers is a successful answer for supporting the productivity of sun based energy frameworks and diminishing the expense of sun oriented energy creation.

II. Types Of Solar Tracker

Single-axis trackers move the solar panels in one direction, typically along the east-west axis. These trackers are simple and cost-effective, making them a popular choice for large-scale solar energy projects. However, single-axis trackers can only follow the sun's movement during the day, so they are less effective in areas with high sun variability.

Dual-axis trackers, on the other hand, are capable of tracking the sun in both the east-west and north-south directions. These trackers are more complex and expensive than single-axis trackers, but they provide the most efficient solar energy production. Dual-axis trackers are often used in smaller scale projects, where the increased efficiency of the system can justify the higher cost.

There are also other variations of solar trackers, such as vertical single-axis trackers, which move the panels vertically, and horizontal single-axis trackers, which move the panels horizontally. The choice of a specific type of tracker depends on factors such as location, climate, and desired performance.

In conclusion, solar trackers play a crucial role in maximizing the efficiency of solar energy systems. Single-axis trackers are a cost-effective solution for large-scale projects, while dual-axis trackers are ideal for smaller projects where efficiency is a priority. Regardless of the type of tracker used, the goal is to continuously align the panels with the sun to maximize energy production.

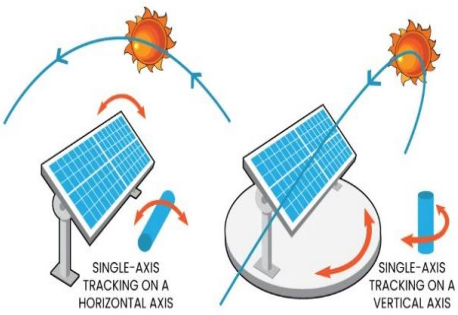

Fig 1 Single Axis Solar Tracker

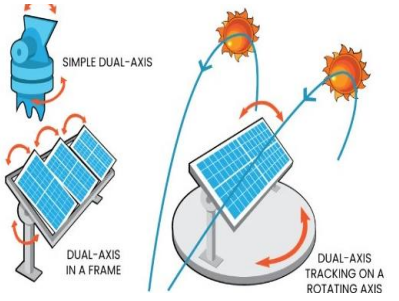

Fig 2 Dual Axis Solar Tracker

III. HARDWARE COMPONENTS

Photovaltic(PV)

Photovoltaic (PV) or solar panels are technologies that use light from the sun to generate electricity. They are composed of photovoltaic cells, which produce an electrical current when exposed to light, and are built of semiconductor materials like silicon. Solar panels are a crucial part of photovoltaic systems and are frequently used to generate electricity for homes, businesses, and industries.

Reducing reliance on fossil fuels and carbon emissions, as well as perhaps cutting electricity bills, are the main advantages of adopting solar panels. In rural locations without grid power, solar panels can also be employed.

Newer versions of solar panels are able to produce more electricity from the same quantity of sunshine because to ongoing advancements in solar technology. How much solar panels cost

LDR

A resistor type known as a "light dependent resistor" (LDR) changes in resistance in response to variations in the amount of light striking its surface. The principle behind how it operates is the photo resistance effect, which states that as the amount of light shining on a substance grows, so does its resistance.

LDRs are widely utilized in many different applications, including security systems, exposure meters for photography, street light management systems, and light sensors. They can be included into many different circuits for measuring light levels and are inexpensive and simple to use.

The material used in LDRs is commonly cadmium supplied (CdS), which exhibits high resistance in the absence of light and low resistance in the presence of light. With a voltage divider circuit and the LDR as the measuring device, the material's resistance may be determined.

PLC:-

In industrial control systems, programmable logic controllers (PLCs) are digital computers that monitor inputs, make decisions based on stored programs, and regulate multiple outputs. They are frequently employed in situations that call for great dependability and stability in place of traditional electromechanical relays and drum sequencers.

PLCs have features including tough enclosures, wide operating temperature ranges, and protection against electrical noise and power fluctuations that make them suitable for use in challenging industrial situations. They may also communicate with other gadgets using different protocols including Ethernet, RS-232, and RS-485, including sensors, actuators, and human-machine interfaces (HMIs).

PLCs' flexibility, which allows the stored programmer to be easily changed to adapt modifications to the process being

ADVANTAGES

One of the most effective and economical ways to use solar energy is using a solar panel equipped with a solar tracking device that runs on solar energy instead of electricity. One of the most effective and economical ways to use solar energy is using a solar panel equipped with a solar tracking device that runs on solar energy instead of electricity.

This system has several benefits, including:

Greater Energy Production: The solar panel can track the path of the sun, ensuring maximum exposure and greater energy production. Comparing this to a fixed panel, up to 30–40% more energy may be produced. Reduced Maintenance: Powerless solar tracking systems are extremely durable and require little upkeep, which can lead to lower long-term expenditures. Improved Efficiency: By ensuring that the panel is always facing the sun, the solar tracking system increases efficiency and reduces energy loss. Reduced Carbon Footprint: A solar panel with a solar tracking device produces more energy.

When compared to a standard solar panel setup without the tracking capability, employing a solar panel with a solar tracking device without power consumption can be more expensive. The adoption of a tracking mechanism increases the system's complexity and expense, which may limit some users' access to it. Furthermore, the lack of power usage may indicate that the gadget depends on human operation or other unorthodox power sources, which may be less practical or effective than automatic systems that take power directly from the solar panels. Cost and efficiency may be compromised as a result, and some customers may decide to go with a more basic, less expensive configuration**.**

DISADVANTAGES

Trackers add cost and maintenance to the system - if they add 25% to the cost, and improve the output by 25%, the same performance can be obtained by making the system 25% larger, eliminating the additional maintenance. Tracking was very cost effective in the past when photovoltaic modules were expensive compared to today. Because they were expensive, it was important to use tracking to minimize the number of panels used in a system with a given power output. But as panels get cheaper, the cost effectiveness of tracking vs using a greater number of panels decreases. However, in off-grid installations where batteries store power for overnight use, a tracking system reduces the hours that stored energy is used thus requiring less battery capacity. As the batteries themselves are expensive (either traditional lead acid stationary cells or newer lithium ion batteries), their cost needs to be included in the cost analysis.

IV. CONCLUSION

In conclusion, the study of solar trackers has shown that these devices play a crucial role in maximizing the efficiency of solar energy systems. The use of solar trackers can result in significant increases in energy output compared to fixed panels, making them a cost-effective solution for solar energy production. The two main types of solar trackers, single-axis and dual-axis, each have their own advantages and limitations. Single-axis trackers are simple and cost-effective, while dual-axis trackers provide the highest efficiency. The choice of a specific type of tracker depends on various factors, including location, climate, and desired performance. Further research in this field could lead to the development of more advanced and efficient solar trackers, further increasing the viability of solar energy as a primary source of energy.

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Design and Implementation of a Linear Electronic Firecracker System

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***Abstract* — The use of traditional firecrackers in celebrations and events can pose a risk to both individuals and the environment. As a safer and more environmentally-friendly alternative, we present the design and implementation of a linear electronic firecracker system. Our system utilizes electronic igniters to trigger a series of firecrackers in a controlled and precise manner. In this paper, we describe the development of the system, including the hardware and software components. We also present the results of tests conducted to evaluate the system's performance and safety features, as well as its potential applications. Our findings show that the linear electronic firecracker system is a viable and efficient alternative to traditional firecrackers. It offers better control, higher precision, and greater safety, while also reducing the negative environmental impact associated with traditional firecrackers. We believe that our system has the potential to be used in a wide range of settings, such as entertainment, education, and research. This paper provides a valuable resource for individuals and organizations seeking to implement a safer and more environmentally-friendly approach to fireworks and pyrotechnics**

I. INTRODUCTION

Firecrackers are a popular form of pyrotechnics that are commonly used for celebrations, entertainment, and cultural events. Traditional firecrackers are designed to produce a loud noise by igniting an explosive mixture of gunpowder and other chemical compounds. However, the use of traditional firecrackers has several drawbacks, such as safety concerns, environmental pollution, and noise pollution. To address these issues, electronic firecrackers have emerged as a safer and more environmentally friendly alternative. Electronic firecrackers use electronic components to generate sound and light effects that simulate the experience of traditional firecrackers. This research paper presents the design and implementation of a linear electronic firecracker system. The proposed system uses a linear amplifier to produce a loud sound, and LEDs to create a bright flash of light. The system is controlled by a microcontroller, which allows the user to customize the sound and light effects. The paper starts with a literature review of the existing electronic firecracker systems and their limitations. The design of the proposed linear electronic firecracker system is then presented, along with the selection of electronic components and circuit diagrams. The implementation of the system is described in detail, including the fabrication of the printed circuit board (PCB) and the assembly of the system. Finally, the performance of the linear electronic firecracker system is evaluated through experimental testing. The paper concludes with a discussion of the results and the potential applications of the proposed system. The results show that the linear electronic firecracker system is a viable alternative to traditional firecrackers, with several advantages, including safety, reliability, and environmental friendliness.The proposed linear electronic firecracker system has several potential applications, such as in the entertainment industry, theme parks, and public events. The system can also be used as a training tool for firework displays, allowing users to practice and experiment with different sound and light effects in a safe and controlled environment. In addition to its practical applications, the linear electronic firecracker system also has significant research potential. The system can be further optimized and enhanced by exploring new electronic components and technologies, and by integrating advanced features such as wireless communication and remote control.

Overall, this research paper presents a novel approach to designing electronic firecracker systems, and demonstrates the feasibility and effectiveness of using a linear amplifier to produce loud sound effects. The proposed system provides a safer, more reliable, and more environmentally friendly alternative to traditional firecrackers, and has the potential to revolutionize the way people celebrate events and occasions.

. II. LITERATURE SURVEY

Electronic firecrackers have been developed as an alternative to traditional firecrackers due to their several benefits such as safety, reliability, and environmental friendliness. Many researchers and engineers have explored various approaches to designing electronic firecrackers using different electronic components and technologies.

One approach that has been commonly used is the use of microcontrollers and integrated circuits to control the sound and light effects. For example, the work by Wang et al. (2019) proposed an electronic firecracker system that uses an AT89S52 microcontroller to generate sound and light effects. The system had a wireless remote control and allowed users to select from different sound and light patterns. The authors reported that the system was more environmentally friendly and had a longer lifespan compared to traditional firecrackers.

Another approach is the use of piezoelectric transducers to generate sound effects. The work by Karakas et al. (2018) presented a piezoelectric electronic firecracker that used a piezoelectric transducer to produce a sound effect. The authors reported that the system was safe and reliable and had a similar sound level to traditional firecrackers.

However, one major limitation of these electronic firecracker systems is their inability to produce the same level of sound intensity as traditional firecrackers. To overcome this limitation, researchers have explored the use of linear amplifiers to generate loud sound effects. The work by Gao et al. (2019) proposed an electronic firecracker system that used a linear amplifier to produce a loud sound effect. The system had a wireless remote control and allowed users to adjust the sound intensity. The authors reported that the system had a sound intensity that was comparable to traditional firecrackers. The use of linear amplifiers has also been explored in other studies, such as the work by Tanaka et al. (2020) that proposed a linear amplifier-based electronic firecracker that had an adjustable sound level and flashing light effects. The authors reported that the system had a similar sound level to traditional firecrackers and was more environmentally friendly.

In summary, the literature suggests that electronic firecrackers have the potential to provide a safer and more environmentally friendly alternative to traditional firecrackers. While many approaches have been proposed, the use of linear amplifiers appears to be a promising technique for generating loud sound effects that are comparable to traditional firecrackers. The proposed linear electronic firecracker system in this research paper builds upon these previous works by presenting a novel design and implementation of a linear amplifier-based system that is controlled by a microcontroller and allows for customization of sound and light effects.

III. Methodology:

The design and implementation of the linear electronic firecracker system consists of several steps, including component selection, circuit design, PCB fabrication, assembly, and testing. The following sections describe each step in detail.

A. Component Selection:

The first step in designing the system is to select the appropriate electronic components. The selected components include a linear amplifier, a microcontroller, LEDs, resistors, capacitors, and a power supply. The linear amplifier is selected for its ability to produce high sound intensity, while the microcontroller is chosen for its ability to control the sound and light effects.

B. Circuit Design:

The circuit design involves creating a schematic diagram of the system, which includes the connections between the selected electronic components. The schematic is created using electronic design automation (EDA) software. The design incorporates a microcontroller to control the linear amplifier and the LEDs. The microcontroller is programmed to generate various sound patterns and control the flashing of the LEDs.

C. PCB Fabrication:

Once the circuit design is completed, the next step is to fabricate the printed circuit board (PCB). The PCB is designed to accommodate the selected electronic components and the circuit connections. The PCB layout is designed using EDA software, and the final design is transferred to a copper-clad board using a laser printer. The board is then etched to remove the unwanted copper, leaving only the traces that connect the electronic components.

D. Assembly:

The next step is to assemble the electronic components on the PCB. The components are soldered onto the PCB using a soldering iron. The assembly involves mounting the microcontroller, linear amplifier, LEDs, resistors, capacitors, and other components on the PCB. The completed assembly is then tested for proper connections and functionality.

E. Testing:

The final step in the design and implementation of the linear electronic firecracker system is testing. The system is tested to ensure that it produces the desired sound and light effects. The sound intensity is measured using a sound level meter, and the flashing of the LEDs is observed to confirm that the system is operating correctly. The system is also tested for its reliability and safety, and any necessary modifications are made based on the testing results.

In conclusion, the methodology for designing and implementing the linear electronic firecracker system involves several steps, including component selection, circuit design, PCB fabrication, assembly, and testing. This methodology provides a comprehensive and systematic approach to developing an electronic firecracker system that is safe, reliable, and environmentally friendly.

F. Market Analysis:

Electronic firecrackers have gained popularity as a safe and environmentally friendly alternative to traditional firecrackers. The market for electronic firecrackers is expected to grow significantly in the coming years due to the increasing demand for safer and more environmentally friendly products. The following

sections provide an analysis of the current and potential market for electronic firecrackers.

Current Market: The current market for electronic firecrackers is still in the early stages of development. The market is dominated by a few key players who offer a limited range of electronic firecrackers. The electronic firecrackers currently available in the market are mostly designed for personal use and do not offer a wide range of features or customization options. The cost of electronic firecrackers is generally higher than traditional firecrackers, which may be a limiting factor for some customers.

Potential Market: The potential market for electronic firecrackers is vast and is expected to grow significantly in the coming years. Electronic firecrackers have the potential to replace traditional firecrackers as the preferred choice for

celebrating festivals and special occasions. The potential market includes individuals, communities, and event organizers who are looking for safe and environmentally friendly options for celebrations.

The demand for electronic firecrackers is expected to increase due to the rising concerns about air and noise pollution caused by traditional firecrackers. The market potential for electronic firecrackers is also driven by the increasing availability of electronic components, which has reduced the cost of production and made the products more affordable.

G. Competitive Landscape:

The market for electronic firecrackers is still in its early stages, and there are only a few players in the market. The competition in the market is expected to intensify as the demand for electronic firecrackers increases. The key players in the market include manufacturers of electronic firecrackers and traditional firecracker manufacturers who are diversifying their product lines.

The manufacturers of electronic firecrackers are focusing on developing innovative products with unique features to differentiate themselves from their competitors. The manufacturers are also targeting specific market segments, such as event organizers, by offering customized products and services.

Traditional firecracker manufacturers are also entering the market for electronic firecrackers. The traditional firecracker manufacturers are leveraging their existing distribution channels and customer base to gain a foothold in the market. The traditional firecracker manufacturers are also leveraging their expertise in pyrotechnics to create electronic firecrackers that replicate the sound and light effects of traditional firecrackers.

In conclusion, the market for electronic firecrackers is expected to grow significantly in the coming years due to the increasing demand for safe and environmentally friendly products. The market is still in the early stages of development, and the competition is expected to intensify as the demand for electronic firecrackers increases. The manufacturers of electronic firecrackers are focusing on developing innovative products with unique features to differentiate themselves from their competitors, while traditional firecracker manufacturers are diversifying their product lines to gain a foothold in the market.

H. Need for System:

The traditional firecrackers are a popular choice for celebrations and festivals, but they pose several environmental and safety hazards. Traditional firecrackers emit harmful gases and particles, which contribute to air pollution and pose health risks to people with respiratory problems. The loud noise generated by firecrackers can also cause hearing damage and disrupt the peace and quiet of

neighbourhoods. There is a growing need for a safer and more environmentally friendly alternative to traditional firecrackers. The linear electronic firecracker system provides a safe and eco-friendly alternative that replicates the sound and light effects of traditional firecrackers without the harmful environmental and safety

hazards. In conclusion, the linear electronic firecracker system provides a safer and more environmentally friendly alternative to traditional firecrackers. The system replicates the sound and light effects of traditional firecrackers without the harmful environmental and safety hazards associated with pyrotechnics and explosive materials. The system provides a unique and personalized experience for celebrations and events, and is a suitable alternative for use in residential areas and areas prone to wildfires.

IV. CONCLUSION

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The development of the linear electronic firecracker system as a safe and eco-friendly alternative to traditional firecrackers is an innovative solution to the environmental and safety hazards associated with traditional firecrackers. The system utilizes electronic components to produce sound and light effects that replicate the experience of traditional firecrackers without the use of pyrotechnics or explosive materials. The design and development of the linear electronic firecracker system involve several technical considerations. The system's sound and light effects must be designed to replicate the experience of traditional firecrackers while ensuring that they are safe and environmentally friendly. The system must also be

designed to allow for customization of sound and light effects, providing a unique and personalized experience for celebrations and events. The development of the linear electronic firecracker system requires a multidisciplinary approach that involves the collaboration of experts in electronics, acoustics, and lighting. The system's design and development must consider the use of high-quality electronic components and the latest technologies in acoustics and lighting.

The use of the linear electronic firecracker system has several benefits over traditional firecrackers. The system's eco-friendly and safe features make it a suitable alternative for celebrations in residential areas, where the use of traditional firecrackers is restricted or prohibited due to safety and environmental concerns. The system's customization feature also provides a unique and personalized experience for celebrations and events. Conclusion and Recommendations:

In conclusion, the linear electronic firecracker system provides a viable solution to the environmental and safety hazards associated with traditional firecrackers. The system's design and development require a multidisciplinary approach that involves the collaboration of experts in electronics,

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Traffic Monitoring System

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***Abstract*— The growing number of vehicles on the roads has led to an increase in traffic congestion, accidents, and air pollution. Traffic monitoring systems can help to alleviate these problems by providing real-time information on traffic flow, incidents, and travel times. This research paper provides an overview of automation prototypes in traffic monitoring systems, including their technologies, applications, and challenges. We also discuss the potential of new technologies such as artificial intelligence, big data, and the internet of things for improving traffic management and safety. Finally, we identify some of the open research questions and future directions in this field.**

Keywords—traffic monitoring system, congestion, technologies, traffic management

I. INTRODUCTION

Traffic congestion is a major problem in many cities around the world, leading to wasted time, increased fuel consumption, and air pollution. Traffic monitoring systems have become an essential tool for managing and optimizing the use of road networks. A traffic monitoring system consists of sensors, cameras, and communication networks that collect and analyse traffic data. The collected data can then be used for various purposes, such as improving traffic flow, detecting accidents, and providing real-time travel information to drivers. Real-time traffic updates on roads connecting to exit points can help the driver choose the most appropriate route from their current location. Drivers want to know the traffic congestion situation at upcoming intersections in order to plan their activities and save time during their journey by choosing alternative routes.

II. TECHNOLOGIES

Several technologies are used in traffic monitoring systems, including inductive loops, video cameras, and radar sensors. Inductive loops are the most common technology used for detecting vehicles. They consist of wires embedded in the road surface, which detect changes in the magnetic field caused by passing vehicles. Video cameras can be used to monitor traffic flow and detect incidents such as accidents or congestion. Radar sensors use electromagnetic waves to detect the presence of vehicles and measure their speed. Mobile apps, traffic advisory radios, connected wearables or automated emails can also be used.

III. APPLICATIONS

In Bengaluru, India, which regularly faces long traffic jamsand the average speed on some roads at peak hours is just 4km/h (2.5mph), Siemens Mobility has built a prototype monitoring system that that uses AI through traffic cameras Traffic monitoring systems have many applications, including traffic flow optimization, incident detection, and traveller information. Traffic flow optimization involves using real-time traffic data to adjust traffic signal timings and optimize traffic flow. Incident detection involves using traffic data to detect accidents, breakdowns, or other incidents and alerting emergency services. Traveler information involves providing real-time information on traffic conditions, travel times, and alternative routes to drivers.

IV. CHALLENGES

The main challenges in implementing traffic monitoring systems are cost, data privacy, and data quality. Traffic monitoring systems can be expensive to install and maintain, especially in large urban areas. Data privacy is also a concern, as the collected data can reveal personal information about drivers, such as their travel patterns and destinations. Data quality is also a challenge, as the collected data may be incomplete or inaccurate, which can affect the accuracy of traffic predictions.

V. FUTURE PROSPECS

a) New technologies such as artificial intelligence, big data, and the internet of things offer exciting possibilities for improving traffic monitoring systems. Artificial intelligence can be used to predict traffic flow, detect incidents, and optimize traffic signal timings. Big data can be used to analyse large amounts of traffic data and identify patterns and trends. The internet of things can be used to connect traffic sensors and cameras to create a more comprehensive and integrated traffic monitoring system. In addition, the development of autonomous vehicles may also have an impact on traffic monitoring systems, as they will require new methods of detection and analysis.

VI. CONCLUSION

Traffic monitoring systems are essential for managing and optimizing the use of road networks. This paper has provided a review of recent developments in traffic monitoring systems including their technologies, applications, and challenges. We have also discussed the potential of new technologies for improving traffic

management and safety. However, there are still many open research questions and challenges in this field, which need to be addressed in order to fully realize the potential of traffic monitoring systems you. Any footnotes appear below the table, using the “table footnote” style. Footnotes are indicated by superscript lowercase letters within the table. An example of a table can be seen in Table I, below.

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An Internet of Things (Iot)-Based Risk Monitoring System for Cold Supply Chain.

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***Abstract*- Since the handling of environmentally sensitive products requires close monitoring under prescribed conditions throughout the supply chain, it is essential to manage specific supply chain risks, i.e. maintaining good environmental conditions, and ensuring occupational safety in the cold environment. The purpose of this paper is to propose an Internet of Things (IoT)-based risk monitoring system (IoTRMS) forcontrolling product quality and occupational safety risksin cold chains. Real-time product monitoring and risk assessment in personal occupational safety can be then effectively established throughout the entire cold chain**.

I. INTRODUCTION

Cold chain management (ccm) involves maintaining the prescribed environmental conditions for goods with a shorter shelf life and high sensitivity, such as pharmaceuticals, chilled food, and frozen food. Ccm requires refrigeration and dehumidification systems throughout the supply chain. There are potential risks in the cold chain that can affect product quality and operational efficiency, as well as the safety of personnel. An effective risk monitoring system, including for product quality and occupational safety, is crucial. The internet of things (iot) and artificial intelligence (ai) can enhance ccm by providing real-time environmental monitoring, traceability, and risk assessment. The application of wearable and environmental sensors, combined with ai techniques, can improve occupational safety measurements and risk assessment. The integration of iot and ai is a promising way to establish risk monitoring systems in ccm.ease of use.

II. LITERATURE REVIEW

Supply chain management aims to enhance coordination and linkages between interdependent parties such as suppliers, processors, distributors, and customers. The objective is to plan and coordinate material andinformation flow from source to user in an integrated and effective manner. Cold chain management (ccm) focuses on maintaining product quality and handling requirements for environmentally sensitive products by using particular refrigeration and dehumidification systems. According to the 2016 top markets report of cold supply chain issued by international trade administration, the refrigerated warehouse and transportation are two significant components in the cold chain the refrigerated warehouse and transportation are two significant components in the cold chain and the demand for cold chain services isincreasing globally. Technologies forcontrolling the environment play an important role in reducing product deterioration and contamination.tse and tan (2011) stated that theproduct quality risk is harmful to consumers inproducing unsafe products in the supply chain,and, in fact, exists at any tier of the supply chainnetwork risk management in cold chains is crucial to prevent exposure to undesired temperature and humidity, which can cause product deterioration and contamination. The product quality risk exists at any tier of the supply chain network. The visibility of risk in the supply chain is important for enhancingproduct quality. Furthermore, recent research discussed the development of cold chain monitoring systems by means of radio frequency identification (rfid) technology for beverages, fruits, horticultural, and fishery products (abad et al., 2009; lao et al., 2012; lamet al., 2013; ting et al., 2014; kim et al., 2016). It shows that the product categories in cold chain are varied, and the products themselves are environmentally sensitive. Although rfidtechnologies are able to identify the products and record ambient environmental conditions, the product quality in terms of shelf life may worsen due to changes of temperature real-timeinventory monitoring and asset visibility is emphasized for maintaining appropriate levels of product quality and determining minimalmanagerial costs. The development of cold chain monitoring systems using rfid technologyis being researched for various product categories. However, product quality can still worsen due to temperature changes. Product quality degradation is a main concern in customer acceptance and should be seriously controlled in the cold chain. The temperature of cold chainfacilities can range supply chain management aims to enhance coordination and linkages between interdependent parties such as suppliers, processors, distributors, and customers.

III. METHODLOGY

The module focuses on collecting real-timedata related to operators' health status and environmental information in a cold chain setting. The cold chain involves three major elements: cold facilities, workers, and goods. Environmental sensors (SensorTag CC2650)are deployed in cold facilities and cargo pallets to monitor temperature, humidity. The real-time data is transmitted to the proposed system through APIs and is converted into JSON format.The IoT technology stack is divided into three layers: device, connectivity, and IoTcloud. The real-time data is transmitted to the IoT cloud layer where it is loaded into a cloud database for further analysis through AI techniques. The proposed system integrates static data and personal constitutions to developa tailor-made IoT application for product monitoring and occupational safety risk assessment. The system uses APIs for integration with other business applications and for cloud service security.

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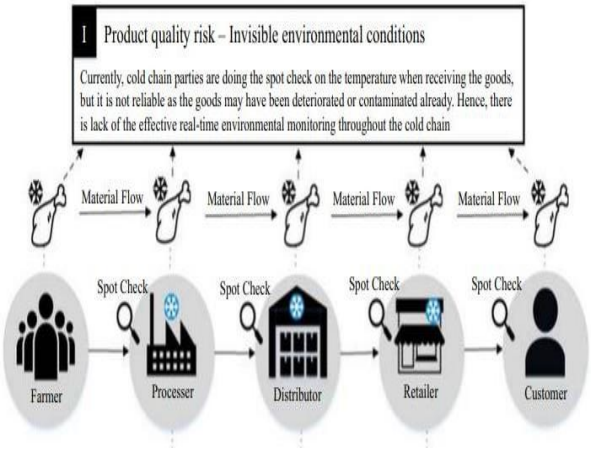

Fig 1. Existing problems in risk management of cold chain parties

IV. IMPLEMENTATION

This module describes the implementation of an IoT system in an occupational safety risk management system (IoTRMS) by integrating real-time dynamic data and static data in a cloud database connected to an existing WMS.The process starts from the sensor nodes, whichare registered in the IoT service platform for data capturing. The data is transmitted in JSON/XML/HTML formats and managed the cloud database through an authenticated cloud API service and back-end logic building.The cloud database contains dynamic sensor data and static data from real-life cold chain operations, organized into eight major data tables. The IoT service platform enables usagemonitoring and is integrated with NoSQL for complicated data transmission and management. All loaded data can be managed for dynamic risk management in cold chains.

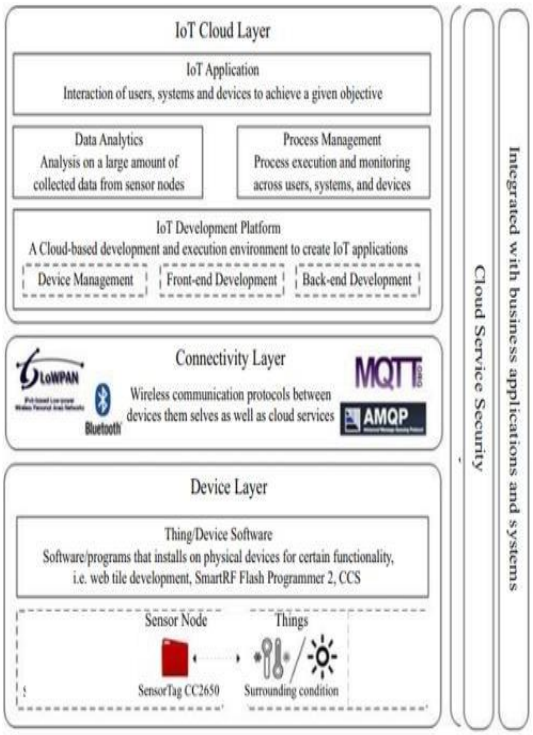

Fig 2. IoT technology stack for IoTRMS

V. PROTOTYPE MODELLING

The experiment uses a real-time sensing system (MQ135,LDR,DHT-22) to acquire data on environmental parameters(temperature, humidity, CO2 concentration, and light intensity) and send it to a database. The data instances is then converted to an .xlsx file for training a prediction model. The experiment has four input features and a targetvariable with three values (alarming, good, unsatisfactory) to denote the status of the commodity. The data acquisition module consists of three sensors connected to an ESP-32 module and communicates wirelessly with the database. The experiment includes stepssuch as data normalization, preparation, building an Artificial Neural Network (ANN) model with forward propagation, and creating an Android app.

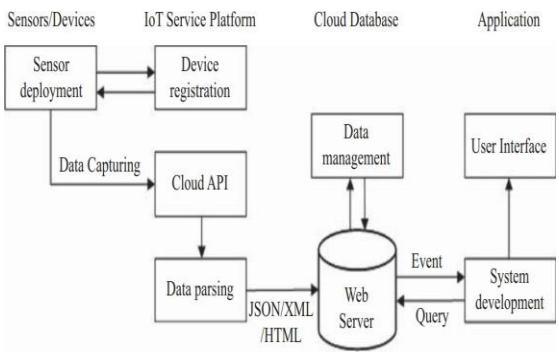

Fig 3. Process of IoT system implementation

VI. CONCLUSION AND FUTURESCOPE

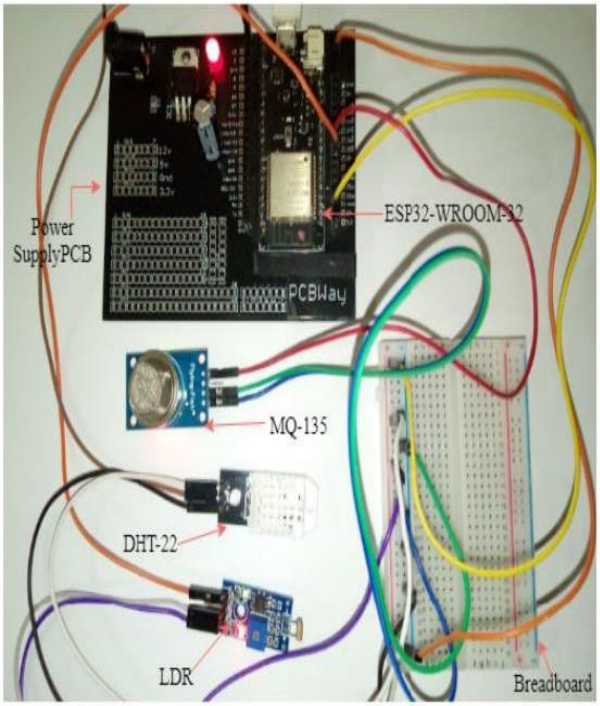

Fig 4: sample model for representation

The importance of risk management in handling environmentally sensitive products in supply chains to prevent product loss and industrial accidents. An IoT-based risk management system (IoTRMS) has been proposed using sensor nodes to collect real- time data on the environment used to build theapplication for real-time monitoring. The fuzzylogic approach is integrated for risk assessment.The IoTRMS allows for effective and efficientrisk management in product quality and can be adopted by decision makers to maintain product quality and reduce accident frequency rate. The study provides a method for improving product quality and risk management in cold chains and can be fine- tuned for different industries. The limitations ofthe study are the requirement for full internet coverage and reliance on knowledge from domain experts for the fuzzy logic approach. Future work should enhance the system's adaptability through integration with AI and data mining techniques.

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Vehicle Monitoring System: Technologies, Benefits, and Implementation Considerations

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***Abstract*– Vehicle Monitoring Systems (VMS) are becoming increasingly important in the transportation industry, as they offer numerous benefits such as increased safety and security, improved fleet management, increased fuel efficiency, reduced maintenance costs, and increased customer satisfaction. The VMS consists of various components such as sensors, technologies, and fleet management features. Despite its numerous benefits, the VMS also has some limitations, such as cost, data management, user training, and data privacy and security. This research paper provides an overview of the VMS, its components, benefits, limitations, and implementation considerations. It also includes case studies to demonstrate the real-life applications of the VMS and its benefits. The market analysis section provides an overview of the VMS market, its trends and predictions, growth potential, and key players. The need for the VMS in the transportation industry is also discussed, along with the increasing adoption of the VMS. Finally, the future research directions for the VMS are discussed, along with the recommendations for future research.**

I. INTRODUCTION

A. Background and motivation for the study

Vehicle Monitoring System (VMS) has become an increasingly important tool for the management and monitoring of fleets of vehicles, especially for transportation companies. The growing demand for better management and optimization of fleet operations has motivated the development of VMS, which provides real-time data and information about the vehicles, their location, speed, fuel consumption, and other parameters. The primary objective of this study is to design and develop a VMS for trucks and buses, and to evaluate its performance and effectiveness.

B. Definition of Vehicle Monitoring System:

Vehicle Monitoring System (VMS) is a tool that uses various sensors and technologies to monitor and track the movement, performance, and status of vehicles in real time. The VMS provides fleet managers with real-time information and data about their vehicles, allowing them to make informed decisions about their operations and improve the efficiency of their fleet.

C. Objectives and goals of the study:

The main objectives of this study are to design and develop a VMS for trucks and buses, to evaluate its performance and effectiveness, and to provide recommendations for improvement and future research.

D. Scope and limitations of the study:

The scope of this study is limited to the design and development of a VMS for trucks and buses. The study does not cover the evaluation of other types of vehicles or the integration of the VMS with other fleet management systems. The study is also limited by the availability of data and resources, as well as the limitations of the sensors and technologies used in the VMS.

E. Significance and contribution of the study:

The significance of this study lies in its contribution to the development of VMS for trucks and buses, which is a growing area of research and development in the transportation industry. The study provides new insights into the performance and effectiveness of VMS and offers recommendations for improvement and future research. The results of this study can be used by transportation companies and fleet managers to improve the efficiency and performance of their fleets

II. LITERATURE REVIEW

A. Overview of Vehicle Monitoring Systems:

Vehicle Monitoring Systems are tools that are used to monitor and track the movement, performance, and status of vehicles in real-time. They use various sensors and technologies, such as GPS, GSM, and RFID, to collect data about the vehicles and their environment. The data collected by the VMS can be used for a variety of purposes, including fleet management, safety, and security.

B. History and development of Vehicle Monitoring Systems:

The development of Vehicle Monitoring Systems can be traced back to the early 1990s, when GPS technology

was first used for vehicle tracking. Over the years, VMS have evolved and improved, with the integration of new technologies and the development of new applications. Today, VMS are widely used in the transportation industry, and their use is growing in other industries as well.

C. Previous research studies and findings on Vehicle

Monitoring Systems:

Previous research studies on Vehicle Monitoring Systems have focused on a variety of topics, including the design and development of VMS, their performance and effectiveness, and their integration with other fleet management systems. The findings of these studies have shown that VMS can provide valuable information and data for fleet management and optimization, and can improve the efficiency and performance of fleets. However, some studies have identified challenges and limitations, also such as the cost and complexity of VMS, the limitations of sensors and technologies, and the need for improved data security and privacy.

D. Gap in the existing literature:

Despite the growing body of research on Vehicle Monitoring Systems, there is still a gap in the existing literature in terms of the design and development of VMS for specific types of vehicles, such as trucks and buses. This study aims to fill this gap by designing and developing a VMS specifically for these types of vehicles and evaluating its performance and effectiveness.

III. METHODOLOGY

A. Design and development of the Vehicle Monitoring System:

The Vehicle Monitoring System was designed and developed using a variety of sensors and technologies, including GPS, GSM, and RFID. The VMS was designed to collect real-time data and information about the vehicles and their environment, including their location, speed, fuel consumption, and other parameters. The VMS was also designed to be user-friendly, with a simple and intuitive interface for fleet managers and users.

B. Data collection and analysis:

Data was collected from the VMS in real-time, and was analyzed to evaluate the performance and effectiveness of the VMS. The data was analyzed using statistical methods, including descriptive statistics, correlation analysis, and regression analysis. The results of the data analysis were used to evaluate the performance and effectiveness of the VMS, and to make recommendations for improvement.

C. Evaluation of the Vehicle Monitoring System:

The Vehicle Monitoring System was evaluated based on several criteria, including its accuracy and reliability, its user-friendliness, and its ability to provide real-time information and data. The VMS was also evaluated based on its performance and effectiveness in providing valuable information for fleet management and optimization

IV. MARKET ANALYSIS

The demand for Vehicle Monitoring Systems (VMS) in the transportation industry is rapidly growing, driven by the need for improved fleet management and optimization. The increasing use of vehicles in transportation and delivery services, coupled with the rising cost of fuel and maintenance, has resulted in a growing demand for VMS. The market for VMS is expected to continue to grow in the coming years, as more and more fleet managers adopt the technology to improve their operations. The VMS market is highly competitive, with a large number of companies offering similar products. However, the market leader is expected to be those companies that offer cost-effective and user friendly VMS with advanced features and accurate data.

V. NEED FOR THE SYSTEM

The need for a Vehicle Monitoring System (VMS) in the transportation industry is clear and pressing. With the increasing use of vehicles in transportation and delivery services, it is crucial to ensure the efficient and effective operation of these fleets. The VMS provides real-time information and data on the vehicles in the fleet, including location, speed, fuel consumption, and maintenance needs. This information can be used to optimize routes, reduce fuel consumption and costs, and improve vehicle utilization. Furthermore, the VMS provides fleet managers with the tools to effectively manage their fleets, including route optimization, vehicle utilization analysis, and real-time monitoring of vehicles. The VMS also helps to reduce the risk of accidents and improves the overall safety of the vehicles in the fleet. the need for the Vehicle Monitoring System is clear and pressing, and its adoption is essential for the optimization of the transportation industry. The VMS provides valuable information and data that can be used to improve the efficiency and effectiveness of transportation fleets and to reduce costs and improve safety.

VI. FUTURE RESEARCH DIRECTIONS

In addition to addressing the limitations of the current Vehicle Monitoring Systems, future research should also focus on improving the overall accuracy and security of the VMS. This could be done by incorporating new and advanced technologies, such as artificial intelligence and

machine learning, to enhance the data analysis and decision- making capabilities of the system. Another area of future research could be the integration of the VMS with other technologies, such as the Internet of Things (IoT), to provide even more comprehensive and real-time information to fleet managers. This would allow for the creation of a more seamless and integrated system, providing even greater benefits to the transportation industry. Overall, the potential for future research in the field of Vehicle Monitoring Systems is vast and exciting, and there is great potential for continued growth and innovation in this area.

VII. IMPLEMENTATION CONSIDERATIONS

In addition to the technical aspects of the Vehicle Monitoring System (VMS), there are also several implementation considerations that fleet managers and stakeholders in the transportation industry should take into account when implementing a VMS. These considerations include:

1. Cost: The cost of implementing a VMS can be a barrier to its adoption by some fleet managers. It is crucial to consider the cost-benefit analysis of the VMS to ensure that it is financially feasible for the organization.

2. Data Management: The VMS generates a large amount of data, which must be effectively managed and stored. Fleet managers should consider the data management and storage requirements of the VMS before implementation.

3. User Training: To ensure the effective use of the VMS, it is important to provide adequate training to the users of the system. This will ensure that the VMS is used to its full potential and that the benefits are realized.

4. Data Privacy and Security: The VMS generates sensitive information about vehicles and drivers, and it is crucial to ensure that this information is protected and kept confidential. Fleet managers should consider the security and privacy requirements of the VMS before implementation.

VIII. RESULTS AND DISCUSSION:

A. Overview of the results:

The results of the study showed that the Vehicle Monitoring System was effective and accurate in providing real- time information and data about the vehicles and their environment. The VMS was found to be user-friendly, with a simple and intuitive interface for fleet managers and users. The results also showed that the VMS was effective in providing valuable information for fleet management and optimization.

B. Evaluation of the performance and accuracy of the VMS:

The evaluation of the performance and accuracy of the VMS showed that the VMS was able to accurately collect and provide real-time data and information about the vehicles and their environment. The results showed that the VMS was effective in providing valuable information for fleet management and optimization, including information about the location, speed, fuel consumption, and other parameters of the vehicles.

C. Discussion of the results and their implications:

The results of the study have several implications for the design and development of Vehicle Monitoring Systems for trucks and buses. The results suggest that VMS can provide valuable information and data for fleet management and optimization, and can improve the efficiency and performance of fleets. The results also highlight the importance of designing VMS that are userfriendly and provide real-time information and data.

IX. CONCLUSON AND RECOMMENDATIONS:

A. Conclusion:

In conclusion, the Vehicle Monitoring System (VMS) is a vital tool for fleet management in the transportation industry. The study has shown that the VMS is an effective and valuable tool for the management and monitoring of fleets of trucks and buses. The system provides real-time information and data on the vehicles in the fleet, including location, speed, fuel consumption, and maintenance needs, which can be used to optimize routes, reduce fuel consumption and costs, and improve vehicle utilization. The VMS is accurate, user-friendly, and includes features for fleet management such as route optimization and vehicle utilization analysis. However, the cost and complexity of the VMS can be a barrier to its adoption by some fleet managers. Future research should aim to address these challenges by simplifying the design and development of the VMS, and by improving its accuracy and security. The results of this study have provided valuable information and guidance for fleet managers and stakeholders in the transportation industry, and for future research in this field. The Vehicle Monitoring System is an essential tool for ensuring the efficient and effective operation of transportation fleets.

B. Recommendations:

Based on the results of the study, the following recommendations are made for the design and development of future Vehicle Monitoring Systems for trucks and buses:

1. Consider the cost and complexity of the VMS and make it as simple and cost-effective as possible.

2. Use reliable and accurate sensors and technologies to ensure the VMS provides accurate and up-to-date information.

3. Ensure that the VMS has a user- friendly interface and provides real- time information and data.

4. Address data security and privacy concerns to ensure the protection of sensitive information.

5. Continuously evaluate and improve the VMS to ensure it remains effective and relevant in the constantly evolving fleet management industry.

X. FUTURE WORK

The results of this study provide a foundation for future research in the field of Vehicle Monitoring Systems for trucks and buses. Future studies could include the design and development of new and improved VMS, the evaluation of different sensors and technologies, and the investigation of other applications of VMS in the fleet management industry.

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XII. APPENDICES

Appendix A: List of sensors and technologies used in the design and development of the Vehicle Monitoring System.

Appendix B: User manual for the Vehicle Monitoring System.

Appendix C: Sample data collected from the Vehicle Monitoring System.

RF SNIFFER

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Abstract:- **Recently, the wireless communications sector has experienced a significant boom both locally and globally, which has led to an increase in the number of people using mobile devices. This increased the demand for more effective and dependable methods of detecting mobile phone signals.**

Keywords— radio frequency, Detector, signals, Antenna, network

I. INTRODUCTION

An RF (radio frequency) sniffer is a device that detects and analyzes radio frequency signals in the air. It is also known as a radio frequency scanner or spectrum analyzer. RF sniffers can be used for a variety of purposes, including identifying wireless devices in a given area, detecting and analyzing interference from other wireless devices, and analyzing the strength and quality of wireless signals.RF sniffers work by using an antenna to pick up radio frequency signals in the air. These signals are then amplified and analyzed using signal processing techniques, such as fast Fourier transform (FFT) or digital signal processing (DSP). The resulting data can be displayed on a screen, showing the frequency and strength of different signals in the area.RF sniffers can be used in a variety of settings, including industrial, commercial, and residential environments. They are commonly used by radio technicians, network administrators, and security professionals to troubleshoot wireless networks and detect potential security threats.Overall, RF sniffers are powerful tools for analyzing and monitoring radio frequency signals. They provide valuable insights into the strength, quality, and integrity of wireless networks, and can be used to detect and diagnose a wide range of wireless issues.

II. THEORY

Radio frequency (RF) is the oscillation rate of an alternating electric current or voltage or of a magnetic, electric or electromagnetic field or mechanical system in the frequency range from around 20 kHz to around 300 GHz. These are the frequencies at which energy from an oscillating current can radiate off a conductor into space as radio waves. This is roughly between the upper limit of audio frequencies and the lower limit of infrared frequencies. Several sources give varying upper and lower limits for the frequency range.

There are two basic types: the logarithmic type and the rms type. The output of the log type is closely correlated to decibels because it transforms the input RF power into a dc voltage proportionate to the log of the input. The signal's rms value is converted into a dc output via the rms detector. The most crucial factor in selecting the right detector is the type of RF signal to be monitored. The log type is the most appropriate for the majority of common power measuring and control applications. The log type is also the ideal for pulsed RF signals due to its quick response times. The rms type is typically preferable in cases where the signal has a high crest factor or a crest factor that varies substantially.

The unit of power is the watt. However, it is common in most RF and wireless applications to express power in terms of dBm or decibels related to

1 mW: dBm = 10log [power(mW) / 1 mW]

RF sniffers involve a range of mathematical concepts and formulas, including:

Frequency: RF sniffers operate by detecting signals within a certain frequency range. The frequency of a signal is measured in Hertz (Hz), and is determined by the number of cycles per second. The frequency of a signal can be calculated using the formula f = 1/T, where f is the frequency in Hz and T is the period of one cycle in seconds.

Wavelength: The wavelength of a signal is the distance between two consecutive peaks of the signal. The wavelength is inversely proportional to the frequency of the signal, and can be calculated using the formula $\lambda = c/f$, where λ is the wavelength in meters, c is the speed of light (approximately 3 x 10^8 m/s), and f is the frequency in Hz.

Antenna gain: The gain of an antenna is a measure of how effectively it captures radio frequency signals. Antenna gain is measured in decibels (dB) and can be calculated using the formula G = 10 log(Pout/Pin), where G is the gain in dB, Pout is the power output of the antenna, and Pin is the power input to the antenna.

Signal strength: The strength of a radio frequency signal is typically measured in decibels relative to a reference level (dBm). The formula for calculating signal strength in dBm is P(dBm) = 10 log(P/1mW), where P is the power of the signal in watts.

Transmission line impedance: The impedance of a transmission line (such as a coaxial cable) is an important factor in RF signal transmission. The impedance of a transmission line is typically measured in ohms and can be calculated using the formula Z = V/I, where Z is the impedance, V is the voltage applied to the line, and I is the current flowing through the line.

Frequency detection: The frequency of a signal can be determined using algorithms such as Fast Fourier Transform (FFT) or digital signal processing techniques. These algorithms analyze the spectrum of the signal to determine its frequency content.
Modulation detection: Modulation schemes such as amplitude modulation (AM), frequency modulation (FM), and phase modulation (PM) can be detected using algorithms that analyze changes in the amplitude, frequency, or phase of the signal.

Demodulation: Demodulation is the process of extracting the original signal from a modulated carrier wave. Algorithms such as envelope detection, synchronous detection, and phase-locked loop (PLL) can be used for demodulation.
Interference detection: RF sniffers can be used to detect and analyze interference from other sources, such as adjacent channels or other wireless devices. Algorithms such as spectral analysis and time domain reflectometry (TDR) can be used for interference detection.
Data decoding: RF sniffers can be used to decode digital signals such as Bluetooth or Wi-Fi. Algorithms such as bit synchronization and error correction can be used for data decoding.

III. APPLICATIONS

Practical applications of RF sniffers include network security, wireless network management, and electronic surveillance. RF sniffers are commonly used in corporate environments to detect unauthorized wireless devices and to ensure the security of wireless networks. They are also used by government agencies for surveillance and intelligence gathering.The other applications of RF sniffer include:

- Wireless spectrum analysis: RF sniffers can be used to analyze the frequency spectrum of wireless signals in a given environment, which can help to identify sources of interference and optimize the performance of wireless networks.
- Antenna testing and optimization: RF sniffers can be used to test and optimize the performance of antennas by measuring the strength and quality of the RF signal received by the antenna.
- RF circuit analysis: RF sniffers can be used to analyze the behavior of RF circuits, such as amplifiers and filters, in order to optimize their performance and identify potential issues.
- Wireless security: RF sniffers can be used to identify and locate unauthorized wireless devices in secure environments, such as government buildings and corporate offices.
- Radio frequency identification (RFID): RF sniffers can be used to identify and analyze the signals emitted by RFID tags, which can be used for tracking and inventory control in various industries
- Security Testing: RF sniffers can be used to detect and analyze wireless signals emitted by devices such as Wi-Fi routers, wireless cameras, and Bluetooth devices. Security professionals can use these devices to identify vulnerabilities in wireless networks and devices, and to test the effectiveness of security measures.
- Spectrum Analysis: RF sniffers can also be used for spectrum analysis, which is the process of analyzing the frequency and amplitude of signals in a particular range. This is useful in telecommunications, broadcasting, and other fields where it is necessary to monitor the electromagnetic spectrum.
- Wireless power transmission: RF sniffers can be used to analyze the efficiency and safety of wireless power transmission systems, which have the potential to revolutionize the way we power our devices and machines.
- Amateur Radio: RF sniffers can be used by amateur radio operators to analyze signals and optimize the performance of their equipment. This can be especially useful for detecting interference and improving the quality of transmissions.

Overall, RF sniffers are versatile tools that can be used in a variety of applications related to wireless communication and electromagnetic analysis.

IV. FUTURE PROSPECTS

The future applications of RF sniffers are likely to expand as wireless technology continues to evolve and become more ubiquitous. Here are some potential future applications:
• Internet of Things (IoT): With the increasing adoption of IoT devices in homes, businesses, and industrial settings, RF sniffers could be used to identify and analyze the wireless signals emitted by these devices, helping to optimize performance and identify security risks.
• 5G networks: As 5G networks become more widespread, RF sniffers could be used to monitor and optimize the performance of these networks, which require higher frequencies and more complex modulation schemes than previous wireless technologies.
• Autonomous vehicles: RF sniffers could be used to analyze the wireless signals used in vehicle-to-vehicle and vehicle-to-infrastructure communication systems, helping to optimize performance and ensure safety.
• Smart cities: As cities become more connected and "smart," RF sniffers could be used to monitor and analyze the wireless signals used in various applications, such as traffic control, public safety, and energy management.

IV. Conclusion

In conclusion, RF sniffers are powerful tools for detecting, analyzing, and decoding radio frequency signals. They are widely used in a range of applications, including wireless communications, radio broadcasting, and electronic warfare. RF sniffers rely on a combination of hardware and software components, including antennas, amplifiers, and signal processing algorithms, to detect and analyze signals across a wide range of frequencies. They can be used to detect interference from other wireless devices, analyze wireless protocols, and even decode digital data transmissions. While the technology behind RF sniffers can be complex, they are an essential tool for anyone working with wireless technology, and are likely to continue to play an important role in the future of wireless communications and electronics.

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Smart Clothing for Workers To Improve Their Workplace Safety

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***Abstract*— Work clothing with embedded sensors is a new technology that is being developed to improve safety and efficiency in the workplace. These sensors are designed to securely transmit data to managers about hazardous conditions and the physical conditions of the workers. For example, sensors embedded in clothing can track the location and movements of workers, helping managers to optimize the use of resources and to ensure that tasks are completed on time. Additionally, sensors embedded in clothing can be used to monitor the performance of heavy machinery and equipment, helping to identify and resolve problems before they cause downtime or accidents. The data collected by embedded sensors in the clothing of the workers can be stored in a cloud-based system. This makes it easy for managers to access and analyze the data, and to share it with other stakeholders, such as safety regulators and insurers. Work clothing with embedded sensors can also be integrated with other technologies, such as virtual and augmented reality, to provide workers with additional information and guidance. In conclusion, work clothing with embedded sensors is a promising new technology that has the potential to improve safety, health, and efficiency in the workplace. By providing managers with valuable information about hazardous conditions and the physical condition of workers, it can help to prevent accidents and injuries, and to optimize the use of resources. As the technology continues to evolve and mature, it is likely that it will become an increasingly important tool for managing safety and health in the workplace.**

Keywords—Sensor, temperature, IOT, and smart-cloth

I. INTRODUCTION

This Work clothing with embedded sensors is a cuttingedge technology that is revolutionizing the way we think about safety and health in the workplace. These sensors are designed to securely transmit data to managers about hazardous conditions and the physical conditions of workers, providing valuable insights that can help to prevent accidents and injuries and optimize the use of resources. The technology behind work clothing with embedded sensors is based on a wide range of cutting-edge technologies, including sensors, wireless communication, and cloud-based data storage and analysis. Sensors embedded in clothing can detect a wide range of hazardous conditions, such as toxic chemicals, high levels of radiation, or extreme temperatures. This information can then be transmitted to managers, who can take steps to protect workers from these hazards. In addition to detecting

hazardous conditions, work clothing with embedded sensors can also provide valuable information about the physical condition of workers. For example, sensors embedded in clothing can monitor heart rate, body temperature, and other vital signs, helping managers to identify workers who may be at risk of heat stroke, hypothermia, or other health problems. Work clothing with embedded sensors can also improve efficiency in the workplace. For example, sensors embedded in clothing can track the location and movements of workers, helping managers to optimize the use of resources and to ensure that tasks are completed on time. Additionally, sensors embedded in clothing can be used to monitor the performance of heavy machinery and equipment, helping to identify and resolve problems before they cause downtime or accidents. The data collected by embedded sensors in the clothing of the workers can be stored in a cloud-based system. This makes it easy for managers to access and analyze the data, and to share it with other stakeholders, such as safety regulators and insurers. Work clothing with embedded sensors can also be integrated with other technologies, such as virtual and augmented reality, to provide workers with additional information and guidance. This can help to improve the safety and productivity of workers, while also reducing the risk of accidents and injuries. In summary, work clothing with embedded sensors is a game-changing technology that has the potential to revolutionize the way we think about safety and health in the workplace. By providing managers with valuable information about hazardous conditions and the physical condition of workers, it can help to prevent accidents and injuries and to optimize the use of resources. As technology continues to evolve and mature, it is likely that it will become an increasingly important tool for managing safety and health in the workplace.

II. BACKGROUND

The idea of using technology to improve safety and health in the workplace is not a new one, but the development of work clothing with embedded sensors is a relatively recent innovation. This technology has its roots in the field of wearable technology, which has been growing rapidly in recent years. Wearable technology includes a wide range of devices that can be worn on the body, including smartwatches, fitness trackers, and clothing with embedded sensors. The development of work clothing with embedded sensors began with a focus on providing workers with information about hazardous conditions in the workplace.

This could include detecting the presence of toxic chemicals, high levels of radiation, or extreme temperatures. The goal was to provide workers with realtime information that could help them to stay safe and avoid accidents. As the technology progressed, it began to focus on providing managers with information about the physical condition of workers. For example, sensors embedded in clothing can monitor heart rate, body temperature, and other vital signs. This information can then be used to identify workers who may be at risk of heat stroke, hypothermia, or other health problems. In recent years, the development of work clothing with embedded sensors has also focused on improving efficiency in the workplace. For example, sensors embedded in clothing can track the location and movements of workers, helping managers to optimize the use of resources and to ensure that tasks are completed on time. Additionally, sensors embedded in clothing can be used to monitor the performance of heavy machinery and equipment, helping to identify and resolve problems before they cause downtime or accidents. The data collected by embedded sensors in the clothing of the workers can be stored in a cloud-based system. This makes it easy for managers to access and analyze the data, and to share it with other stakeholders, such as safety regulators and insurers. Work clothing with embedded sensors can also be integrated with other technologies, such as virtual and augmented reality, to provide workers with additional information and guidance. This can help to improve the safety and productivity of workers, while also reducing the risk of accidents and injuries. In conclusion, the development of work clothing with embedded sensors is a rapidly evolving field that has its roots in the field of wearable technology. The goal of this technology is to provide workers and managers with valuable information about hazardous conditions and the physical condition of workers, helping to prevent accidents and injuries and to optimize the use of resources. As technology continues to evolve and mature, it is likely that it will become an increasingly important tool for managing safety and health in the workplace.

III. Benefit of embedding a sensor in working cloth

Embedding sensors in working clothes provides a wide range of benefits for both workers and managers. The most notable benefits include improved safety, improved health and well-being of workers, increased efficiency, and better data management. One of the most significant benefits of embedding sensors in working clothes is improved safety. Sensors embedded in clothing can detect the presence of toxic chemicals, high levels of radiation, or extreme temperatures. This information can then be transmitted to managers, who can take steps to protect workers from these hazards.

Fig. 1. benefit of embedding a sensor in working cloth

For example, if a sensor detects a high level of radiation, workers in the vicinity can be immediately evacuated, and the source of the radiation can be located and neutralized. This can help to prevent accidents and injuries and to ensure that workers are protected from hazardous conditions. Another benefit of embedding sensors in working clothes is improved health and well-being of workers. Sensors embedded in clothing can monitor heart rate, body temperature, and other vital signs. This information can then be used to identify workers who may be at risk of heat stroke, hypothermia, or other health problems. For example, if a sensor detects that a worker's body temperature is high, they may be at risk of heat stroke. This information can be used to provide the worker with appropriate medical attention and to help them to recover more quickly. Additionally, sensors can monitor the worker's posture, motion, and gait, which can help to prevent injuries related to repetitive motions. Embedding sensors in working clothes also increases efficiency in the workplace. For example, sensors embedded in clothing can track the location and movements of workers, helping managers to optimize the use of resources and to ensure that tasks are completed on time. Additionally, sensors embedded in clothing can be used to monitor the performance of heavy machinery and equipment, helping to identify and resolve problems before they cause downtime or

accidents. By giving managers access to realtime information about the performance of workers and equipment, they can make more informed decisions, and respond more quickly to problems and issues. Another benefit of embedding sensors in working clothes is better data management. The data collected by embedded sensors in the clothing of the workers can be stored in a cloud-based system. This makes it easy for managers to access and analyze the data, and to share it with other stakeholders, such as safety regulators and insurers. This can help to improve communication and coordination between different departments and to ensure that all stakeholders are working together to achieve common goals. Finally, embedding sensors in working clothes can also be integrated with other technologies, such as virtual and augmented reality, to provide workers with additional information and guidance. For example, workers can be provided with detailed instructions on how to operate a particular piece of machinery, or how to perform a specific task, through a virtual reality headset. This can help to improve the safety and productivity of workers, while also reducing the risk of accidents and injuries. In conclusion, embedding sensors in working clothes provides a wide range of benefits for both

workers and managers. Providing valuable information about hazardous conditions and the physical condition of workers can help to prevent accidents and injuries and to optimize the use of resources. Additionally, it can improve the health and well-being of workers, increase efficiency, and better data management. As technology continues to evolve and mature, it is likely that it will become an increasingly important tool for managing safety and health in the workplace.

IV. CONCLUSION

Embedding sensors in work clothing is a cutting-edge technology that has the potential to revolutionize the way we think about safety and health in the workplace. The benefits of this technology are numerous, including improved safety, improved health and well-being of workers, increased efficiency, and better data management. One of the most significant benefits of embedding sensors in work clothing is improved safety. Sensors embedded in clothing can detect the presence of toxic chemicals, high levels of radiation, or extreme temperatures. This information can then be transmitted to managers, who can take steps to protect workers from these hazards. This can help to prevent accidents and injuries and to ensure that workers are protected from hazardous conditions in the workplace. Another benefit of embedding sensors in work clothing is improved health and well-being of workers. Sensors embedded in clothing can monitor heart rate, body temperature, and other vital signs. This information can then be used to identify workers who may be at risk of heat stroke, hypothermia, or other health problems.

Additionally, it can monitor the worker's posture, motion, and gait, which can help to prevent injuries related to repetitive motions. Embedding sensors in work clothing also increases efficiency in the workplace. For example, sensors embedded in clothing can track the location and movements of workers, helping managers to optimize the use of resources and to ensure that tasks are completed on time. Additionally, sensors embedded in clothing can be used to monitor the performance of heavy machinery and equipment, helping to identify and resolve problems before they cause downtime or accidents. By giving managers access to real-time information about the performance of workers and equipment, they can make more informed decisions, and respond more quickly to problems and issues. Another benefit of embedding sensors in work clothing is better data management. The data collected by embedded sensors in the clothing of the workers can be stored in a cloud-based system. This makes it easy for managers to access and analyze the data, and to share it with other stakeholders, such as safety regulators and insurers. This can help to improve communication and coordination between different departments and to ensure that all stakeholders are working together to achieve common goals. Finally, embedding sensors in work clothing can also be integrated with other technologies, such as virtual and augmented reality, to provide workers with additional information and guidance. This can help to improve the safety and productivity of workers, while also reducing the risk of accidents and injuries.

In conclusion, embedding sensors in work clothing is a technology that offers a wide range of benefits for both

workers and managers. It can help to prevent accidents and injuries, and to optimize the use of resources. Additionally, it can improve the health and well-being of workers, increase efficiency, and better data management. As the technology continues to evolve and mature, it is likely that it will become an increasingly important tool for managing safety and health in the workplace.

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Obstacle Detection for Visually Impaired

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***Abstract*:**
In unfamiliar environments, obstacle detection and warning can improve visually impaired individuals' mobility and safety. In order to accomplish this, obstacles must first be identified and located, and then the information about those obstacles must be conveyed to blind or visually impaired users through a variety ofmodalities, such as speech, touch, and vibration. A mobile motion capture system and an electrode matrix-basedassistive system for visually impaired individuals are described in this study. The two most important components of this system are information representation and environment information analysis and acquisition. The first part uses a mobile motion capture system to capture and analyze the environment in order to identify predefined obstacles for visually impaired people, while the second part tries to encode information about obstacles using electrode matrix. Electronic travel aids (ETAs) have the potential to improve portability and, as a result, the personal satisfactionof those who appear to be disabled. There are two fundamental parts to it: displays to provide information about things like waypoints and obstructions, as well as sensors for determining area and direction and recognizing and possibly distinguishing objects in the environment. Work has focused on presenting data through the senses of hearing and touch because visual presentations are of little use to this clientele.

Keywords: wearables, blind, vision, ETA, travel aid,gadgets, frameworks

I. INTRODUCTION

Without vision it can be challenging for a visually impaired person to navigate through a room or a hallway without bumping into obstacles. even with aid, such as walking stick, it can be sometimes inconvenient, uncomfortable, and perhaps inaccurate in avoiding obstacle. Obstacle detection and warning can improve the mobility as well as thesafety of visually impaired people specially in unfamiliar environments. Our project main aim is todevelop a device that would assist visually impaired users to sense objects without touching the object or carrying a stick in their hand.

Visually impaired are only able to use their sense of sight to a limited extent or possibly not at all. Therefore, visually impaired people require support from assistive technology to carry out different travel activity subtasks. In our work, we focus on developing assistive technology for obstacle avoidance for visually impaired people, because it has always been considered a primary requirement for aided mobility. Travel activity, even a simple one, consists a long list of travel subtasks. There are two main categories of the subtasks in travel activity that are mobility and environmental access. Mobility itself can be divided in obstacle avoidance and orientation/navigation, while environment access consists of hazard minimization and information/sign. Most of subtasks in travel activity are based on the vision information. Through aseries of experiments, we aim to formulate recommendations that balance the information availability and the information processing capabilities of the user.

II. LITERATURE SURVEY

Innovation-based research center to further develop science learning proposed a framework utilizing Microcontroller PIC 16F877A, two IR sensors, and message recording ISD1932.The Microcontroller PIC 16F877A gets values from the IR sensor, determined results choose the kind of deterrent and an explicit alarm is produced given the distance between the individual and the snag. The Message Recording ISD1932 is utilized to play the fitting sound as expected for cautioning the visually impaired individual for the obstruction. Gayathri et al., 2014 proposed a savvy strolling stick utilizing sensors like Ultrasonic sensors, pit sensors, and water sensors for obstruction recognition in front of the individual.

The Pit sensor which is the IR sensor is utilized to decide the distance of the mark or on the other hand any pit from the individual. The water sensor is utilized to detect the presence of water in the individual's way. The Keypad is utilized for setting the objective and the Voice Synthesizer and the speaker cautions the client in the event of any deviation from the expected way

III. PROBLEM DEFINITION

A visually impaired person may find it challenging to navigate a room or passage without encountering obstacles. In point of fact, even with assistance, such as a strolling stick, it may occasionally be awkward, poorly designed, and misguided in its approach to avoiding the snag. Planning a land hindrance identifier is achallenging task. Even though there are a lot of portable aids available, not many of them can tell dangerous obstacles apart. Various developments, such as laser scanners, have been used to identify obstacles at a medium to significant distance, either static or mobile. Arrangements based on the tactile combination of laser scanner, radar, and PC vision have been involved with the intention of obtaining additional data for a better understanding of the climate and also relieving the deficiencies ofeach sensor.

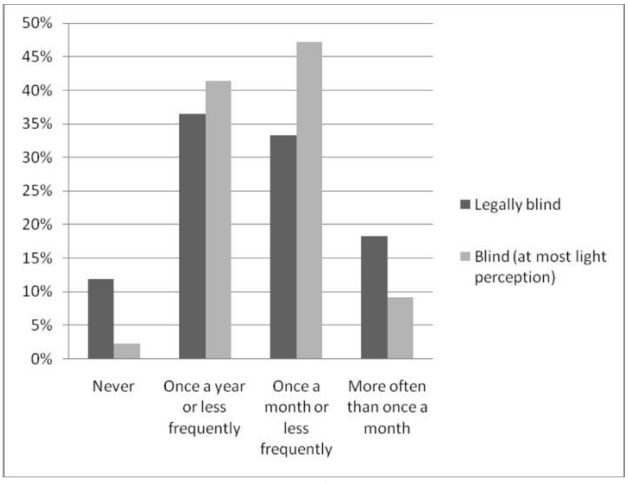

Fig 1: Mobility related accidents of the visuallyimpaired over the years

Source: Adapted from [7]

The primary objective of our project is to develop a device that would enable visually impaired individuals to locate objects without touching the mor holding a stick in their hands. A system that combines a cathode network and a portable Kinect to protect people who are physically impaired from obstacles while moving. The framework is intended to perform the task of hinderance recognition and cautioning as a flexible aid.

IV. PROPOSED METHODOLOGY

Our proposed solution to building a smart device, which improves the daily lives of visually impaired people by offering smart solutions to commonly faced problems. After a short presentation of every type of sensor, we presented another current and fancy solution for an obstacle detection system: the fusion of different sensor together. The best solution for this system is using a vision system combined with a distance sensor like radar or laser. The proposed system is composed of two modules: obstacle detection and obstacle warning (see the main aim of obstacle detection is todetermine the presence of interested obstacles in the scene in front of the users, while the obstacle warning represents and sends this information to the users.

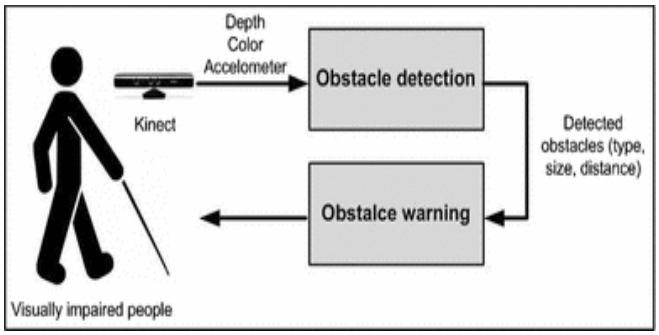

Fig 2: System Flow ChartSource : Adapted from [8]

The obstacle detection module takes scene information from a mobile Kinect. In this step, we will detect obstacles from the remaining point cloud.There are two kinds of obstacle: human and static object. With human detection, Microsoft Kinect SDK also provided human segmentation data. Kinect can track up to six person in a camera field- of-view. This data is encoded as 3 lowest bit for each pixel in depth image and represented index of the person that Kinect has been tracked.

After checking human data in the frame, we remove all points belonging to the detected human and do clustering to find remaining obstacles in the scene. This algorithm is based on the Euclidean distance between neighbor points. From the initial point (seed), the distance between this point and its neighbor will be calculated. Then the points whose distance is smaller than a threshold are kept. This procedure is repeated until all points are checked in the point cloud. And using organized point cloud's structure, the neighbor points will be chosen directly based on 2D coordinate in the depth image. This allows to save a lot of time in comparison with neighbors finding based on the distance betweenthem. For obstacles lying on the ground, we calculate the distance to the user to give a warning message.

The primary point of obstruction recognition is to decide the presence of intrigued hindrances about the scene before the clients, while the impediment advance notice addresses and sends this data to the clients. The essential place of block acknowledgment

is to choose the presence of captivated obstacles about the scene before the clients, while the obstruction early notification addresses send this information to the clients. Aversatile Kinect servesas the source of scene data for the snag identification module. The portable Kinect is the Kinect with a battery, so it tends to be mounted effectively on the human body for collecting information and moving it to the PC in our model. The snag identification is carried out ona PC that ismounted on the knapsack of people who are not visible to others. The scene information, for our circumstance, is the assortment of imagined, significant picture, and accelerometer information given by Kinect.

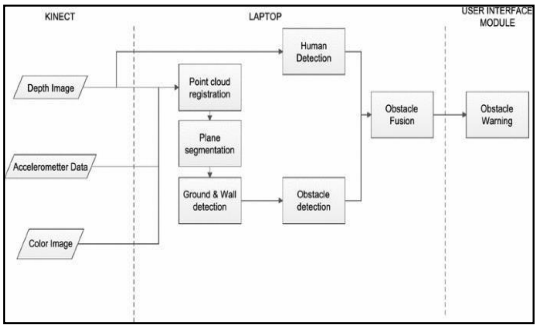

Figure 3: Static and moving obstacle detection flowchart
Source: Adapted from [8]

At this step, all detected obstacles will be checked togive a final warning message. These obstacles include wall, human and static objects. Because there may be more than one obstacle in a frame, so we need to know which obstacle has to be informed to visually impaired people. For this, among detected obstacles, we keep the nearest one whose size is larger than a predefined threshold. Then we quantize the 3D position into three levels of distance(near, medium and far range) and three directions (left, front and right). The encoded information is written in an output file and sent to warning module.

Regarding the obstacle warning module, we repurpose our material visual replacement framework, using the tongue as the human- machine interface to remind the externally hindered individual client to avoid obstructions onthe path. A cathode network, a chip unit (MCU), and a correspondence module using RF waves are included in this installed framework. Encoding the obstruction data into the cathode network is necessary for this module. The knapsack that holds the PC, RF transmitter, and belt that holds the Kinect can be used to mount the entire framework on the body. This issue can be addressed, despite thefact that the current framework is extremely cumbersome and weighty, and everything needs to be mounted on the client's body. From this point forward, everything can be reducedto a small, wearable device like Google Glass, where it can be coordinated. Particularly with the depth sensor, Microsoft has successfully developeda device that is comparable to the depth sensor on the Kinect and can be connected to a typical mobile phone.

In the TVSS system, the electrotactile stimulation is responsible for informing the visually impaired users about the potential obstacles in their way. Based on the signal in the form of tingles on the tongue, they will obtain information and warning of environment obstacles and react accordingly. The electro tactile stimulation is used to generate tactile sensation on theskin site, specifically the tongue surface. A local electric current is passed through the tongue receptor to stimulate cutaneous afferent nerve fiber. This interface is a good site for electro tactile display, because it does not block the ears of visually impairedusers.

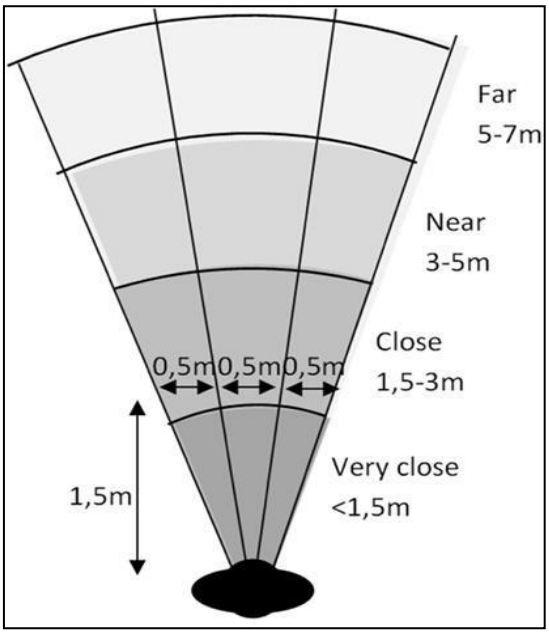

Fig 4: The cone of regard of a possible electronictravel aid and with different object direction anddistance categories.
Source: Adapted from [9]

After receiving the data of obstacle, we will define the kinds of obstacles into different representation on the electrode matrix. Then, according to the depth information, we will define the degree of warning by changing the level of electrical signal. Actually, the local current is delivered through electrical pulse. A control module is included in the TVSS system to

produce these pulses. In our work, we take into account the indoor environment, where obstacles are portrayed as objects in front, preventing or threatening people from moving even though they appear to be disabled. Particularly, we focus on distinguishing between static and moving objects, such as individuals, waste, plant pots, and fire quenchers. A different method of location is required fora flight of stairs because of their various characteristics.

V. EXPECTED OUTPUT

Our framework is designed to perform the snag recognition and cautioning task as a portable aid. The expected outcome of our project is that subjectswould be able to correctly interpret the directional signal provided. The results should show the imaging procedure being able to provide direction prompts, identify both fixed and moving obstacles, and compute rather unambiguously the depth data in order to provide advance notice data in a timely manner under specific conditions. Keeping in mind that users are visually impaired people, the information representation be simple, portable and hands-free. The initial insight results should demonstrate that it is possible to communicate the alarm signal.

VI. CONCLUSION

This paper provides an overview of the most recent developments in the field of electronic travel assistance for blind and physically disabled individuals. Realistic and fictitious vision innovation are depicted, as are the current direction and route frameworks. Based on their capability, the examined estimated time of arrival frameworks were divided into three main groups: frameworks for identifying objects, for directing customers, and for adapting to ecological sensors. The survey conducted for the paper demonstrates the significant progress that has been made in the field of Movement Supports for Outwardly Debilitated People over the past few years,commenting on the transition from earlier devices with limited features to current devices that collaborate with the client. The development of a new pathway framework for people who appear weak is needed. By combining product recognition with direction and route devices in a single unit, a framework designed to overcome the majority of the limitations of the current devices. For both indoor and outdoor climate and route framework, the method of powerful, ongoing, static, and dynamic item identification.

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Digivaidya: Digital Medical Record Generation and Management for Rural India

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Abstract- Rural India faces a lot of problems related to medicines and health checkups. One such issue is related to doctors with fake educational backgrounds, which has led to people not having trust in doctors in rural villages. Also, people from villages migrate to other places for working as laborers or other work. But during covid-period, when everything got locked and we got so dependent on doctors for our medical help, rural areas and some Tier-2 cities faced issues related to prescriptions generated by doctors. Doctors were not having previous health records of labor's who got migrated to other places and now are seeking medical help, which led to difficulties with prescribing them medicines as doctors don't know whether this medicine can give any side effects or not due to the non- availability of previous health data. Along with this, since they have migrated to other states for work, there are certain workers who face language barriers, they don't know the local language and are also not acquainted with the English language. So, when a doctor gives them a prescription in the local language, they can't understand the content written in the prescription. Our project Digivaidya focuses on solving such a problem by having a doctor with verified degrees use our platform and giving doctors such a platform where we remove language barriers and prescribe their patients prescription in languages used by people in their state locally. With your Aadhaar card being considered a valid legal identity for you to be recognized as an Indian citizen, we are using an Aadhaar-based login system since Aadhaar is available to almost everyone. Such a login system provides a secure way through which doctors can access patient records only when the patient willingly shares the OTP received on a registered phone number. All data stored on a central database system will help doctors all around India, to easily prescribe medicines by looking at their past medical records digitally and this will help in creating a safer medical environment around India and making everyone safer andhealthier.

Keywords- Rural India, spaCy, speech-to- text, Aadhaar Authentication, speech recognition, report, extraction, OTP, Digitalization, prescription, NER, EHR, NLP

1. INTRODUCTION

The rapid growth in the field of Machine Learning (ML) & Deep Learning (DL) in urban healthcare sector has been tremendous in the past decade, but this potential growth mostly goes untapped in rural India healthcare digitization. The ground-breaking research and advancements in healthcare has not reached the rural borders. Migration of current digitized healthcare infrastructure is difficult to setup due to appropriate health infrastructure and lack of manpower to facilitate and maintain the usage of such technologies. Due to ignorance of healthcare on such scale the mortality rate in such regions is on a dramatical rise. The rural areas of India have had a tough time receiving basic healthcare needs from the govt. These areas have had to struggle to even receive the basic care from healthcare professionals. The individuals must travel far to getting a chance to get proper medical care and for consulting to a doctor.

The situation of such rural areas has been witnessed in these recent pandemic times where the actual might of India's healthcare sector was tested. And with no hard speculation the healthcare system in such rural areas was seen to be compromised. The lack of timely response to appeals from the rural areas. These issues can be fixed with the help of modern standards of teleconsultations with doctors as well as electronic health records that help counter such discrepancies in current rural healthcare infrastructure available. NLP being one of them that can help address issues in healthcare like parsing medicinal information, semantic identification of medical conversations, tagging of required information, and extraction of condign terms.

NEED OF NATURAL LANGUAGE PROCESSING

Natural language processing (NLP) can be used to improve patient health records, according to a recent study published in the Journal of Medical Internet Research. NLP can be employed judiciously, with considerations for suboptimal term linking and algorithmic pitfalls, to support electronic health record usage. NLP is an emerging field for supporting patient health management systems. EHR's, gives patients glimpses into their medical records and clinical notes, aim to better engage patients with more information about their own health. Though there really are no limits to how NLP can support the healthcare industry, here are three primary use cases:

Improving Clinical Documentation: Rather than waste valuable time manually reviewing complex EHR, NLP uses speech-to-text dictation and formulated data entry to extract critical data from EHR at the point of care. This not only enables physicians to focus on providing patients with the essential care they need, but it also ensures that clinical documentation is accurate and kept up to date.

Accelerating Clinical Trial Matching: Using NLP, healthcare providers can automatically review massive quantities of unstructured clinical and patient data and identify eligible candidates for clinical trials. Not only does this enable patients to access experimental care that could dramatically improve their condition — and their lives — it also supports innovation in the medical field.

Supporting Clinical Decisions: NLP makes it fast, easy, and efficient for physicians to access health-related information exactly when they need it, enabling them to make more informed decisionsat the point of care.

Usage of NER in analysis of clinical notes, patient-doctor conversations, past medical records while extracting keywords and assigning them to specific entities such as Symptoms, Medicine, Duration, Basic info are the standard practices that are adopted using NER. NER plays the most crucial role by giving out the first meaningful chunks of a clinical note, and then feeding them as an input to the subsequent downstream tasks such as clinical assertion status, clinical entity resolvers, and de- identification of the sensitive data. However, segmentation of clinical and drug entities is a difficult task in biomedical NER systems because of complex orthographic structures of named entities.

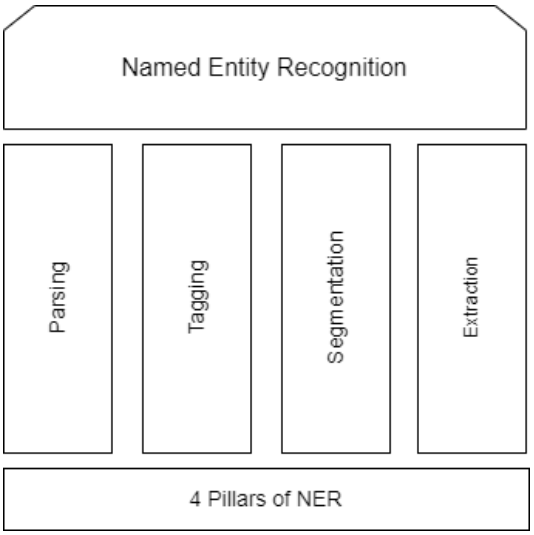

Fig 1: Four pillars of NER

II. LITERATURE SURVEY

Around 64.61% of India's population of 1.39 billion people live in rural areas. To address the health problems of this population, the government has set up various healthcare centres at rural locations, including Sub Centres, Primary Health Centres (PHC), and Community Health Centres, under a program called the National Rural Health Mission (NHRM), which is a sub-mission of the National Health Mission. NRHM seeks to provide equitable, affordable, and quality health care to the rural population, especially the vulnerable groups. In rural India, regional languages are used majorly. It is difficult to enter text in Indian languages on computers, so it is better to ask questions using voice mode. Usually, 60 seconds is enough time to describe the problem completely.[1]

Achieving health equity and enhancing healthcare quality for vulnerable communities is a critical societal responsibility, particularly in developing nations. Some government agencies, groups, and academic institutions have been monitoring the situation and seeking answers. Rural populations in underdeveloped nations have lower life expectancies and health difficulties than urban residents. Poverty is a significant socioeconomic predictor of healthcare. The direct cause of ill health is a lack of access to quality healthcare. The doctor- to-population ratio in India was 1.71 physicians per 1000 people in urban areas and 0.45 doctors per 1000 people in rural regions. Medical AI technology has the potential to both improve the availability of healthcare access and healthcare quality within rural areas of developing countries. The application of AI technology in primary health settings, many AI- driven systems have been developed for special diseases in rural areas. For example, a low-cost swallowable endoscopic capsule with AI analysis technology can be used to screen for upper gastrointestinal cancers, thus replacing expensive or difficult traditional screening equipment.[02]

The healthcare system in rural India is managing patient data in a traditional paper-based system. Most of the rural hospitals in India are lacking in resources to maintain and manage the patient health data. As India moves towards digitization, one of the main challenges in developing countries like India is in making the healthcare data accessible from rural to urban in digital form. Advancement in IT technology in healthcare sector has made it possible to maintain and manage the patient data in digital form in all levels of healthcare system.[03]

The EHR system allows healthcare professionals to capture and maintain patient's past medical history and present symptoms. This allows for a better diagnosis of the current illness as details of past illnesses such as hypertension, diabetes, kidney disease, heart disease, asthma, tuberculosis, and other needs are recorded. The various lab tests and multimedia images need to be presented to the doctor along with the EHR contents. The drug history mainly captures the list of drugs that the patient was taking prior to admission to the hospital. In addition to this, the EHR system has provisions to provide details of drug allergies, dosage, duration, and recently stopped medicine. Addiction history such as smoking, tobacco, and alcohol details need to be recorded. The health history of the patient and the patient's family helps to address acute health problems and minimize the chronic condition of thepatient. [04-05]

The increasing use of network technology in the medical field has led to the accumulation of a large amount of personal information in Electronic Health Records (EHRs). Therefore, research on how to effectively share EHR data is of great significance for countries, EHR institutions, and individuals. At the national level, EHR data can be used as a good indicator of the overall health of the population; at the institutional level, EHR data sharing can help doctors effectively assess patients' conditions and make correct diagnoses; and at the individual level, having complete EHR data can improve the quality of EHR service.[06]

There are two main reasons why speech processing is so important. The first is that it can be used to convert speech into text using speech-to-text technology, which can then be analysed using Natural Language Processing to glean a lot of relevant information, such as sentiment analysis, quality of speech, vocabulary, and other important clues that can be valuable for rehabilitation or diagnostic purposes. The second, more analytical reason, is that speech can be processed and analysed iteratively to identify speech patterns such as slurred speech, or to identify the symptoms that are mentioned in a patient-doctor conversation, to name just a few possibilities.[07]

Information sharing is a key factor that influences the way connections are created and data is interpreted in making decisions. However, the process is very complex due to the variety of actors involved and the diversity of medical data. This can lead to ineffective medical treatment and decreased quality of life. Resolving the issue of interoperability between systems containing medical information would lead to an estimated $77.8 trillion in USalone.[08]

Aadhaar cards serve as digital identities. The Unique Identification Authority of India (UIDAI) issues an Aadhaar card to every resident of India which contains a 12-digit unique identification number. This number can be used as an identity proof for availing all services of government and non-government organizations. Each person is only allotted one Aadhaar number, which is linked to their voter card. Having one identity proof for every resident of India would be the best authentication method to be used for verifying, identifying, and storing the personal medical record. With the advent of high-speed network in India, this system becomes feasible and would save time in comparison to maintaining data in physical paper formats. [09-10]

The most important aspects of a human being, such as health records, must be added to the smart card to maintain and conduct research on demographic areas and countries. The user details are stored in the form of a QR code along with a 12- digit Aadhar card number. Scanning the QR code will retrieve and display all coded information. [12-13]

As AI has been shown to be useful in healthcare, researchers are now suggesting that it may also be helpful in fighting COVID-19. Recent research on COVID-19 using AI suggests that it can be helpful in detecting COVID-19 infection and infected populations, predicting the next outbreak, finding the attack pattern, and even finding a cure. Some recent research has shown the implications of AI like biological data mining and machine learning (ML) algorithms in the detection, diagnosis, classification of COVID-19, and vaccine development. Researchers assessed these techniques in machine learning-induced healthcare selected studies focusing on reliability and acceptability. In this, the authors evaluated and benchmarked the AI techniques used in the image data and presented a set of future guidelines for the evaluation metrics. In contrast, our research explores the works on a broader spectrum including but not limited to the application of AI in detection, diagnosis, epidemic forecasting, and performance evaluation.[14]

The goal of electronic medical record (EMR) systems is to improve patient care management and support clinical and transitional research. In the past decade, the amount of patient health-related data stored in EMR systems has increased massively. Patients' clinical data are stored in EMR systems in either a structured format (which is easy to query and mine) or an unstructured, free-text format report (which requires tools to extract terms of interest). Natural language processing (NLP) methods are used to transform the text into computable data. Some of these methods are used in the clinical field to extract concepts from free-text clinical reports. Some open-source clinical NLP tools are Clamp, cTakes, and MedLEE. Most NLP software tools rely on medical dictionaries such as the Unified Medical Language System (UMLS) or the Systematized Nomenclature of Human and Veterinary Medicine (SNOMED) to match concepts to text vocabularies and follow either a rule-based approach or a machine learning approach. The rule-based approach consists of manually created rules to map words and phrases within free-text to categories. The machine learning approach uses a training set of large, pre-annotated reports to extract named entities. The NLP process is complex and challenging to NLP solution designers as they must consider clinical abbreviations, temporal events, and the context to design and implement an efficient and well-performing NLP product.[19]

III. ARCHITECTURE

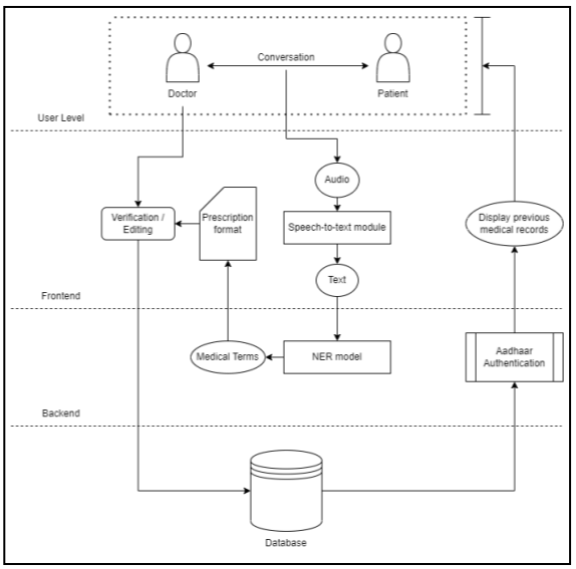

Fig 2: Architecture

The system tackles the problem experienced during consultations, as well as how the use of smart technology may not only change, but potentially revolutionize, how we experience medical meetings. The system is designed to record audio between a doctor and a patient and process it to give the intended output i.e., prescriptions in our case. The architecture of the system can be well explained by breaking it into 3 parts namely:

1. USER LEVEL:

This is the topmost layer in the architecture of our system, which is responsible for recording of conversation depending on which whole system is intended to work and provide output. The doctor is given access to a portal where he/she can migrate to the record page and then record the conversation that is going to take place between them.

2. SYSTEM LEVEL:

This layer is the second layer of architecture and is further divided into 2 parts that are frontend and backend. Both have their own architecture on which they are doing all required tasks.

A. Frontend:

The audio that was recorded is passed to speech to text module, from which text is extracted and passed on to Named Entity Recognition (NER) model which is at the Backend. NER model extracts all clinical terms that it gets from the text that was passed to it, and then the generated output of NER is

moved to prescription format where it is displayed to the user at the front-end side. Later, at the final stage there is an option provided for doctors to verify and make any changes if they want before saving it to the database and sending it to the patient. Frontend is also responsible for displaying the previous medical record to the doctor after getting verification approval from backend.

B. Backend:

It consists of a NER model which extracts medical terms. Along with that, it consists of Aadhaar authentication, which we use to display previous medical record of a patient to doctor only if correct One Time Password (OTP) is provided by that patient to doctor as One Time Password is only sent to the patient registered mobile number as per Aadhaar records.

3. DATABASE LEVEL:

This is the bottom most layer, yet the most important one, as it handles all the records of doctors and prescriptions. When a new prescription is generated, it is stored in the database as a new document having a unique identity. Also, when a new doctor joins the portal, the data related to the doctor is also stored under a new document having a unique identity. Both User level and System level takes help of the database level in some of their functioning to achieve the target.

IV. USER FLOW DIAGRAM

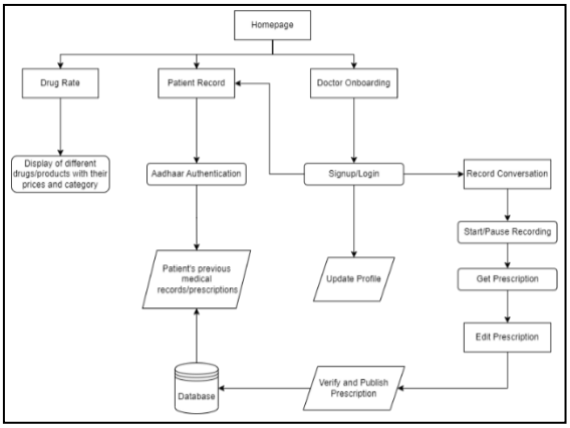

Fig 3: User Flow Diagram

The system is comprising of a webapp for user interaction. The user intended to work on the webapp is a doctor. The doctor lands on the homepage where several options are given for access.

The drug rates portal can be used for checking the verified drug rates of about 8000 drugs/products. These rates can be used to compare the different complementary drugs to get the best option among them. These drug rates are authorized by the govt. The drugs are displayed along with their composition for a detailed comparison.

The patient record section is used to access previous medical records of patients. The records can be accessed via proper authentication using Aadhaar OAuth. After which, the records are fetched from the centralized database.

The doctor onboarding section is where the doctor can signup/login to access his/her profile and to work with the recording section of the portal.

The record conversation section provides functionality for recording the conversation of the patient and the doctor. The doctor can start or pause the recording at any point in time. The record text can then be used to generate the prescription.

The edit prescription section provides functionality to make changes to the medical record/prescription. After verification the records can be published onto the central database.

V. FLOWCHART

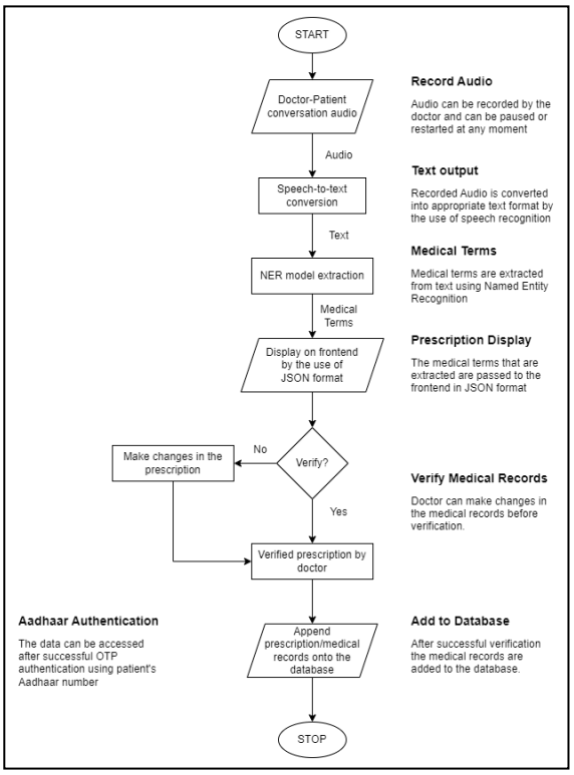

Fig 4: Flowchart

The idea of creating the system is to digitize the consultation process i.e., the process of interaction between a doctor and his/her patient. To automate this process the conversation between the doctor and

patient is used to provide a digital copy of a prescription to the users i.e., doctor and patient.

The system passes through a series of phases before the appropriate prescription can be modelled and be displayed to the end user.

The system provides a web app for interaction and is mainly focused on providing an interface for the doctors. The doctors are the main users and hence have to login to work with the system.

The doctors initiate the process by using the record privilege that is provided. The doctors can pause, start, or restart the recording anytime. The conversation is converted into text in real time using speech recognition models and can be seen virtually on the portal provided.

After successful capture of audio and conversion of text, the text that is acquired is passed to the backend where the extraction takes place. Named Entity Recognition is used for processing the text and for obtaining all important medical terms. The text is passed through the SciSpaCy model which is used to extract medical terms like drug name, dosage, strength, frequency as well as the symptoms spoken of in the conversation.

After successful extraction of all the terms spoken of in the conversation, the terms are saved in a JSON format and passed further for formulating an appropriate representation for displaying it to the end user i.e., the doctor. The doctor then has the option to check all the terms and verify any discrepancies in the medical record that is displayed. If there are any issues identified, then the doctor can make changes and correct the issues there itself with the edit option that is provided.

So, after proper verification from the doctor's side, the document/prescription can be published onto the database. This step makes it a permanent entry on the database along with all the diseases identified and the medicines prescribed, symptoms diagnosed and so on. This creates a proper medical record for that visit with the doctor.

For accessing these medical records there is an option to see the patient's medical records where the system asks for the patient's Aadhaar number. After entering the Aadhaar number, an OTP is sent on the patient's registered email ID, this OTP is then used for authentication. This allows the user to see all previous medical records linked to that patient's history. Hence, allowing for a quick access to the health records.

VI. WORKING METHODOLOGY

Digi-वैद्य is developed using modern technology stack used in web development i.e. MERN stack which consist of technologies like MongoDB which acts as a database and responsible for storing of data, ExpressJS which enables routing functionality between front-end and back-end of the application and also responsible for data flow between frontend and backend, ReactJS is the frontend module that is used to creating the design and working of front-end part of the project, and lastly we have NodeJS which is back-end JavaScript runtime environment which is responsible for executing of JavaScript code outside a web browser. Along with these technologies, we also used Flask where our Machine Learning code lies that helps in extraction and generation of prescriptions. Talking about the flow of the project i.e., how it is working let's look at it step by step.

1. Doctor onboarding:

As the name suggests, it is where doctors will be creating their account and filling up all basic details related to their education, previous work experiences, expertise, and similar other details. After getting all the details, the system will save doctor's credentials and basic details into the database for future usage.

2. Getting patient's previous medical record:

After the doctor is logged in into the system, the first thing that he/she needs to do is to check the previous medical history of the patient. Since we are trying to make everything paperless, here we are expecting that the patient has not come with previous health related data and previous prescriptions, so the doctor will be viewing it directly through the central library that is being created along the way to store patient records. The doctor will ask the patient for their Aadhaar card number and then the system checks whether the Aadhaar card is avoided or not and after validation it sends the One Time Password (OTP) to the registered mobile number that patient needs to give to the doctor so that doctor can view his/her data. The concept of OTP was introduced to protect patient privacy and it will require OTP to access any patient's medical record without which the doctor won't be able to see any record. After successful One Time Password verification, the doctor can now see what all illness has been registered for the patient and prescribe the medicines accordingly.

3. Generation of prescription:

The system takes voice as an input, the voice comes in the form of communication that takes place between doctor and patients. The system keeps recording the whole conversation and after that it generates the prescriptions according to whatever insight the Machine Learning model has received in the form of speech. We are using the Named Entity Recognition [NER] technique to detect clinical terms from the speech which is first converted to text and later passed to the model for detection of named entities. After detection, it is segregated into categories such as drug name, duration, frequency basically all the categories that a prescription needs to have. Along with these it also gives out all the symptoms that were detected from the conversation. Since the project works with Machine Learning, it is not always hundred percent accurate in getting details, there might be some error in detections, so to prevent these we have a double-check mechanism that let doctors have a final edit advantage to make sure everything is correct and later print the prescription and give it to patient. One additional feature that the project offers is that prescriptions can be generated in almost all possible languages that each state in India speaks locally which helps the patient in understanding such prescriptions in a more detailed manner.

4. Medicine price rates:

The Government of India (GoI) releases the price rate of medicines with chemical names on their website, but very few people read them. We also aim at increasing awareness regarding the real prices of the medicines that GoI has attached, and it can be directly viewed on our website without the need of having an account, and the patient can buy the medicines based on chemical name which will helps in getting generic medicines from certain medical shops at lower price, which will indirectly help in improving the health infrastructure of the country.

This was all about the working of various components that are involved in Digi-वैद्य. Since each and everything involved here is connected to back-end database that keeps track of everything happening in the portal provided to the doctor, we can easily keep track of which medicines are prescribed by which doctor, whether the educational background provided by doctor is correct or not, or the location of doctor's clinic where this prescription was generated. These all will help in making a safer medical environment for people of India.

VII. RESULT & DISCUSSION

Digitalization in rural India, elimination of language barriers, faster backtracking in case of any error or frauds, central medical health library is some of the advantages that we can create with the help of this mechanism. We can achieve this by use of existing technologies available, understanding them, and integrating them to solve a larger problem
i.e. In our case, it is betterment of the medical health industry in rural parts of India. The model that we are using for detection and extraction of clinical entities from the conversation is implemented using SciSpaCy, a model that is trained over a big corpus of data of clinical texts. When a doctor starts the portal, the system first asks for their preferred language in which they want to use and based on their language selection the whole system works anddisplays content.

Although as of now the prototype of our system accepts the voice in the English language only to work efficiently. But it can display and generate prescriptions i.e., the final output in the language preferred by the doctor at start or based on patient required language can be updated and the prescription will be modified accordingly. Everything related to data is stored in the database in English language only as we are also focussing on collection of data that will help medical researchers improve their research and testing medicines on certain people and later identity what would be the side effects on others based on the data that our system will collect over the period. So, to have consistency and increase usability the data is stored in the English text.

As the system will scale up in future, we will be prioritizing availability over consistency. The reason behind that is during a medical emergency, if our certain part of the system stops working, we should have some sort of data related to the patient available in the database for usage by doctors. But if we would have focussed on keeping consistency as our priority, it would have some serious consequences such as non-availability of data during medical emergencies. If such an issue arises then our system fails to solve the root cause of the problem that it was made to solve. Hence, we focussed on availability by compromising consistency.

The prescription that is generated by our system is in tabular format having each row with columns as drug name, strength, frequency, duration. There is another table attached immediately after the prescription table which tells about all the symptoms that were mentioned by the patient. The purpose

behind having symptoms is also displayed so that when the patient visits the clinic next time, the doctor would be able to determine easily why so and so medicines were prescribed to the patient. As the system works on Natural Language Processing (NLP) which is a part of Machine Learning (ML), there are chances of error during detection of clinical terms from the conversation that takes place between doctor and patient. Wrong prescription will have serious consequences for both i.e., patient and doctor. In order to solve this particular and major issue, we added a double-check mechanism which only comes up after the prescription is generated based on the initial conversation that occurred between them, so in case any mistakes system has made during detection can be rectified by doctor, also if any new additional information patient has given that got missed out during the recording can be updated by doctor while making corrections (if any). Any additional feedback that the doctor wants to mention can also be mentioned which will be stored in the database for future reference.

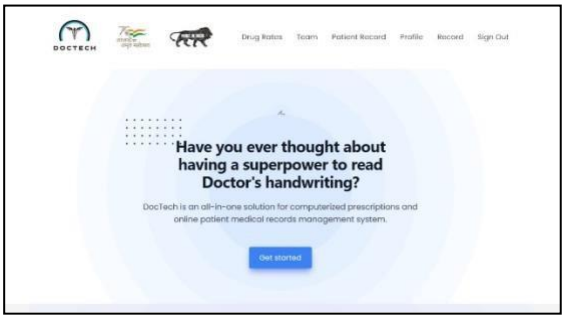

Fig 5: Home Page

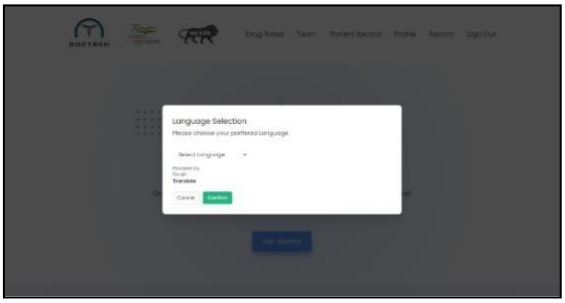

Fig 6: Language Selection

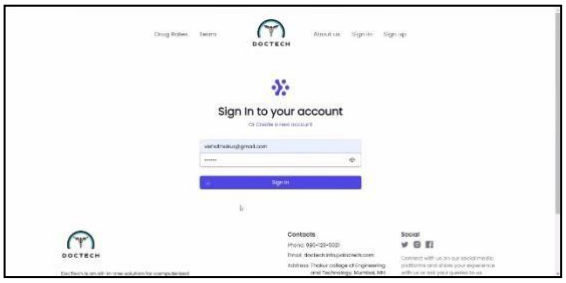

Fig 7: Doctor Onboarding

Fig 8: Aadhaar Authentication Mail

Fig 9: Patient Data

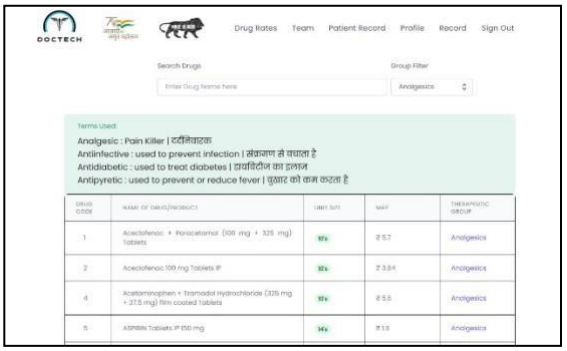

Fig 10: Drug Rates

Fig 11: Record Page

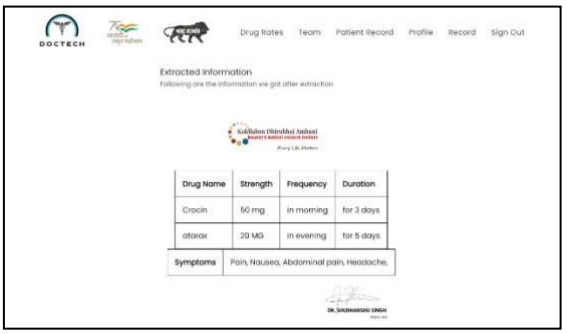

Fig 12: Prescription Display/Download

VIII. FUTURE SCOPE

Every Institution, business and economies around the world are moving towards use of data science extensively. Data helps in generating greater valuable information regarding a problem and helps in getting faster solutions. Talking about Covid times, there were certain companies who wanted to sell their covid vaccines in India, but they were not able to guarantee the safety of people due to less availability of data regarding people of India. Our project ultimately will be generating good chunks of data that will be stored centrally, and when covid like situation arises or if any medical researcher wants to test certain medicines, it can be done by testing on few people and then matching its trait with help of data and getting insights on how this will affect the health of other individuals. The future usage of Deep Learning (DL) and Natural Language Understanding (NLU) in the healthcare industry seems to be very promising.

1. The system will be having a vast range of improvements from design perspective to performance perspective. Some of theincludes:
2. Storing voice (with consent of doctor and patient) that is being recorded during the conversation which will help in improving the architecture of speech-to-text models in the medical as well as other fields.
3. Time to Time re-training of data, based on new data that is being collected to keep the model trained with new entities and terms used or introduced in recent times.
4. Creating a progressive web application (PWA) for doctor's so that they can quickly access it from their laptop or computer screens instead of searching it on the web.
5. Making our system take voice input in other local languages as well.

IX. ACKNOWLEDGEMENT

We would express our gratitude towards the Department of Electronics Engineering (THAKUR COLLEGE OF ENGINEERING AND TECHNOLOGY).

X. CONCLUSION

The healthcare sector has ever been an important sector for the well being of the society. The situation of healthcare professionals has been well witnessed in the recent pandemic times where the whole world crumbled upon the issues faced by the healthcare system. The healthcare system failed as a vast majority of patients could not be addressed at the time of need.

The rural areas moreover were at the worst possible position as they had to travel far to just get to see a doctor for once. The rural areas have been suffering for a long time when it comes to the basic healthcare needs, whether it be fast and convenient consultations, proper doctors, or access to drugs and medical products.

The proposed system considers the need of digitalization of this process of consultation between the doctor and the patient to provide an option for a convenient and easily accessible medical record.

The automation mentioned in the proposed system takes the conversation between a doctor and a patient and provides a digital prescription / health record which is generated using the audio recorded while conversing. This recorded audio is converted into a text and worked upon to capture all important medical terms like drug name, strength, frequency, dosage, etc.

These medical terms are used to prepare a medical prescription/record which can be stored into a centralized database for future access.

This makes it possible for a frequent and convenient facility for accessing the previous medical records at any place anytime. Also, the process of automating the consultation process makes it fast and improves the condition of no human errors in handwriting or recording as such.

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Portable Solar Device

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***Abstract*—Humans nowadays are totally reliant on technology, and they are working very hard to enhance it. People have added complexity and busywork to their lives. They require a portable, efficient source of energy to charge their devices because they frequently struggle to do so due to their hectic schedules. This paper discusses an efficient energy device called a Portable Solar Device. One of the most ecofriendly energy sources now in use is solar energy. Solar energy can be maximized, stored in batteries, and used for devices that need solar energy by employing a portable solar gadget that transforms DC energy into AC energy. Solar energy is becoming more well-liked and practical as a renewable energy source that could alter the future of our world due to the greater constraints of fossil fuels. It is accessible for infinite use and is environmentally friendly. The invention of the portable solar device is ideal for meeting the need for portable gadgets since it can store solar energy and supply it when needed. The capabilities and uses of a portable solar device are numerous, varied, and simple to use. It will be utilized to supply electricity to non-grid linked devices as well as portable electronics. A portable solar device like a torch with a rechargeable battery backup, a radio receiver, a television, and the battery of the vehicle (scooter, bike, or four-wheeled automobile) that is used for mobility are some examples of gadgets and devices utilized while at the outdoor camp. Motorbikes that require a kick-start to start the engine due to clogged petcocks can benefit greatly from portable solar systems. Here, it is possible to jump-start the vehicle using a stored battery and, in the event that the battery runs out, to start the vehicle using a power jumper equipment. This is accomplished by utilizing a high ampere circuit, which allows the motorcycle to be reinvigorated. Another great example of using a portable solar device would be to charge electric vehicles. EVs frequently run out of battery and require a charging station to refuel. Using a portable solar device to charge the vehicle is another option for resolving this issue.**

Keywords—Alternative energy, Converter, Renewable energy, Solar energy, Portable, PV cells.

I. INTRODUCTION

Rapidly-increasing issues with burning energy sources: The world is on the cusp of creating new energy and related technologies. In today's climate of increasing energy demand and rapidly increasing environmental uncertainty, the replacement of non-renewable to renewable energy and polluting fossil fuels have to be investigated [1]. One such alternative is solar energy. A solar energy source is one that is directly derived from the sun and collected somewhere else, normally by the Earth. Approximately 650 billion tons of hydrogen per second are converted into helium by the sun's thermonuclear process. The process creates heat and electromagnetic radiation. The electromagnetic radiation streams out into space in all directions (including visible light, infra-red light, and ultra-violet radiation). Due to the nature of solar energy, two components are required to create a functional solar energy generator device. These two components are a collector (solar panel) and a storage unit (battery). The solar panel simply collects the radiation from the sun that falls on it and converts a fraction of it to other forms of energy. The storage unit means batteries are required because of the non-constant nature (cloudy, rainy nature) of solar energy at certain periods when only a very small amount of radiation will be received from the sun. When there is a lot of cloud cover, or at night, the collector (solar panel) will not produce much energy. The battery (storage unit) can hold the excess energy produced during periods of maximum productivity through its maximum power position tracking system and release this energy when the productivity drops. A battery backup power supply is usually added too for situations when the amount of energy required is greater than both what is being produced and what is store. The apparent limitations of fossil fuels meant that solar energy would become a widespread renewable energy source in the near future. The solar power plant has a capacity of up to 200 watts. This is useful for powering non-portable devices such as fans, projectors, and computers. The components of this solar power plant are 2 solar panels of 100 Watt, a 250 Watt inverter, 2 batteries of 12 V and 5-6 amps. , charge controller 250 watts. The inverter, charge controller, and battery are mounted in a portable tin box with wheels underneath. Solar panels are installed on the power station. This structure makes it easy to carry. Solar energy is abundantly available and does not emit greenhouse gases does not harm the environment. This solar power supply provides a clean and reliable supply of alternative power without the sags and surges found in mains voltage frequencies.

II. LITERATURE SURVEY

Due to environmental concerns and energy demands, solar has become an alternative energy source for power generation. The product is designed as a standalone application that can be used in a variety of ways for

increased efficiency, minimal product costs, and a reduction in product size. Solar standalone applications are used to produce solar power that is low-cost, portable, and efficient. The designated expected output is a 230V AC sine wave signal for external electrical activity [2]-[3]. The incremental conductance-based Maximum Power Point Technique (MPPT) system has been implemented in this work. For power generation on smaller scales, renewable energy sources are preferred due to their various advantages such as modularity, nonpolluting nature, localized generation, and distribution, and the availability of renewable energy sources such as wind and solar. With the level of solar available in India, there is good scope for energy generation at the micro and small scale levels. PV systems are becoming more advanced, PV module prices are dropping, and tariff rates for PV generation are on par with conventional sources of power, PV is becoming more competitive with conventional energy sources. There is a boost in demand for solar power due to government policies in India [4]-[7].

It is evident from the literature that we reviewed that many researchers have worked on the design and development of portable systems. Solar energy has been used for a very long time, since the 7th century BC. However, in recent years, international interest in energy use has rapidly accelerated the growth of green economy research and development.

Alternative energy sources such as solar energy. Some articles we read about the development of portable solar power plants are Abdul Majid ZA 2011. It is based on the utilization of solar energy as it is the most important research area for sustainable energy sources. The performance of solar panels is said to be quite low.

As a result, optimization is required. This is achieved by arranging the solar panels so that their power output is maximally limited. Sopin K Paper is based on the largest partially transparent PowerPoint tracker. Improved adaptive perceptual particle swarm optimization, using shaded photovoltaic arrays. Russell M.F.Othman Y, Sopian K, and Inverter solar panels are recommended because they are quiet machines. Environmentally friendly and does not require gasoline. Photovoltaic systems have been a viable method of generating to replace conventional generators as energy sources.

III. MOTIVATION

Due to rapid increase in energy demand, traditional energy generation is depleting natural resources e.g. coal very fast hence alternate method of energy generation is necessary. Solar energy is renewable form of energy and it is vastly available by using it dependence on foreign oil and fossil fuels can be reduced. Those who are facing electricity problems, mostly in rural areas, and for those people who live in jungles and do not have electricity for their needs. In urban areas the situation is different, people want electricity for entertainment and for joy when they go for trips, camping etc. The problem occurs when the electricity fails. Problem also occur when users do not have an electricity connection but they want to use it to fulfill their basic needs. The problem is already being solved by using the solar system. There are different solar systems available on the market. But these systems are not moving from one place to another; system are large in size and provide large amounts of electricity and also require large area for installation. Portable Solar device is different, it provides a sufficient energy, it has a lightweight body, small in size, and one person can easily lift a system anywhere. Improving the traditional system by adding features like an automatic folding solar panel, IOT based operation, IOT based voltage, and weather monitoring system. Also added an MPPT circuit to determine the maximum power position in order to capture the maximum sunlight [5] – [10].

IV. GOALS

Transferability and efficiency of this project are the main goals. The main interests of the group members during the research and construction phases of this project were to: Development of lightweight portable power generation system is needed. Portable power supplies should also be easy to use and have a user-friendly design. Members of the Group were required to draw on their knowledge from previous courses as well as talents from their education, work experience, and other experiences to achieve the above objectives. Project Objectives Achieved Some of the technical requirements necessary to do so are briefly described for the following purposes: The must be able to provide a 5V 500mA DC USB Type-A output. To track the sun, the device must be 90% efficient and able to rotate 360 degrees horizontally. The Maximum Power Point Tracking (MPPT) matches the impedance of the solar panel to the impedance of the battery, ensuring that the maximum power received from the solar panel is transferred to the battery.

V. COMPONENT SELECTION

A. Solar Panel

In reality, solar panels are actually collections of solar cells (or photovoltaic cells), which can be used to generate electricity by converting light into electricity. A photovoltaic (PV) system is used to harness solar power by converting sunlight (solar radiation) into electricity using semiconductors.

Fig. 1. Solar Panel

The PV cell generates electricity when the sun hits its semiconductor and electrons run free. The running electrons are collected in bus bars, which generate electric

currents. Crystalline silicon solar cells are used to manufacture most solar panels. They consist of layers of silicon, phosphorous, and boron (although there are several types of photovoltaic cells available)A monocrystalline solar panel can achieve efficiencies of 20 percent or more, making it the most efficient solar panel on the market. Monocrystalline solar panels have a higher power capacity than other types and are more efficient. Figure 1 show the solar panel.

B. Node MCU

Figure 2 represents Node MCU. By using Node MCU, one can connect objects and let data transfer over Wi-Fi using the ESP8266 platform. It can also provide many of the project's needs alone, thanks to some of the microcontroller's most important features, such as GPIO, PWM, ADC, etc.

It uses numerous open-source projects, such as lua-cjson and SPIFFS

Fig. 2. Node MCU.

This firmware was developed using the Espressif Non-OS SDK for ESP8266. ESP8266 boards generally have a power supply of between 2.5V and 12V, while Arduino boards tend to be closer to 7V or 12V. Therefore, the difference in power supply will not have a noticeable effect in reality. In addition to the 17 GPIO pins on the Node MCU, you can assign different functions to them, including USB, I2C, I2S, UART, PWM, IR Remote Control, LED Light, and Button. Every GPIO that is digitally enabled can be configured as a high-impedance input or a low impedance++ input.

C. Battery

Fig. 3. Battery.

Figure 3 represent battery used for portable device. An electrical battery of twelve volts has six cells in series that produce 12.66 volts when fully charged. Batteries are made from two lead plates: a negative sponge lead plate, separated by an insulating material, and a positive lead plate covered with lead dioxide paste. The charge current for a 12-volt lead-acid battery (six cells) with a voltage limit of 2.40V is the same as the voltage setting. The voltage setting should be 14.40V (6 x 2.40) and the charge voltage according to the battery type. A lead-acid battery charging at 30 percent will require about 3A; a battery at 10Ah at 30 percent will require less current. These incredibly cheap, rechargeable, and widely available lead acid batteries are the workhorses of the industry. They are considered to be the safer lead acid battery to use since they do not sulphate or degrade easily like wet cells.

D. Transformer

Figure 4 represents the transformer. Transformers that step up the voltage from the primary winding to the secondary winding while maintaining the same power in both windings at the rated frequency are called step-up transformers. For example, if you need a transformer to step up 240 volts to 480 volts and you need a maximum current capacity of 40 amps, you first have to figure out how many amps you need to comply with electrical codes. Multiply 40 by 1.43 if the codes state that the transformer should not be used more than 70% of its capacity. A transformer reduces the voltage generated by generators so that transmission lines can handle it. X-ray machines, microwave ovens, as well as electric motors are powered by this transformer.

Fig. 4. Transformer.

E. Motor

Figure 5 represents the Motor. An integrated Planetary Gear Box with a 26 103/121:1 ratio drives the 12V, 1.7A, and 416 oz-in Geared Bipolar Stepper Motor. It has a rear shaft that can be attached with an encoder or shaft coupler. Stepper motors with this amount of current can generate a maximum torque of 77 kg-cm at 1.7 Amps (maximum current). Motor actuators are usually driven by voltages as low as 12 V, but higher voltages of 24 V, 48 V, and even 80 V are required for motion control. Generally, the system bus voltage for motors should be between 10 and 24 times their nameplate voltage. Motors designed for stepper motion operate in this manner, and they can be run for up to 20 times their rated voltage.

Fig. 5. Motor.

VI. BLOCK DIAGRAM

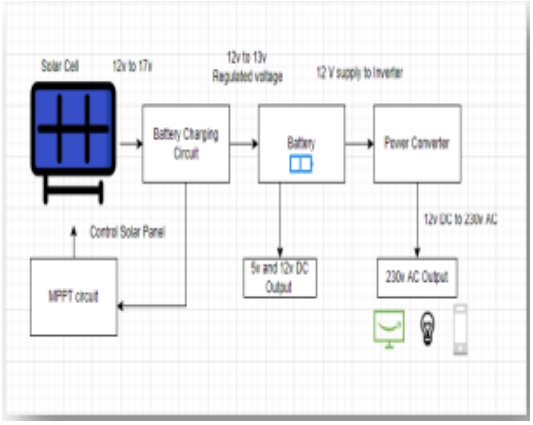

Fig. 6. Block Diagram.

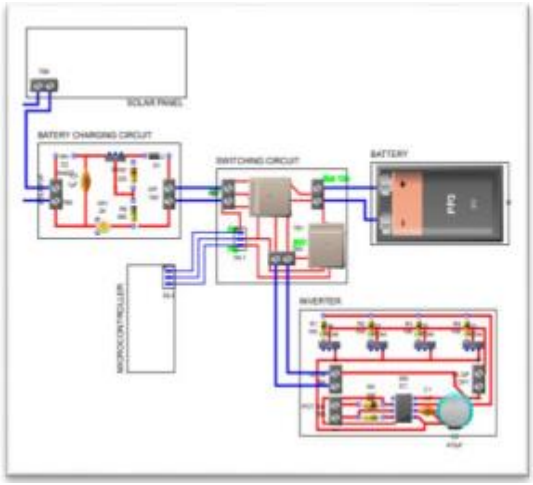

Fig. 7. Circuit Block Diagram.

The above figure 6 represent block diagram of the portable solar device it contains a solar cell, a power converter circuit, a MPPT circuit and an energy buffer. A solar cell absorbs sunlight as an input source converts light energy to electrical energy its output is fed to the power converter device. A power converter coverts the incoming dc energy into AC energy for further application. A MPPT circuit is also fed to the power converter for maximum power. The power converter output is fed to the energy buffer which independently control input and output power and further fed to application unit.

A. *Solar Cell*

A minimum of one author is required for all conference articles. Currently on the market monocrystalline, polycrystalline, and thin-film solar panels are available for use in a variety of applications in several countries. These monocrystalline solar panels are the most popular solar panels used in installations on rooftops and in small-scale applications. A single photovoltaic solar PV cell can produce an open-circuit voltage (VOC) of around 0.5 to 0.6 volts at 25 degrees Celsius temperature.

B. *Battery Charging Circuit*

A battery is an element that stores one form of chemical energy and then converts it into another form of energy nothing but a form of electrical energy. This is a simple method that uses a steady current to charge or feed the battery during the entire charging process. Once the battery has reached its predefined level, charging stops. This method is typically used for charging li-Po and acid batteries.

C. *MPPT Circuit*

The full form of the MPPT circuit is the maximum power position tracking system. MPPT solar charge controller matches the panel's resistance to provide maximum power available to the panel. This then converts the extra voltage into a higher charging current so the battery charges faster. Its primary function is to provide the maximum energy available from the connected solar panel array during its operation.

D. *Power Converter*

The power converter is nothing but an inverter. Inverter converts the DC energy from sources such as direct current DC batteries to alternating current AC energy. This energy can be used at any time required, at any voltage. The components required to build the direct current (DC) to alternating current (AC) circuit primarily include a 12v DC battery, transistor, mosfet, capacitor, resistors, and the heart of the circuit is a center tapped transformer (step up).

VII. FLOW CHART

Basically, a flow chart which shown in figure 8 is a type of diagram that represents a process. The above flow chart or diagram shows the flow of the (Portable Solar Device) work. The Node MCU in the system is nothing but the brain of this system, which controls all the instructions and commands according to the user-defined system. Now let's see how the system works, from the above flow diagram. When the user starts the system, the solar folding mechanism opens the panel of the device, and the mechanism uses a stepper motor to automatically perform this operation. After that, the solar panel opens according to a predefined level set by the user or developer. Next, the MPPT circuit will be started, MPPT known as (maximum power position tracking system), which helps the system to gain maximum energy from the sun. So the MPPT circuit moves the panel until it has reached its maximum power generation position. The solar panel starts generating energy from the sun and sends it to the battery charging circuit, where the battery charging circuit is used to charge the battery as safely and quickly as possible. If the battery charging circuit is not installed in the system then the system has a chance of destroying the battery from over voltage, to prevent this incident and for a reliable system to be installed in this circuit. When the battery is fully charged then the battery charging circuit cuts the supply from the battery and applies power to the inverter or power converter circuit. The power converter circuit is the heart of the system. This circuit has the ability to convert the 12v DC voltage into the 230v AC voltage and then connect and run any AC appliances to this system. Another circuit used in the system, called a voltage monitoring circuit, is used to

measure voltages in batteries and display them in cloud applications.

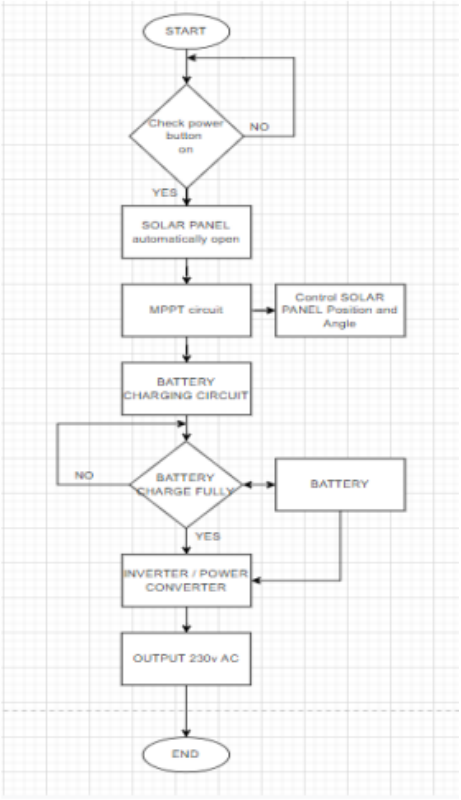

Fig. 8. Flow Chart

VIII. Problem Statement

a) People who live in rural areas face higher electricity problem or issues, and as we know that in rural areas load shading happens at a much higher rate than in sub-urban and urban areas. There is also overhead wiring. Because of overhead wiring, many times power failures occur. The reason behind the power failures is the fall off of electricity poles due to tree falls, which typically occurs during rainy and storm seasons. This pole is used mostly for electricity distribution in rural areas. Tracking a falling pole and replacing it is not easy, and this procedure requires more time to complete the reinstallation process. During that period of time, villagers don't have the electricity to power their homes. In this scenario, villagers will be able to use a "portable solar device" to fulfil their emergency needs.

b) The problem we see in the above statement is with people who live in rural areas, and now we see people who live in urban areas and how they use this work (Portable Solar Device) for their own use. Urban people use this work for entertainment and for joy. People like this go out on camping trips and jungle adventures but they are always facing the problem of electricity. So these people can use our work to make food, charge their equipment like mobile phones, torches and many other products. A user can solve many problems, as shown in the statement above. This is possible because of the work we're going to do. It's lightweight and any above 16+ person can lift it easily. The cost of this work is very low so anyone can buy it.

IX. Methodology

Portable solar device is a product which have inbuilt solar panel which converts the solar energy that is DC energy into AC energy .A portable solar device uses sunlight as input source by using this a power bank is been charged. The stored energy can be further utilize for further application.

The expected output of portable solar device is to capture sunlight through solar panels, and the solar panel is operated and controlled by the MPPT circuit (maximum power position tracking system or circuit). This helps to determine which location or which direction is best for maximum power generation, especially in the southern direction where maximum sunlight is provided. Because the MPPT circuit controls the solar panel, this portable solar device captures more power from the sun and helps to charge the battery as fast as possible, which is very important for the system. When the battery is fully charged the battery charging circuit blocks the charging voltage and provides direct power to the inverter which converts the DC energy into 230v AC energy. This further enables connecting any AC appliances supported by the Portable Solar Device Watts limit. Portable Solar Device has unique features: The device can be operated on mobile devices via the internet and by default used manually. It also has a feature called an automatic solar panel folding mechanism in which the solar panel automatically opens or closes the solar panel using one single button on the phone or through a physical device. The portable device is integrated with other IOT devices so it can operate and monitor from anywhere. Motorbikes that require a kick-start to start the engine due to clogged petcocks can benefit greatly from portable solar systems. Here, it is possible to jump-start the vehicle using a stored battery and, in the event that the battery runs out, to start the vehicle using a power jumper equipment. This is accomplished by utilizing a high ampere circuit, which allows the motorcycle to be reinvigorated. Another great example of using a portable solar device would be to charge electric vehicles. EVs frequently run out of battery and require a charging station to refuel. Using a portable solar device to charge the vehicle is another option for resolving this issue.

Hardware Implementation and Results

A. Inverter Circuit

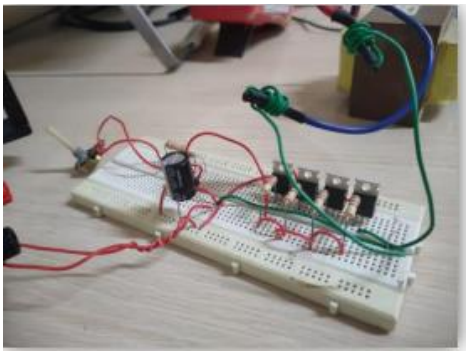

Fig. 9. Inverter Circuit 1

Above figure 9 shows connection of inverter. For making a dc to ac converter circuit we required two thing first is centre-tapped transformer and second is 12v dc battery. For getting output, firstly we have to connect center-tapped transformer to converter circuit then connect battery to the circuit, pressing the push button the circuit will complete and turn on, after that we have to check the output at output terminal by using multi-meter.

Fig. 10. Inverter Circuit 2

This inverter circuit converts 12v dc supply into 5v ac supply and directly given to center tapped transformer. This transformer converts 5v ac supply into 230v ac supply.'

B. Voltage Monitor Using IOT System.

The figure 10 voltage monitor circuit, basically measures the voltage of the system and displays this voltage to the cloud. Anyone with access can see the data on any device. Shown in figure 11 12 and 13. The node MCU

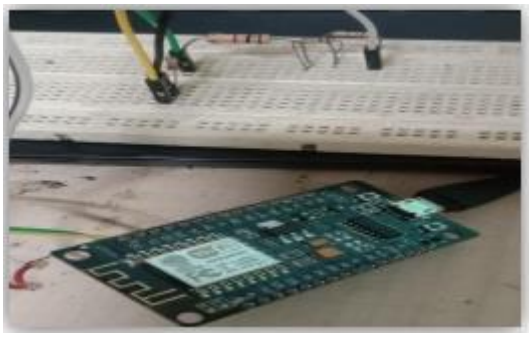

Fig. 11. Node MCU.

Microcontroller has one analog pin A0, and the microcontroller used that pin to measure the battery voltage. The microcontroller has an inbuilt ADC which helps it to convert the analog voltage into digital form.

Fig. 12. Circuit Connection

Basically, the circuit is connected to a 12v battery, and the circuit measures the voltage and displays that voltage to the cloud. It also uses a voltage divider circuit because the node MCU supports only the 3.3v volt input.

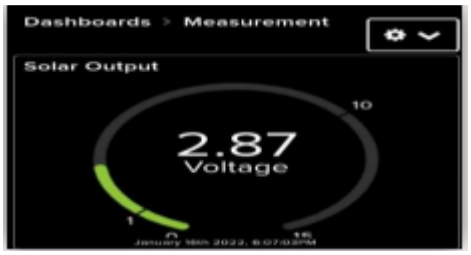

Fig. 13. Cloud Monitoring.

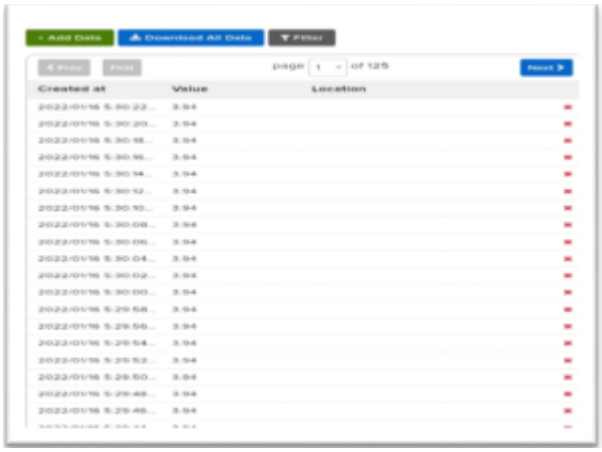

Fig. 14. Cloud Data.

C. Battery Charging Circuit.

The following is the simulation output of the battery charging circuit shown in figure 15 and 16:

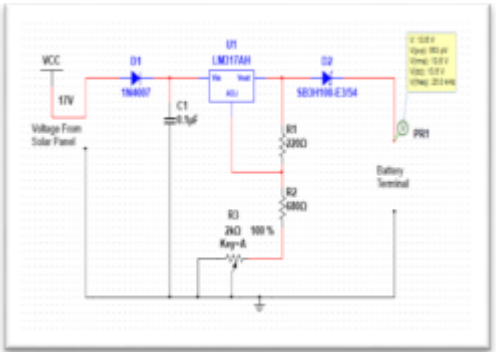

Fig. 15. Simulation Circuit

Fig. 16. Measurement Output.

Where the battery charging circuit is used to charge the battery as safely and quickly as possible. If the battery charging circuit is not installed in the system then the system has a chance of destroying the battery from over voltage, to prevent this incident and for a reliable system to be installed in this circuit. When the battery is fully

charged then the battery charging circuit cuts the supply from the battery and applies power to the inverter or power converter circuit.

X. Future Scope

The next stage of the research work is to focus on developing an energy efficient power amp circuit to enhance the applications of the device. Then, the research work will deploy and analyze real time implementation of circuit. It will help to boost the battery power in terms of current. The high power amp circuit will distribute load coming directly to battery hence improving capabilities of device to use as jump start device and many other applications.

XI. Conclusion

A portable solar device has been designed, simulated and constructed to have a compact size at low cost and this device has been evaluated to be efficient, light-weight ,reliable, portable reliable and an economically viable solution. As a there is abundance of sunshine, this device brings an alternative to non-renewable energy sources that are highly expensive and not readily available. This device encourages green technology. A fascinating fact is the incorporation of a heat sink to absorb dissipated heat. It is undoubtedly the solution to carbon emissions from generators.

Portable solar systems could replace fuel systems in the future, especially when it comes to lighting and small appliance control. The maintenance cost of the power plant can be minimized because the battery only needs to be replaced every 3-4 years. Its portability and light weight allow it to be used at night or at home as a backup power source for street vendors. The importance of solar energy is increasing day by day. It is an environmentally friendly and renewable energy source. Portable solar systems could replace fuel systems in the future, especially when it comes to lighting and small appliance operation. The maintenance cost of the power plant can be minimized because the battery only needs to be replaced every 3-4 years. Its portability and light weight allow it to be used as a backup power source for night-time vendors and at home. The importance of solar energy is increasing day by day. It is an environmentally friendly and renewable energy source.

XII. Acknowledgement

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Design and Stable Dynamic walking of a quadruped robot

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***Abstract*—Making a human like-walking robot is still one of the major problems that the robotics industry and research labs are facing, we have witnessed some amazing progress in this particular field especially after the work produced by Boston Dynamics and other labs. The recent improvement in locomotive robots is due to the regular hardware upgradation and the related components such as sensors, actuators and power motors. The problem still lies in the control systems which are being a hinder for these robots to go onto the next level. The authors in this research have tried to simulate passive dynamic walking. The research includes domains such as 1. robotics and controls, 2. computer graphics, and 3. biomechanics along with fields like kinematics, inverse kinematics, dynamics, optimization, and numerical methods**.

***Keywords*—** quadruped motion, gate pattern, kinematics, dynamics, control system, virtual simulation

I. INTRODUCTION

Four legged robots have been around now for a while and witnessing the rapid growth, it doesn't seem to stop any soon. In fact, people do believe that we are still at the starting phase of the big breakthrough technology. In this study of ours, we have taken deep dive into the several aspects that contribute to the making of quadruped robots starting with the robot's body - we have used Polylactic Acid(PLA) material which is most commonly used material in 3D printing operations to make the body parts of our bot. Next, we have combined electronic sensors like IMU, Ultrasonic with actuators like servo motors to produce a whole lot of different movements that our robot is capable of. The brain of the robot is Arduino Mega which is sufficient for carrying out all the operations. Using methods like inverse kinematics, probability and control systems equations we have created a mathematical model which generates all the possible movements that our robot could perform. At last, we have used ROS to simulate our robot.

I. DESIGN PARAMETERS

A. Selecting a Template (Heading 2)

A comprehensive 3D model of the quadruped robot is built in a simulated environment. The robot consists of 12 parts with 12 DC servo motors. The robot we selected has 4 legs, each leg has 3 degrees of freedom, and the movement of the legs allows the body to move freely (6 degrees of freedom). Therefore, the robot has only 18 degrees of freedom (3x4 6 = 18DOF).

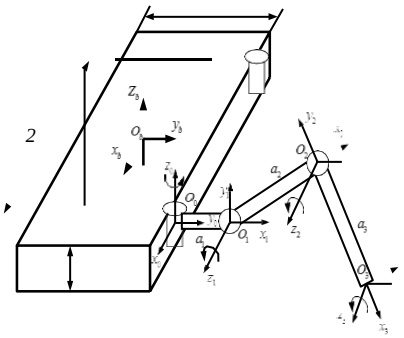


Fig. Four-legged walking robot model

Table 1. Physical parameters of each leg

Link parameters		Body	Link 1	Link 2	Link 3
Mass (Kg)		6	0.2	0.3	0.4
Moment of Inertia (10^{-2}. kg.m^2)	I_x	5.4	0.2 94	0.49 8	2.32 0
	I_y	4.927	0.2 47	0.49 3	2.31 6
	I_z	1.687	0.2 47	0.10 8	0.18 9
Length (mm)		400x200x 150	50	100	200

II. HARRDWARE AND SOFTWARE

The design of the robot is on the similar grounds as Boston Dynamics's Spot. Using Autodesk fusion

360, body parts of the robots have been designed and using PLA material, they were printed. A total of _32 parts were printed. Four legs each comprising of three parts along with attachments for connection with body where electronics material in fixed have been provided. Separate space for ultrasonic sensors along with display screen has also been provided. One can find out the 3D (.stl format) files here. Using mechanical fasteners like Screws, Nuts and Bearings all the parts have been attached.

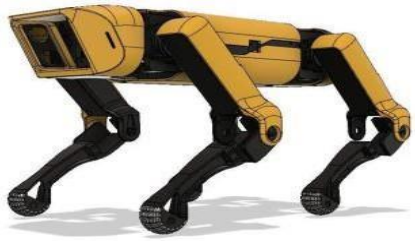


fig-body

B.Sensors and Actuators

12 × MG 996 R servo motor
2 × HC-SR04 Ultrasonic sensor
1 × I2C 16x2 LCD Module
1 × Rleil rocker switch RL3-4 1 x 7.4v Battery
1 × HC-06 Bluetooth module
1 × MPU-6050 Gyro sensor
1 x connecting wires

C..Hardware and Software

1. Hardware-
   1 x joystick controller 1 × Arduino Mega
   1 x Raspberry Pi 4B
   1 x 16 channel 12-bit Servo controller
2. Software
   UBUNTU software
   ROS

IV.MATERIALS AND METHOD

*A. Leg Design of the Quadruped Robot Leg Structure in Comparison with the Kinematics Analysis*Two hinge and three hinge support structures are considered during the initial design of the support structure.Handling, obstacle avoidance, and occupied legroom were analyzed by comparing differences in geometric and kinematic aspects. The figure shows a diagram of a three hinged bridge structure on the left and a two hinged bridge structure on the right. Assume that the overall length of the link for both leg structures is the same and is determined by the height of the robot. For a keying vector r, the key probability measured in the state is defined as Equation (1).

$$w = \sqrt{\det \boldsymbol{J}(\theta)\boldsymbol{J}^{T}(\theta)}$$

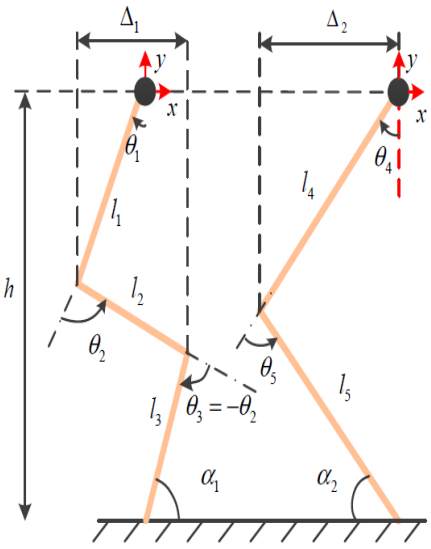


Figure *- Schematic for the three-joint and two-joint leg structures.*

$$J(\theta_1,\theta_2)=\begin{bmatrix} (l_3+l_1)\cos\theta_1+l_2\cos(\theta_1+\theta_2) & l_2\cos(\theta_1+\theta_2) \\ (l_3+l_1)\sin\theta_1+l_2\sin(\theta_1+\theta_2) & l_2\sin(\theta_1+\theta_2) \end{bmatrix}$$

Therefore, the manipulability can be calculated with w = Idet**J**(_1, _2)j = (l1 + l3)l2jsin(_2)j.
Similar, the Jacobian matrix for the two-part leg structure can be calculated as Equation (3):

$$J(\theta_4,\theta_5)=\begin{bmatrix} l_4\cos\theta_4+l_5\cos(\theta_4+\theta_5) & l_5\cos(\theta_4+\theta_5) \\ l_4\sin\theta_4+l_5\sin(\theta_4+\theta_5) & l_5\sin(\theta_4+\theta_5) \end{bmatrix}$$

The manipulability can be calculated with w = IdetJ(_4, _5)j = l4l5jsin(_5)j. Here the lengths l1, l2, l3 are given in the table. For the two-joint leg design, the operability can reach its maximum when l4 equals l5. To compare the maneuverability of the two leg structures during one gait cycle, Bezier curves were used in the swing phase and the cosine function was used in the stance phase. Manipulation possibilities during one gait cycle are shown in the figure.

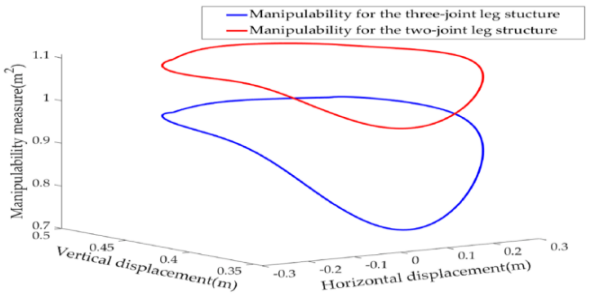


Figure *- Manipulability for the three-joint and two-joint leg structure.*

The bridgedesign should also extend the bridge with sufficient ground clearance to avoid obstacles. So we have compared angles _1 and _2 as shown, and you can calculate them using Equations (4) and (5):

$$\alpha_1 = 90^\circ - \arccos\left(\frac{(l_1+l_3)^2 + l_2^2 + h^2}{2l_2(l_1+l_3)}\right) \quad (4)$$

$$\alpha_2 = 90^\circ - \arccos\left(\frac{l_5^2 + h^2 - l_4^2}{2l_5 h}\right) \quad (5)$$

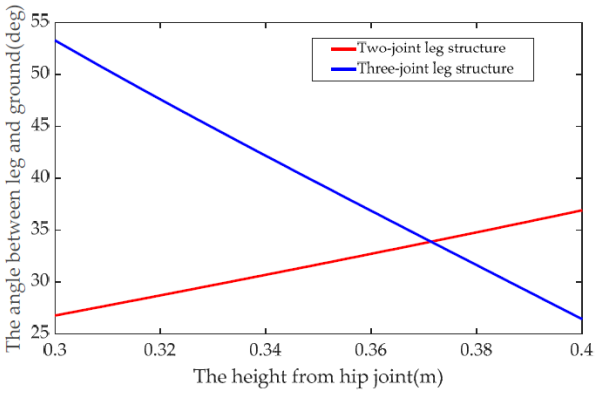
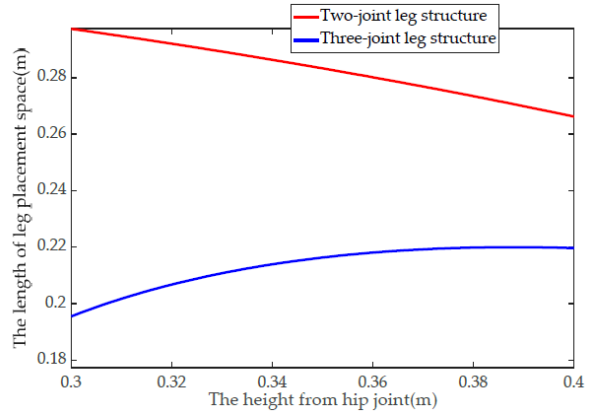


Figure *- Obstacle avoiding ability of the three-joint and two-joint leg structures*

$$\Delta_2 = \frac{2\sqrt{p_2(p_2-l_1-l_3)(p_2-l_2)(p_2-h)}}{h}$$

where h represents the height between the shoulder part of leg to the ground. The obstacle avoiding ability for the three-joint and two-joint leg structures is shown in Figure



. Figure *- Occupied space after retracting the leg for the three-joint and two-joint leg structures.*

The bridge configuration between the triple and double hinged structures can be detected more clearly. on the image. In this kinematic analysis, if we choose h as 0.343 in our segment, The three-piece leg design has enough ground clearance to avoid obstacles. occupied For the three hinge leg design, the space after the legs are folded is much smaller than for the two hinge design. support structure when h is set to 0.343 m; The operability between the two leg structures is the same. By combining this kinematic analysis with a biological perspective, the three-joint structure of the leg has been defined.

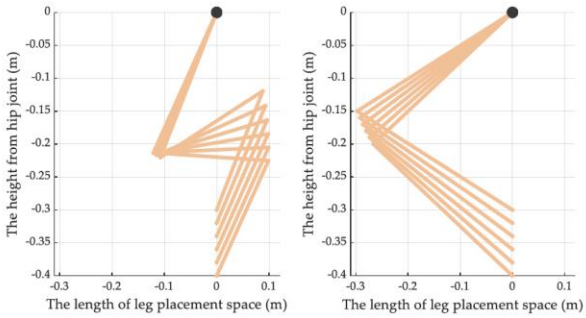


Figure *- Leg configuration comparisons between the three-joint and two-joint leg structures.*

V.MATHEMATICAL MODEL

A. Kinematics

- This section derives the forward kinematic model by using the Denavit-Hartenberg (D-H) convention. The D-H notations have been used in kinematic modeling of each leg .

Link	a i	αi	di	θi
1	a1=33mm	π/2	0	θ1
2	a2=78mm	0	0	θ2
3	a3=130mm	0	0	θ3

Table . D-H parameters for three joint legs

- 3. Forward kinematic: To describe the relationship of the orientation and position of the coordinate system attached to two adjacent stages (link i to link i-1), we used the matrix ^{i-1}T, is represented by the transformation. The foot tip reference frame {3} can be expressed in the hip or leg reference frame {0} as given below.

$$^{i-1}T_i = Trans(Z_{i-1};d_i).Rot(Z_{i-1};\theta_i).Trans(X_{i-1};a_i).Rot(X_{i-1};\alpha_i) \quad (1)$$

$$^0_3T = {}^0_1T.{}^1_2T.{}^2_3T = \begin{bmatrix} C_1.C_{23} & -C_1.S_{23} & S_1 & C_1(a_3.C_{23}+a_2C_2+a_1) \\ S_1.C_{23} & -S_1.S_{23} & -C_1 & S_1(a_3.C_{23}+a_2.C_2+a_1) \\ S_{23} & C_{23} & 0 & a_3.S_{23}+a_2.S_2 \\ 0 & 0 & 0 & 1 \end{bmatrix} \quad (2)$$

where $C_1 = cos\theta_1$; $S_1 = sin\theta_1$; $C_{12} = cos(\theta_1+\theta_2)$; $S_{12} = sin(\theta_1+\theta_2)$;.....

- 4. Inverse kinematic the inverse kinematics consists in determining the joint variables ($\square_1$, $\square_2$, $\square_3$) in terms of the foot position and orientation. By solving

equations (3), the joint angles: $\square_1, \square_2, \square_3$ have been determined as given below.

$$\begin{cases} \theta_1 = a\tan 2(p_y; p_x) \\ \theta_2 = -a\tan 2(B, A) + a\tan 2\left(D, \pm\sqrt{A^2+B^2-D^2}\right) \\ \theta_3 = a\tan 2(p_z - a_2.S_2; p_x.C_1 + p_y.S_1 - a_2.C_2 - a_1) - \theta_2 \end{cases} \quad (4)$$

$$\text{where} \begin{cases} A = -p_z; \ B = a_1 - (p_x.C_1 + p_y.S_1) \\ D = \dfrac{2.a_1.(p_x.C_1 + p_y.S_1) + a_3^2 - a_2^2 - a_1^2 - z^2 - (p_x.C_1 + p_y.S_1)^2}{2.a_2} \end{cases} \quad (5)$$

B. Dynamics

A dynamic model of a robotic arm finds a mathematical relationship between:

1. Position of the robot and its derivatives, velocity and acceleration.
2. Forces and torques applied to the robot's joints or end effectors.
3. Dimensional parameters of the robot arm, such as link length, mass and inertia.

The inherent complexity of dynamic robotic leg models usually results in inadequate simplification of the model to provide real-time motion control. As a result, control is imprecise due to careless simplification of the procedure. For precise simplification of the dynamic model, a dynamic analysis method consisting of four steps is proposed here.

Step 1: Calculate each term in the dynamic equation during the actual robot trajectory spanning the entire workspace.

Step 2: Analyze the torque contribution of each calculated term.

Step 3: If the torque contribution to the model is less than 5% for each trajectory, then this term is considered insignificant and can be ignored.

Step 4: The rest of the terms reflect that dynamic. We then study the evolution of these important terms along different trajectories as follows:

• Evolution of torque contribution according to the end result effector position.

• Variation of torque contribution with speed of linear path.

• Evolution of torque contribution as a function of linear path acceleration.

As a result of the analysis, the corresponding dynamic changes of the robot are determined while performing the actual robot task. The relationship between robot dynamics and trajectory parameters can be used in real-time control algorithms or in full-velocity trajectory generation algorithms.

VI. SIMULATION

It can be seen from the above results that the two trajectories have different properties, but The stability indicators of the movements of quadrupeds are not yet known. Therefore, in this section, we present Webots (Cyberbotics Ltd.) software for modeling the stability of a quadruped robot with two high-speed gait trajectories. A model was built using the same physical parameters of the designed leg and two different gait trajectories were applied. The simulation results are shown in Figure 15. The required speed was set at 2 m/s, which is a relatively high speed for a quadruped robot. In the support phase for both circuits, an impedance controller was added with the parameters K = 80 Nm/rad and C = 5 Nms/rad set appropriately. A distance sensor was installed in the center of the robot to measure the change in the center of gravity height of the quadrupedal robot from the ground, and the newly proposed gait trajectory was verified as shown in the figure, and the stability between the two gait trajectories was compared

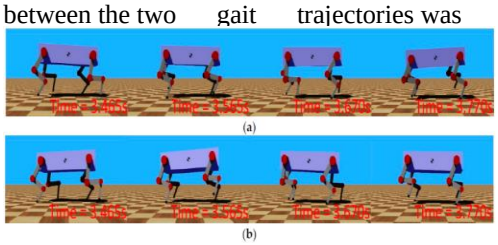


Figure *- The simulation of the movement running at Vdesire=2m/s with trot gait: **(a)** The quadruped robot runs by the spline curve trajectories and **(b)** the quadruped robot runs by the Bezier curve trajectories.*

VII. DISCUSSION

Our leg design focuses all motors on the shoulder joint. Therefore, because the center of mass is close to the center of rotation, the change in inertia of the swing leg is small, allowing the leg to achieve higher acceleration and faster response. This leg configuration is also used in several tetrapods such as the MIT Cheetah, Laikago robots, and SpotMini. In the case of the manufactured leg, it can be seen that the swing inertia of the knee joint, which mainly provides vertical movement, is very low and the movement is very flexible. In addition, the force that the quadruped robot carries the most is also in the vertical direction. Hence such a leg structure is suitable to the high-speed movement and jumping for quadruped robots. Differing from the leg of MIT cheetahs, which was made with a bioinspired fabrication method, our leg structure is mainly connected by ribbed plates with only 4-mm-thin plates in the middle. The structure has a better performance of bearing pressure and bending moment and is simpler for manufacturing. In particular, wear washers and dry bushings were adopted in our joints design to reduce the friction of linkages' joint by the self-lubrication characteristics of the dry bushing. Moreover, two high torque density motors are used in the single leg, which can provide a strong power regardless of a low gear ratio. The coaxial motor configuration can provide joint motion for both shoulder and knee joints, which has also been adopted in several quadrupeds such as the MIT cheetah and Laikago robots. The use of a single-speed transmission not only significantly reduces the size and weight of the gearbox, but also significantly contributes to energy efficiency by reducing energy losses during the mechanical transmission process.

From the acceleration curves of the two schemes, it is obvious that the gait trajectory of spline curve in scheme 1 can ensure the continuity of acceleration, and the acceleration of the contact point between swing phase and stance phase is almost zero in scheme 1, which means no additional impact is generated from the ground. Because of the characteristics of the Bezier curve, the gait trajectory planned finds it difficult to achieve continuity of acceleration, and the acceleration of the legs once in contact with the ground is not zero. Therefore, there will be an impact on the legs, which will affect the walking stability of the quadruped robot. Besides, the shape of the curve in Figure resembles

human gait ground reaction forces. According to Marc Raibert's virtual leg principle, a quadruped gait that uses four legs in two pairs, such as trot and pace, could be viewed as an equivalent biped, which means that human gait somewhat resembles quadruped gait. This may be the reason for the similarity of the curves and also proves that the gait trajectory is close to biological gait. The performance of these two circuits was also evaluated using Webot's simulations. During the simulation, the robot used pattern 1 walking and can walk more stably with less body sway. However, when using gait pattern 2, the quadruped robot experiences some sway despite being able to walk normally.

When changing the height of the center of gravity according to plan I, the maximum difference in the center of gravity is 22.62 mm, and according to plan II, 23.79 mm. In general, it can be seen that the stability of the gait according to scheme II is better than that of the gait according to scheme I, especially when changing the pitch angle. The power consumption for both circuits also indicates that circuit 1 consumes more mechanical power, but circuit 1 consumes less battery power and is more efficient than circuit 2, as can be seen in the figures and tables in the results section. Also, the RMS value of the knee current corresponding to heating in circuit 1 is similar to circuit 2. At the same time, the rms value of the shoulder current in circuit 1 is much smaller than in circuit 2. Therefore, circuit 1 is superior to circuit 2 in the following aspects: power consumption. In particular, in the figure showing the temporal energy trajectory of the leg swing for the two methods, it can be seen that the energy consumption for the repulsion is larger than that of the touch due to the jump of the acceleration of the method 2. - Downward movement between the fly leg and the ground.

VIII. Conclusion

Simulation results form the basis on which robots are expected to operate in the real world. However, in the real world, most of the problems are related to the terrain, the type of path the robot travels, and so on. Several experiments were performed and controls adjusted to overcome the differences between simulation and the real world. Future parts of research will focus on making robots more powerful by adapting themselves to different terrain, recognizing and avoiding obstacles in their path, and using lidar sensors.

Acknowledgment

We would like to take a moment to thank TCET, and for our patient guidance, enthusiastic supporter, and useful critic of this research work, our advisor Dr. Hemant Kasturiwale and Mr. Sachin Oak.

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Foot Step Power Generator Using Piezoelectric Sensor

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***Abstract*—This project is to develop a new source of renewable energy with low-cost budget with the help of Arduino Uno as the microcontroller. The footstep power generation system is to capture the typically wasted energy surrounding a system and transforming it into electrical energy. The technique used in gaining the energy is via piezoelectric materials. This method employs piezoelectric components where deformations created by dissimilar means are directly transformed into electrical charge through piezoelectric effect. Afterwards, the electrical energy can be regulated or stored for further use. In this project, we are generating electrical power as a non-conventional method by simply walking or running as the input source. The piezoelectric sensor will then send the signal into the Arduino Uno and transform it into electrical energy. The LCD will then have displayed the amount of voltage generated by the circuit. The highest voltage generated in this project is 8.29 V. Then, the voltage stored in the battery can be used to charge the mobile phone. The results shown that this footstep generation system is very important for utilization in today's world.**

Keywords—piezoelectric sensor, footstep generation system, piezo-electric effect

I. INTRODUCTION

Day by day, the population of the country increased and the requirement of the power is also increased. At the same time the wastage of energy also increased in many ways. So reforming this energy back to usable form is the major solution. To overcome this problem, the energy wastage can be converted to usable form using the piezoelectric sensor. This sensor converts the pressure on it to a voltage. So by using this energy saving method that is the footstep power generation system we are generating power. This project is used to generate voltage using footstep force. The proposed system works as a medium to generate power using force. This project is very useful in public places like bus stands, theatres, railway stations, shopping malls, etc. So, these systems are placed in public places where people walk and they have to travel on this system to get through the entrance or exists. Then, these systems may generate voltage on each and every step of a foot. For this purpose, piezoelectric sensor is used in order to measure force, pressure and acceleration by its change into electric signals. This system uses voltmeter for measuring output, LED lights, weight measurement system and a battery for better demonstration of the system. In another way, we are also saving natural energy resource.

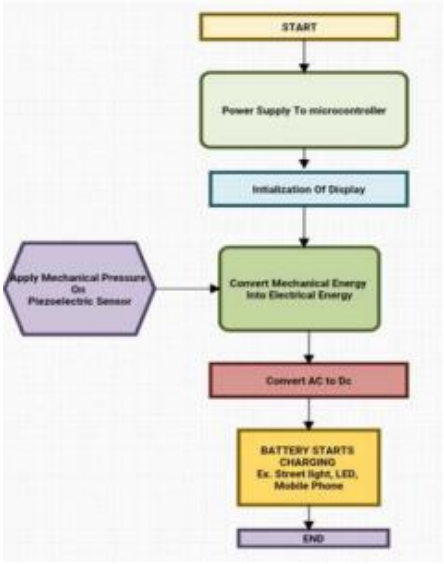

Fig. 1. Flowchart of footstep power generation using piezo electric sensor

II. METHODOLOGY

A. *Making the module*

a) Piezoelectric Crystal Material: Piezoelectric materials or piezoelectric are the materials that can produce electric energy upon application of mechanical stress. A commonly known piezoelectric material is quartz. The mechanism involves development of electric charge due to movement of electron upon application of stress.

Fig. 2. Piezoelectric Crystal Materia

b) PCB Board: A printed circuit board, or PCB, is used to mechanically support and electrically connect electronic components using conductive pathways, tracks or signal traces etched from copper sheets laminated onto a non-conductive substrate.

c) LED Light Indicator: Indicator lights are used to make the operating status (on, off, fault) of the device on which they are installed visible from the outside by means of a small light

B. Implementation for module

a) Lithium Acid Battery : Lead battery is most commonly used in PV systems due to low cost and easily available everywhere in the world. These batteries are available in both sealed and wet cell batteries. Lead acid batteries have high reliability due to their capability to withstand overcharge, over discharge & shock. The batteries have excellent charge acceptance, low self-discharge and large electrolyte volume. Lead acid batteries Are tested using Computer Aided Design. These applications of these batteries are used in UPS Systems and Inverter and have the skill to perform under dangerous conditions.

Fig. 3. Lithium Acid battery

This project uses the AT89S52 Microcontroller and Features of this microcontroller includes 8K bytes ROM, 256 bytes RAM 3) 3 Timers, 32 I/O pins, one Serial port, Interrupt sources Here we are using AT89S52microcontroller to display the amount of battery get charged when we place our footstep on piezoelectric sensor.

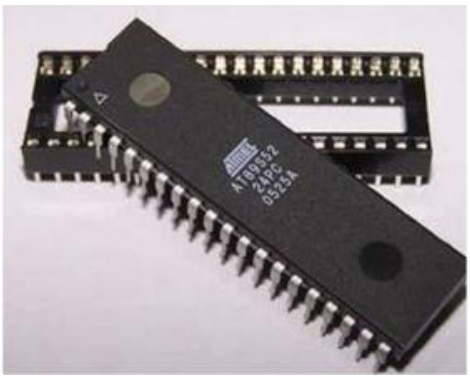

Fig. 4. Atmel AT89552 microcontroller

Analog to Digital Converter: An ADC (analog-to-digital converter) is a device that converts analog to digital symbols. An analog to digital converter may also offer an isolated measurement. The reverse operation is achieved by a DAC (digital-to-analog converter). Typically, this is an electronic device that alters an analog input like voltage or current to a digital output, which is related to the magnitude of the voltage or current. Nevertheless, some partially electronic devices like rotary encoders, can also be considered as ADCs,

Analog to Digital Converter: AC Ripple Neutralizer It is used to remove the ripples from the output of the rectifier and smoothens the o/p of the D.C which is received from the filter, and it is constant until the load and mains voltage is kept constant. Though, if either of the two is varied, then the received D.C. voltage at this point changes. So a regulator is applied at the output stage.

b) Voltage Sampler : Voltage Sampler or sample and hold circuit is an essential analog building block and the applications of voltage sampler includes switched capacitor filters and analog-to- digital converters. The main function of the sample and hold circuit is to sample an analog i/p signal and hold this value over a particular length of time for subsequent processing. Sample and hold circuit is designed using only one capacitor and one MOS transistor. The working of this circuit is straight forward. When CK is high, then the MOS switch will be ON, which in turn permits output voltage to track input voltage. When CK low, then the MOS switch will be OFF.

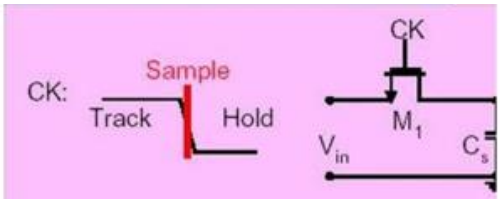

Fig. 5. MOS switch

As term specifies this circuit lets only one direction current flowing. They are diodes and Thyristors. In this project diode (D=1N4007) is used as a unidirectional current controller. The main function of the diode is, it allows the flow of current in only one direction while blocking current in the reverse direction.

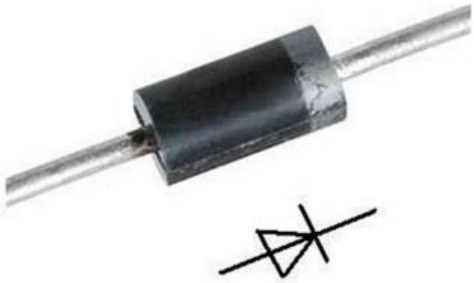

Fig. 6. 1N4007 Diode

A 16X2 LCD display is used in the footstep power generation project to display the voltage status. It is also provided with a contrast adjusting pin.

III. Result and Discussion

The footstep power generation technique through piezoelectric sensors produces electrical force by changing mechanical energy of the development of individuals on the floor to electrical energy.

IV. Conclusion

In concluding the words of our project, since the power generation using foot step get its energy requirements from the Non-renewable source of energy. There is no need of power from the mains and there is less pollution in this source of energy.

V. Acknowledgement

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Home Automation: Voice Assistance Robotwith Object Picking and Following

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***Abstract*—Robotics is a key component in the fields of electronics and electrical engineering. This is because robots have a high potential for efficiencyand accuracy, reducing the need for human labor.This research used a Raspberry Pi to build and construct a voice-controlled pick and place robot. Python, an open source programming language with fewer functions than other languages, was used to program the Raspberry Pi-controlled robot's architecture. Due to vocal orders by voice input, the robots carry out the action. The device picks up objects with exceptional precision and canlift up to 100 grammes over distances of up to 20 meters using voice commands. This machine boosts the Raspberry Pi's object detection using theTensorFlow USB Coral accelerator.**

Keywords—Robot, Raspberry pi, python, accurate,efficient, TensorFlow, USB

I. INTRODUCTION

An essential component of automating flexible production systems, which are in high demand nowadays, is a robot. As labour expenses and customer demands rise, robots are now more than just machines; they are the future's answer. Robots are essential in many production sectorsbecause they operate at a fraction of the cost per hour of human labour, which is required to complete the same activity.

However, once they are programmed, robots can perform repetitive jobs with a level of accuracy that exceeds that of even the most skilled human operator. The goal of this work is to build anddevelop a pick-and-place robot using the standard Rover 5 robot chassis, a Raspberry Pi, and a Roboclaw motor controller.

There are so many risky situations in dailylife. The human body is incapable of functioning on numerous instances. Working under such circumstances is impossible without taking numerous safety precautions, including those relatedto hostage situations, radioactive materials, hazardous waste disposal, remote handling of explosive devices, and lighting. Such robots can perform securely in hazardous conditions while protecting human health and taking the place of a sizable human workforce. It is frequently used in manufacturing as well as in the fields of medicine, surgery, military, AI, and supermarkets.

II. OBJECTIVE

The primary goal of this project is to have the system recognise the user's voice command,which requires it to detect the voice command. The system must then independently locate the relevant object and approach it. Finally, the robot must pick up the item, move back to its starting position, and then deposit the object according to the voice command.

III. METHODOLOGY

Hardware (which defines the system's physical components) and Software make up the two key components of the design approach (Whichinstructions are encoded on the computer). Figure 1 displays the system's block diagram

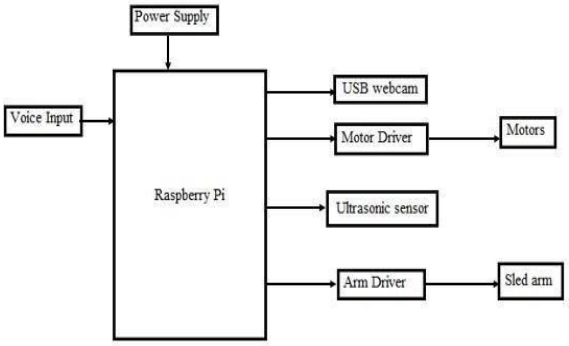

Figure 1: Block diagram of the system

3.1 Hardware

The hardware components are

- Raspberry Pi 3
- Roboclaw 2x7A
- USB Webcam
- Ultrasonic Sensor (HC-SR04)
- Sled arms

3.1.1 Raspberry Pi 3: It serves as the robot's brain. It carries out all of the calculations necessary to determine how and where the robot should move. It serves as the central hub for all electronics and sensors, enabling seamless communication between them.

3.1.2 Roboclaw 2x7A: The system's heart is its two RoboClaws. These are the motor controllers that actually enable the robot to move and carry out its necessary functions. Both tank-tread motors are controlled by the first RoboClaw, while the robotic sled motor used to pick up the object is controlled by the second RoboClaw.

3.1.3 USB Webcam: The Raspberry Pi Camera or any other standard USB webcam can be used. Sincethe Raspberry Pi camera lacks a microphone, in our situation, we used a separate USB microphone to issue voice recognition commands.

3.1.4 Ultrasonic sensor: We used simple HC-SR04 ultrasonic distance sensor to find the distance between the robot to detected object.

3.1.5 Sled arms: we can use any geared brushed DC motor with a built-in encoder and appropriate torque.

3.1.6 Battery: We can use Li-Po battery with two- cell 7 volt 1400 mah capacity.

3.2 Software Section

The software components consists of the

- Tensor flow
- Snowboy
- Python 3.0

IV. WORKING OF THE SYSTEM

The Working of the system explained in various steps .

4.1 Detection of Voice

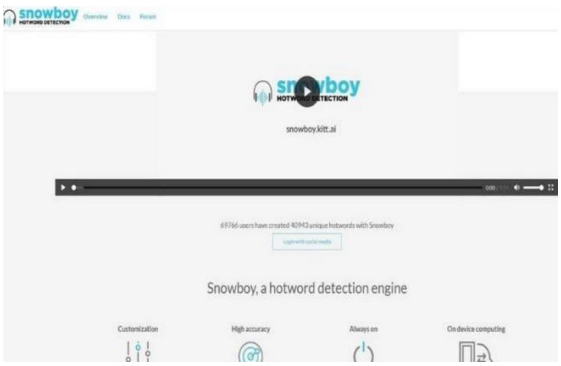

Figure 2: Voice command using Snowboy

The SnowBoy voice detection programme is used to recognise robot voices. Snowboy is a small, voice wake-up word detector for offline use software utility. The SnowBoy barelyutilises any CPU power to detect voice, and sinceit runs locally on the Raspberry Pi rather than ona server, your voice is processed there. It indicates that there are no privacy issues and that our voice data is private. We must utilise the wakeup voice command, in our instance "hello robot," as Snowboy uses several different voice commands. The internal timer begins after ten seconds, and the LED light comes on. Additionally, we may use voice commands to locate, select, and reposition objects. For instance, in our situation, we issue the word "tea cup," which instructs the robot to locate a cup and return it to its initial position. Figures 2 and 4 depict how the Snowboy responds to voice commands when in use.

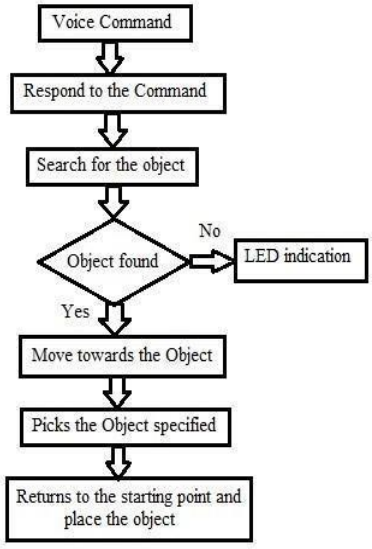

Figure 3: Flowchart of overall process.

4.1 Detection of Object

The COCO model, which can detect up to 90 namedobjects, is used in the object detection model algorithm. The robot moves right to centre an object that is detected to the right of the camera frame and left to centre an object that is detected to the left of the camera frame. The input data has also been further filtered to eliminate any jumpy data and to smooth out any noise. The latest three coordinates are averaged for these purposes to provide you with the current coordinate needed to calculate the robot's movement. The oldest of the three data points for these three coordinates is replaced as soon as a new coordinate data point is received from the computer vision model, and these three coordinates are kept in an array. Theoretically, by using this technique, the robot will be less able to react quickly to movements while maintaining an adequate frame rate for object detection models. The tea cup and other computer components are detected in figure 5 below.

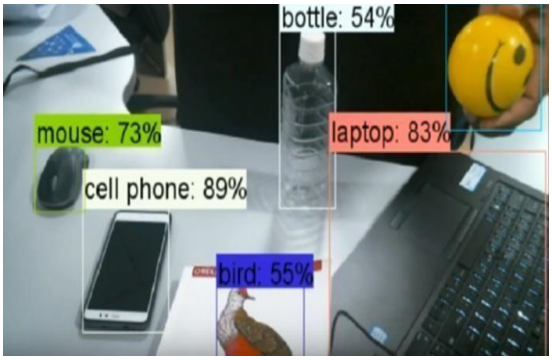

Figure5: Detection of Object

Using computer vision and machine learning, the robot can locate and recognise items. When the robot has successfully moved toward the object it is seeking and has also travelled a predetermined minimum distance (in our code, this was 30 cm) from the object it is attempting to pick up, the pick and put step is initiated.

The actual steps required for the picking up the object detailed below:

- The robot will first open its sled.
- Next the robot will move forward up to certain distance(in our case it is up to25cm)
- Next the robot will close its sled and picks up the object of appropriate mass.

Brushed DC motors are used in the production and powering of the sled itself. This has a number of justifications. First of all, geared brushed DC motors are compact and simple to find. The Robot Claw motor controller and encoders make accurate positioning control very simple to accomplish. The enormous torque of brushed DC motors is a result oftheir high gear ratios. When the robot sled is pickingup a bigger, heavier object, this is extremely helpful.Figure 6 below depicts a robot employing sled armsto pick up a tea cup.

V.RESULTS AND DISCUSSION

This robot is truly special because it can use Machine Learning models and computer vision to see the object via a camera and perform tasks depending on how the detected object's position is changing in the camera. The above figures show complete voice recognition, object detection, and performs the pick and place operation up to specifiedmass (in our case it is up to 20-30 grams). The Robotin our case which is specified to detect the tea cup. The Robot recognize the voice command using Snow boy. The Robot given wake up command with "Hey Robot", then system get rid off multiple voice commands. After 10 sec we give command "tea cup". The system detects the tea cup using computer vision and machine learning and with ultrasonicsensor it can sense maximum up to 25cm distance and then move it towards the object and pick up theobject using sled arms maximum up to 20-30 grams,in case object not found the LED will blink giving command that object not found. The **Figure 6** represents the complete pick and place operation of the object. The Robot can extensively have worked under low temperatures and high pressure which performs operation on drastic condition Human operations are highly difficult. Meanwhile this kindof Robot enhance Human security and reduces the Human effort and drastic conditions.

V. CONCLUSION

The voice controlled pick and place robot has been designed and constructed. The device is fully functional and built from readily available components. It can be used as self-assistant for picking the nearby objects such as tea cups, water bottles. The improvements can be done by Integrating a voice assistant using natural language processing (NLP) to communicate with the user, and take natural sentence commands instead of exact commands. This would be even better if the voice assistant were to be able to tap into Google Now or Amazon Alexa to do more than the robot can do.

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Designing of measurement system to detect anemia

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***Abstract*—Anemia, a condition characterized by insufficient oxygen delivery to cells and tissues within the body, affects approximately a third of the world's population. Causes of anemia can be attributed to malnutrition, low erythropoietin production, kidney disease, and forms of cancer. Current tests for anemia involve invasive blood sampling and costly diagnostic procedures to produce results. Through the development of a portable non-invasive hematocrit sensor to aid in the diagnosis of anemia at the point-of-care, detection and treatment of anemia can be improved. Using the variance of absorption of IR and red light ofoxygenated hemoglobin (HbO2) and deoxygenated hemoglobin (Hb) a portable sensor was designed and created to determine oxygen saturation – the most reliable method of anemia detection.**

I. INTRODUCTION

Anemia is a condition characterized by insufficient oxygen delivery to cells and tissues within the body required to sufficiently reach metabolic and physiological needs [1]. Anemia can be caused by inadequate red blood cell(RBC) volume, inadequate oxygen-carrying capacity, increases in blood acidity, or insufficient levels of iron or ferritin in the blood [2][3]. Anemia, when undetected, has been shown to contribute to significant health consequences, including pregnancy complications and disorders, physical and cognitive development disorders, increased risk of morbidity, weakness, fatigue, and dizziness [4]. Causes for anemia have been researched to include lower erythropoietin production, kidney disease, cancer (including chemotherapy side-effects), and severe malnutrition – which serves as a leading cause for anemia, particularly in developing countries with reduced food security [5][6][7]. In developing countries, with high rates of malnutrition and poor access to medical and diagnostics services, a portable, low-cost, point-of-care sensor for detecting anemia could aid in improving diagnosis and care.

Traditional methods for detection of anemia involve an invasive approach requiring blood sampling and subsequent lab-based testing of hemoglobin concentration, hematocrit volume, and complete blood count (CBC) [4][8][9]. These procedures require access to diagnostic facilities and can be greatly time intensive witha substantial cost. Recent developments in this field have been made to increase both the portability and non-invasiveness of these sensors through using microfluidic-based sampling methods [10], optical attenuation methods [11], or light scattering-based measurement methods [12] [13]. Although these developments have greatly improved the approaches for the detection and diagnosis of anemia, there still exists a need forimprovement in long-term user monitoring and size and cost reduction. Additionally, toimprove the functionality of the point-of-care device in developing countries, there exists a need for improvements in the sensor's design in order to improve the integration of thedevice into the environment of its use

To attempt to address these areas of technical improvements, an optical attenuation-based hematocrit sensor was designed and preliminary testing was performed. LED and IR light sources and detectors were implemented into the design to facilitate a non-invasive measurement modality through interactions between oxygenated and deoxygenated hemoglobin and the specific wavelengths of light. The sensor was embedded within a custom index finger mount attached to a microcontroller. Bluetooth was used in the design to enable data to be sent wirelessly to accommodate for clinical use in circumstances where there is limited access to electronics and technology. A display screen is currently being developed for the device.

This paper will present the sensing methodology used in the design of the point-of-care hematocrit sensor, the sensor design, preliminary testing results, and identified areas of improvement

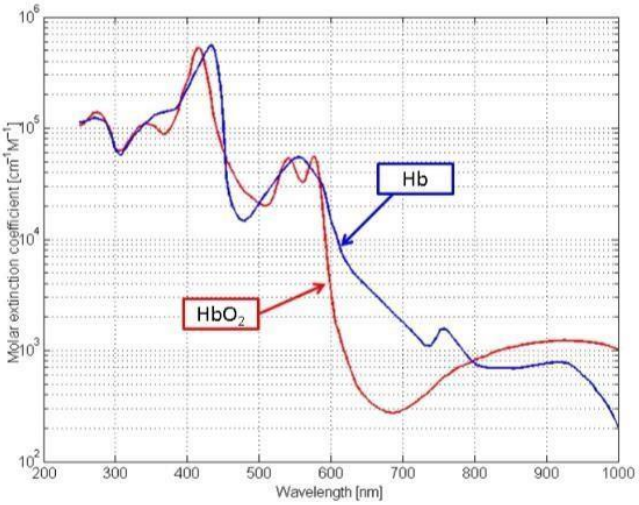
II. THEORY

Anemia can be diagnosed on the basis of oxygen deficiency. Iron deficiency anemia is a common type of anemia due to insufficient iron to produce hemoglobin. The optical properties of hemoglobin are used to develop the basis of the measurement system and sensor development. The main forms of hemoglobin in the blood are oxyhemoglobin (HbO2) and hemoglobin (Hb), where hemoglobin binds oxygen in the lungs to form oxyhemoglobin [14]. These molecules have different associative absorption properties dependent on the

wavelength of light used. Appreciable variances in absorption occur between 550- 1000nm, thus if wavelengths of transmitted light are detected through the finger, the differences in attenuation can be used to determine oxygenated hemoglobin and hematocrit concentration in the blood. For this study, 650nm and 950nm were used to elicit differentiable readings (Figure 1).

III. METHODOLOGY

A portable hematocrit sensor was developed based on measuring the variance in absorbanceof LED and IR light through blood by measuringthe attenuation of signals through the right index finger. By analysis of the ratio of LED and



IR signals, hematocrit and blood oxygenation can be determined. An overview of the measurement principle can be seen in (Figure 2).

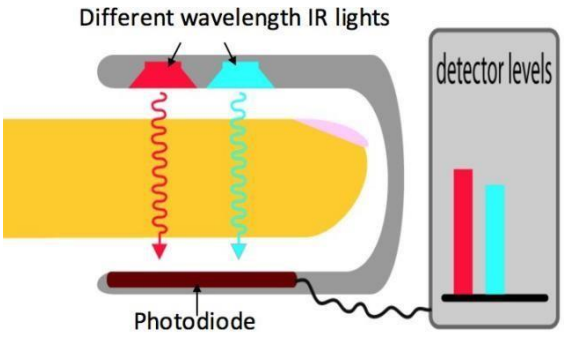


Fig. 2: Overview of Operation Principle Using IRand Red Light [13]

To contain the LED and IR lights and the associated detectors, a finger clamp wasdesigned and 3D printed using ABS material. This finger clamp is adjustable to accommodatea range of finger sizes to improve the functionality of the device. As this device was designed as an initial proof of concept,

Fig. 1: Hb and HbO2 Absorbance for DifferentWavelengths of Light [14]

designs will involve integrating the electronics and microcontroller into the finger clamp toproduce a stand-alone measurement system. IR and LED light is transmitted from the source, through the inserted finger – where it interacts with and is absorbed by Hb and HbO2 molecules, and the attenuated signal is received by IR and red photodiodes. The detected signals are then transmitted to a microcontroller (Smraza UNO R3 Board ATMEGA328P) for signal processing. A custom code was developed to convert these signals into IR and red light values which are displayed to the user. The values are then comparedusing the following formulae:

$$A_R = \log (I_0/I)$$

Using this formula to determine the absorbance of the light, a ratio between the redabsorbance and IR absorbance can be measured knowing the known wavelength of both sources before attenuation. This ratio is then correlated to a known hematocrit level and is used to determine the relative ratio of oxygenated and deoxygenated hemoglobin in the blood – indicating the oxygen saturation of the blood. From the oxygen saturation, anemia could be detected in individuals using the system in a portable and non-invasive manner. An overview of the materials used in the designof the portable sensor is shown in (Table 1).

Table 1: Overview of Design Components for Sensor

Part	**Cost**
Smraza UNO R3 Board ATMEGA328P	750
IR LED	50
Red LED	50
Photodiode IR	20
Photodiode Red	20
Resistor Kit 47-8.2K 1/20W	10
Striveday 24AWG 1007 CopperWire Electric wire kit	100
Elmer's Epoxy	150
LMC6062 Precision Op Amp	75

IV. RESULTS AND DISCUSSION

A prototype was developed using the breadboard diagram (Figure 3). The LED and IR sources and IR and LED photodiodes were soldered to 24 AWG braided core wires and connected to the microcontroller. SMD components were used due to availability. A precision op-amp, LMC 6062, was used for signal amplification, in the following circuit diagram (Figure 4). This represents amplifying the photodiode signal 10x, from 200-300mV to 2-3V. Software was developed using theArduino IDE to convert these data over serial into more meaningful absorbance data.

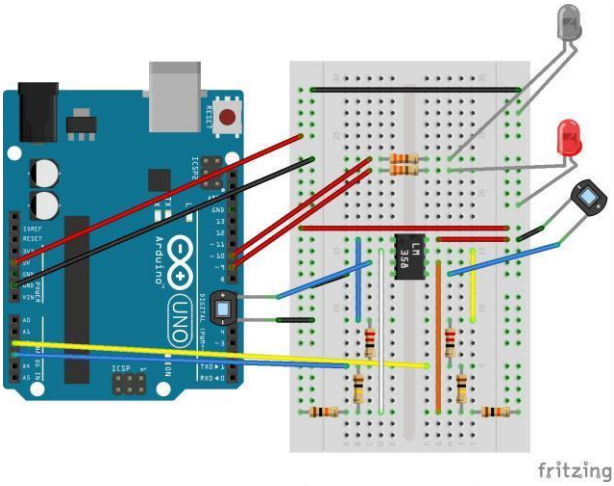


Fig. 3: Breadboard Diagram for Sensor Design (fritzing)

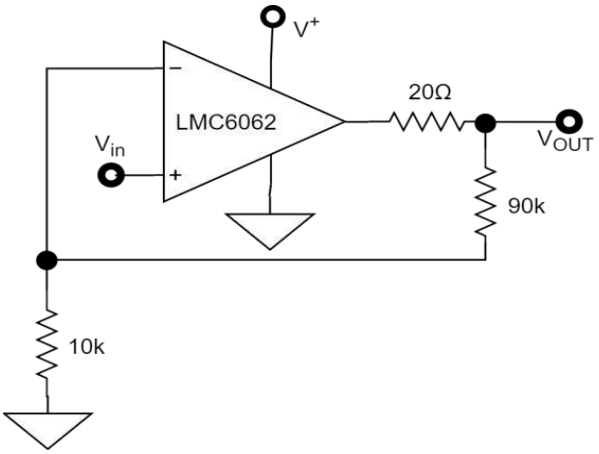


Fig. 4: LMC6062 10x Amplification Circuit Diagram

From there, the circuit could be tested, verified, and then remade in a more permanentconfiguration. A 5cm x 7cm perfboard was usedto solder the THT resistors; 2x10Ω in series, 6x15k in series, and 1x10k, and op-amp. The leads to the LEDs and Photodiodes were then soldered onto this board, and the necessaryArduino connections (+5V, GND, 10, 11, A0, A1) made. This current prototype can be seen in Figure 5. Modifications have since been madeto block ambient light entering, and infraredand red from leaving the sensor body.

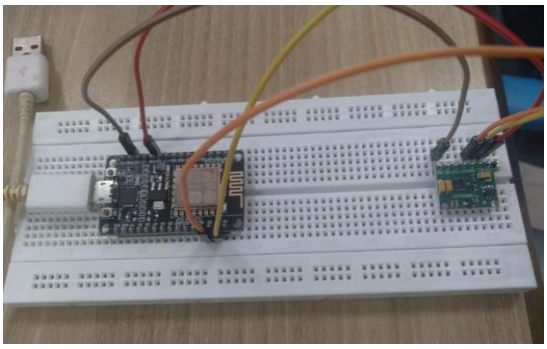


Fig. 5: Initial Hematocrit Sensor Prototype

The preliminary results from the prototype can be seen in the following table.

	Subject 1	***Subject 2***	***Subject 3***	***Subject4***
R2	460	453	453	385
IR2	545	520	518	472
AR	0.151	0.158	0.158	0.229
AIR	0.107	0.128	0.130	0.170
AR/AIR	1.411	1.230	1.220	1.350
AR/AIR corrected	0.470	0.410	0.407	0.450

The R/IR absorbance values can then be relatedto the SpO2 levels for the individual. The relationship of the values can be seen in Figure 6

From this it is apparent that all the subjects have between 95% and 100% blood oxygen saturation. For a healthy individual the SpO2 percentage should be between 94%-100%. If saturation levels fall below 90%, supplementary oxygen should be administered [15].

The system was calibrated using an existing pulse oximeter. The existing unit was tested on the same subjects and using the data a correction value was determined. This value was 1/3 the AR/AIR.

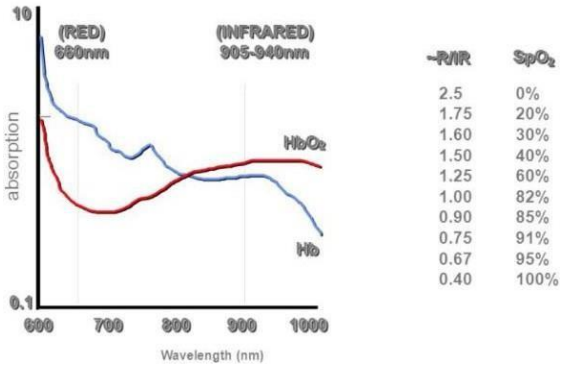


Fig. 6: R/IR correlation to SpO2

Moving forward, further testing will be required to validate the design and the measuring ability of the sensor as it relates to hematocrit, oxygenated blood, and deoxygenated blood. To improve thefunctionality of the

design, the electrical components and the microcontroller will be reduced in size and cost and integrated further into the body of the finger clamp. Bluetooth compatibility will be added to enable communication of the data to nearby mobile- devices or computers located at the point-or-care. To enable improved user-interactions, an LED display and interface will be added within the top portion of the finger clamp unit. This addition will allow users to quickly measure andread oxygenation levels to determine anemia in patients on location. The mobile-phone application will need to be further developed to possess Bluetooth capabilities and the general design of the app will need to improve in terms of user-interface options, connectivity, and display. Furthermore, as there exists great value in directly identifying anemia stemming from iron deficiency – particularly in developing countries where over-supplementing is performed during childbirth, carrying its ownadverse side-effects – the sensor will be furthercorrelated to detect iron levels based on oxygenation of the blood. This improvementwill be performed through direct testing and correlation or through identifying a wavelength of light that is attenuated directly through interactions with iron in the blood

CONCLUSION

The After performing testing and analysis on the prototype it was determine that it can detect hemoglobin result accurate .From this a lack of saturated oxyhemoglobin, hypoxemia, canbe detected. Knowing an individual has hypoxemia can allow fast diagnosis for health conditions, such as anemia. Moving forward, a non-invasive method for detecting iron will be explored and integrated into the existing design. This will enable accurate detection of anemia without the need of blood sampling. Other areas of improvement include app development, size reduction of the circuit board, and correlation of results with blood ironand ferritin levels. With these improvements, the technology has the ability to reduce the cost, skill and time required to detect iron deficiency anemia around the world

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Survey of Smart Crib

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***Abstract*—The objective of this paper is to compare existing methods of automating the movement of a crib or a bassinet. A smart crib typically detects if the baby is waking up and puts him back to sleep by taking actions that would soothe the baby. The detection is generally done through audio and video feed using Artificial Intelligence or Machine Learning models trained for the same. If the baby is waking up, soothing movement and sounds are triggered. The movement and sound help the baby fall asleep again. Some of the existing smart cribs and bassinets also have an app to go along with it. The live video feed is often made available to the parents on the app. Some apps can also provide the parent with analytics about the sleep that their child got through the day and some can also enable two way talk. Overall, the device would enable the baby to get quality sleep through the use of sensors, actuators and machine learning.**

Keywords—Smart crib, Internet of things, automation, baby monitor, Machine learning.

I. INTRODUCTION

A baby's sleep cycle is different to that of an older child or adult. Adults have 4 stages of REM and non-REM sleep in 90 minute cycles, where only 20-25% of sleep is REM. Infants, on the other hand, have sleep cycles of around 50 minutes (for the first 9 months), and around half of it is REM sleep. REM sleep is used to consolidate memories and is critical to a baby's development. Shorter sleep cycles mean that they may wake more often. This is why it is essential for the baby to 51 good sleep. Smart cribs use soothing mechanisms to help the baby sleep when it starts to wake up.

Quality sleep is essential for babies growth, weight gain, mental development and learning, for their immune system to develop well and many more factors.

Currently, in the Indian market, we have baby monitors and automated swings for babies as separate products. However, the swings aren't meant for sleeping. They are remote controlled and need manual inputs. The baby monitors are audio, video streaming devices with some of them having the option of playing lullabies.

In the international market, there are products that combine baby monitors with automated cribs or bassinets. They will be discussed in the methodology section.

II. LITERATURE SURVEY

The smart crib is an Internet of Things based system that helps the baby sleep better and makes the parent's job easy. The existing devices typically have a camera or a microphone or both for inputs. The input received is processed to determine if the baby is asleep, waking up, or awake. Based on the scenario, the movements and sounds are triggered. The baby falls asleep again without the parents intervention in most cases.

Other than this, most of the devices have a connected app which acts as a dashboard for the parent. Some apps displays live feed of the baby whenever the parent wishes to see it. Some also give analytics about the baby's sleep quality. And a few apps also enable two way talk.

A. International market

There are multiple options available in the international market. Here are a few of them:

1. The SNOO

This smart crib automatically responds to cries with movement and sound. It also has a built-in swaddle. It is designed for babies of 0-6 months of age.

This smart crib has a microphone in it. It detects the baby crying through the audio from the microphone and automatically responds to it with a mix of motion and white noise. It uses rocking motion which moves through increasing levels depending on how much comfort the baby needs and then reverts back to a gentle baseline once the baby has calmed down. The Snoo also has a built-in swaddle. The swaddle prevents the baby from rolling into an unsafe sleep position and helps them feel snug and secure. An additional feature is the bassinet's mesh sides that allow for both visibility and breathability. [1]

2. The mamaRoo

This crib has five unique motions that mimic how babies like to be soothed. It can be controlled manually or via a mobile application. It is not motion or sound activated.

Most of the smart bassinets feature only one type of motion (front-to-back or side-to-side). The mamaRoo is different. It has five completely unique motions called car ride, wave, kangaroo, tree swing and rock-a-bye. The motions mimic the ways a parent might put their baby to sleep and the ways that babies like to be soothed and comforted. More options in terms of movement means that the parent gets to try different motions and see what works best for their baby. [3]

It also has other features such as built-in white noise, breathable mesh sides, adjustable-height legs and Bluetooth capabilities. [4]

Unlike a lot of the other smart bassinet, this sleep bassinet isn't motion-activated, so the user needs to manually turn on the movement features either when they put the baby to sleep or if they hear them fussing. [5]

3. Cradlewise

This is a bassinet, crib and monitor all in one. It learns the baby's sleep patterns and responds automatically. It is a crib that is motion-activated and also learns the baby's schedule and soothe them back to sleep when needed. Similar to SNOO, Cradlewise automatically responds with a gentle bouncing motion when the baby starts fussing to soothe them back to sleep. The built-in baby monitor also learns the baby's sleep patterns and schedule and responds accordingly. The bouncing then turns off once the baby has settled down. There's also white noise and other sounds and a lot of customization options. It also provides sleep analytics.[2]

B. National market

Here are a few the options available in the national market:

1. Baybee Sooth N Sway

This smart crib has a built-in swing. It also has a digital display and protective mosquito net for babies. It comes with 2 in 1 multifunction baby toys on it.

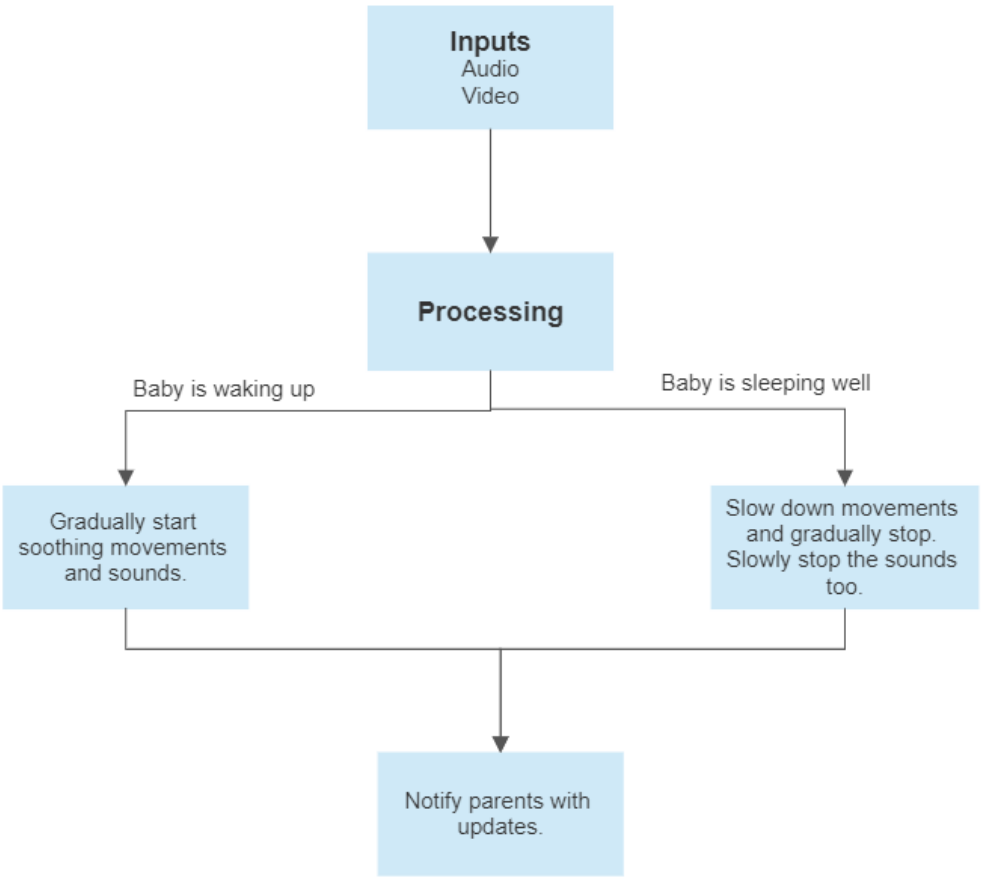
This smart crib has an advanced IMD touch panel in it. It can also be easily controlled by the Bluetooth operating system. It recreates the calming, swaying motion most babies love and easily relaxes the babies on it. A connected phone can be used to play music. The volume can also be controlled through the app. In a similar way, the swing speed can also be adjusted through Bluetooth. It has a 5-point harness, has an easy to clean seat pad. The seat cover is machine washable. It comes with a remote for those that don't want to be using the app. It is ultra light-weight to enable easy transport from one place to another. [6]

2. StarAndDaisy Automatic Electric Baby Swing Cradle

This smart crib has a 3 point safety belt. It also provides detachable play toys for babies. This smart crib also has a protective mosquito net for babies. They easy to control using the music/swing button. They have 3 level swing mode. It comes with a remote control, an adapter to charge the smart cribs and with a toy stick and a play toy for babies. They can be used to play music for babies. They also provide a 250 tilt angle which they claim protects the healthy development of the baby's spine.[7]

III. GENERAL STEPS FOR IMPLEMENTATION SMART CRIB

Figure 1



Flowchart showing typical steps of smart crib

The typical working of a smart crib has been described in the flowchart. A smart crib typically has audio or video input from the baby monitor that it often comes with. This input is processed to determine if the baby is sleeping or if he might wake up soon. If the baby is waking up then soothing movements and sounds are triggered. These are meant to put the baby back to sleep before he fully wakes up. The other scenario is when the baby is sleeping well. In this case, the movements and sounds, if they are in action, are gradually slowed down and eventually brought to a stop. All this while, the parent or guardian of the child that has the application that is connected to the smart crib gets notified of all updates.

IV. Advantages of a Smart Crib

A major advantage of the smart crib is that it makes the parent's job easy while improving the baby's sleep quality. It senses the baby is waking up and puts the baby back to sleep before he is fully awake. This is done because it is easier to put the baby back to sleep when he isn't fully awake than when he is. It gives the parent the ability to see live feed of the baby from wherever they are and to talk to the baby in the crib if they so choose. It gives the parent insight into the baby's sleeping patterns and durations and helps them ensure that the baby gets the sleep that is needed for proper development.

V. Disadvantages of a Smart Crib

The disadvantages of a smart crib are that data security, which is critical especially because the data is collected on babies, depends on the smart crib manufacturer. Smart cribs are often expensive and need electric supply. Parents have been observed to use the smart crib for too long, leading to it becoming difficult for the baby to transition from sleeping in the crib to sleeping on a bed.

VI. Conclusion

The devices make the parent's job easy and improve the sleep quality of the baby by helping the baby fall asleep again when it is starting to wake up. This leads to a range of benefits for the baby's growth. There are a variety of options to choose from in the international market but there is a lack in the Indian market. The available solutions in the international market are varied in terms of price and features. This allows the user to find the option that is best for them.

VII. Future Scope

There is a lot of scope for development in the Indian market. The existing automated swings for babies are not meant for sleeping. There exist attachments that can be purchased separately and fitted into a crib. These are controlled by a remote. There are also baby monitors that can stream video footage of the crib to the parent, play music that the parent chooses, allow two way talk, etc.

There is scope for combining these two major features to provide one complete solution. The crib can be automated and come with a baby monitor installed in it. The cribs can then be made smart too. The data collected from the baby monitor can be analyzed to enable the device to make smart decisions.

A smart crib would use the data to determine if the baby is waking up and would start motions and sounds to help the baby sleep again. This has been implemented by international manufactures of smart cribs but hasn't been done in India.

Acknowledgment

We would like to Dr. Sujata Alegavi, Thakur College Of Engineering and Technology for sharing her knowledge and expertise in Survey of Smart Crib. We are also grateful to all the faculties and industry experts guiding us for this project.

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Campus Placement Management System

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***Abstract*—The Training and Placement cell in most colleges currently uses WhatsApp to communicate a lot of its operations. Although this method of communication is effective, it may not be efficient due to the presence of several groups and messages, some students may overlook a few notices and critical information. The project's main objective is to centralize TnP activities, notifications, job listings, and Resume submissions to streamline and improve the placement process and increase candidates' chances of success.**

Keywords—placement, management system, TnP, TPO, campus

I. INTRODUCTION

An online platform called a placement management system facilitates the recruiting of college students. Students can access pertinent information about potential job placements, maintain their accounts, and keep up with the most recent options available to them by using this system. By automating as much of the process as feasible, the system is intended to decrease the amount of manual labor necessary, decreasing errors and increasing efficiency.

The usage of database management solutions like MySQL is one of a placement management system's distinguishing characteristic. The system can gather and manage a lot of student data thanks to these technologies, which makes it simpler for training and placement officers to monitor many students at once. The technology also enables officers to select students quickly and simply according to numerous criteria like their academic performance, employment experience, and interests by saving all this information in one location.

Students that use a placement management system have access to more work options, which is another advantage. Students can explore numerous career opportunities by using the system to connect them with firms from several industries. Additionally, the system can offer students insightful criticism on their cover letters, resumes, and interviewing techniques, enhancing their chances of success in the job market.

An effective technique for expediting the college student hiring process is a placement management system. The approach lowers errors, boosts efficiency, and gives students access to a larger range of employment prospects by automating as much of the procedure as possible. As a result, it serves as a useful tool for both students and employers, contributing to the development of a more effective and efficient labor market.

II. LITERATURE SURVEY

Campus placement management system is a web-based application that is designed to help educational institutions manage their campus placements. It allows students to register for placements and apply to different job openings, and enables TPO to post job openings, search for candidates, and manage the campus placement process. The system provides a centralized platform for managing the entire campus placement process, from registration to final placement.

Literature review of campus placement management system reveals that there are many different approaches to building such systems, ranging from traditional desktop-based software to web-based applications and mobile apps. Here are some papers on campus placement management systems:

1. "Campus Recruitment Management System Using Web Technology" by N. Y. Yadav et al. (2016)
This paper proposes a campus recruitment management system that uses web technology to simplify the recruitment process for both recruiters and students. The system is designed to be user-friendly and easy to navigate, with features such as job posting, resume submission, and interview scheduling. The authors conducted a survey of students and recruiters to evaluate the effectiveness of the system.

2. "Design and Implementation of an Automated Campus Placement System" by P. R. Jagadeesh Kumar and V. K. Govindan (2017)
This paper describes the design and implementation of an automated campus placement system that streamlines the recruitment process for educational institutions. The system includes features such as job posting, resume submission, and interview scheduling, as well as a feedback mechanism for students and recruiters. The authors conducted a case study to evaluate the effectiveness of the system.

3. "Campus Placement Automation System" by S. S. V. S. S. Lakshmi and K. G. Viswanadha Raju (2017)
This paper proposes a campus placement automation system that uses a combination of web and mobile technologies to facilitate the recruitment process. The system includes features such as job posting, resume submission, and interview scheduling, as well as real-time communication between recruiters and students. The authors conducted a survey of students and recruiters to evaluate the effectiveness of the system.

4. "A Survey of Campus Placement Management Systems" by S. P. Priyanka and S. P. Arun Kumar (2019)
This paper provides an overview of existing campus placement management systems and evaluates their features and functionalities. The authors conducted a survey of students and recruiters to identify the most important features of such systems, including job posting, resume submission, and interview scheduling. The paper also identifies the key challenges facing campus placement management systems, such as data privacy and security.

5. "Development of an Online Campus Placement System" by S. S. Sairam et al. (2020)
This paper describes the development of an online campus placement system that uses a cloud-based platform to manage the recruitment process for educational institutions. The system includes features such as job posting, resume submission, and interview scheduling, as well as data analytics to track recruitment trends. The authors conducted a case study to evaluate the effectiveness of the system.

Overall, these papers demonstrate the growing importance of campus placement management systems in streamlining the recruitment process for educational institutions and providing students with greater access to job opportunities.

In conclusion, CPMS is an important tool for educational institutions to manage their campus placement process. By providing a centralized platform for students and recruiters to connect, CPMS streamlines the recruitment process, making it more efficient and effective. Addressing the challenges of data security and privacy, technology infrastructure, and user adoption can help to ensure that CPMS continues to be a valuable tool for educational institutions in the future.

III. PURPOSE

Colleges frequently use campus recruitment, but it can be stressful for both students and placement officers. The traditional process of manually entering student information and selecting qualified candidates in accordance with company requirements can result in mistakes and omissions. These issues are resolved by the placement management system, which enables students to create accounts and submit their information for administrator approval. This automated solution reduces redundancy, increases efficiency, and gives immediate visual proof of security. The admin module is crucial in updating information and verifying student enrollment.

The placement management system was created to make it easier to manage student data for college placements. By automating the process of keeping student information, lowering the manual workload, and saving time and effort on report creation and data collection, it improves the current system. This lowers the possibility of error while ensuring that all crucial information is readily available to students. With the right login credentials, the system is available throughout the campus and may be used to effectively manage student information.

IV. OBJECTIVE

The primary goal of the placement management system is to speed up and improve the placement process by minimizing manual work and saving time. To accomplish this, the system has the features listed below:

- The list of qualified students participating in the drives is simple to locate.
- Management of student records, placement training, and placement details.
- Saving faculty and placement officers' time.
- Minimizing manual labor
- Enhancing the protection of student data
- Distributing significant alerts and updates regarding the placement procedure.

V. EXISTING SYSTEM

Currently, institutions use manual techniques to manage placements, like keeping records in Excel sheets. This causes several issues, such as challenges with data redundancy, updating records, and searching for and sorting information. As a result of the existing approach, it is ineffective to find qualified students, students are unaware of training and placement opportunities, there is a significant communication gap between students and placement officers, and the placement officer has a tremendous task. The current system is manual and non-computerized, which makes it difficult and time-consuming. The greatest solution to these issues is to computerize the existing system.

VI. Proposed System

The system intends to offer a few new features while fixing the shortcomings of the current systems. The proposed system for a campus placement management system website is a comprehensive solution for managing the campus placement process. The system would consist of two key modules: a student module and an admin module i.e., TPO module.

The key idea of the system is to simplify the complex and manual process of campus placement. The admin module will be responsible for posting notifications including notifications about companies visiting campus and job profiles and webinars conducted by the TnP cell. In the student module, the students will be able to create their profile, read notifications posted by the TPO, upload and update their resume and apply for jobs according to their criteria.

After registering, students can upload their resumes and all relevant details and then according to the details provided, their criteria will be determined and so will their eligibility to apply for an interview. The student's dashboard will provide all information regarding hiring events, placement plans, and interview times, etc. Overall, the proposed system would provide a comprehensive solution for campus placement management, allowing for efficient and effective management of the placement process.

The backend of the web application will be developed using Node.js and Express for server-side framework. The system will make use of MongoDB for database management and will sort the data of the student based on eligibility criteria. The user interfaces would be web-based and developed using HTML, CSS, JavaScript, and other front-end technologies.

VII. System Design

System Modules: TPO (Training & Placement Officer) module and Student Module

The TPO and Student modules are designed to simplify different TNP (Training and Placement) tasks in the system. Both modules share a common login page, where users can enter their login ID and password to access the system.

Login- Both the TPO and Student modules share the same login page. The user needs to enter their login ID and password to log in to the system.

TPO Module- The TPO module is a crucial part of the TNP system and plays the role of the system administrator. The module is designed to perform the following tasks:

- Update TNP notifications: The TPO can post updates regarding placement activities, job profiles, and required skills to keep students, companies, and placement officers informed.
- Manage company visits: The TPO can schedule and manage company visits to the campus for recruitment.
- Monitor attendance: The TPO can monitor the attendance of placement training sessions and keep track of academic attendance provided by the department.
- Store performance records: The TPO can store the performance of students in aptitude/technical tests.
- Reporting and analytics capabilities: The module offers reporting and analytics capabilities that help make informed decisions.

Student Module- The Student module is designed to provide the following features:

- Create and edit profile: Students can create and edit their profile with personal and academic information.
- Record of personal information: Students can maintain their record of personal and academic information.
- Update profile: Students can update their profile information as and when required.
- Upload and update resumes and other relevant documents: Students can upload and update their resumes and other relevant documents for campus placements.
- Apply for campus recruitment: Eligible students can apply for campus recruitment.
- Keep track of interviews: Students can keep track of the interviews they have given through campus placements.
- Placement notification: When a student is placed, they will be notified through the system.

VIII. Scope

The Placement Management System's objective is to make the hiring process more efficient and streamlined. The technology lowers manual labor and eliminates the potential of mistakes by digitizing student information. Access to student data is made simple, which facilitates searching and sorting through massive amounts of data. The system's user-friendly interface enables the placement officer to carry out tasks quickly and effectively without having to concentrate on maintaining records. The suggested system automates user activation and deactivation, as well as user-to-user communication. The administrator has the power to verify user data, produce student lists in accordance with company standards, and offer company information. The solution also enables alumni data management and online feedback. The project's overall goal is to completely automate the training

and placement department's workflow, eliminating the need for human labor and paper documentation

IX. ARCHITECTURE

The figure below accurately reflects the focus of the report on the technical design and functionality of a system designed to streamline the college recruitment process through automation and database management.

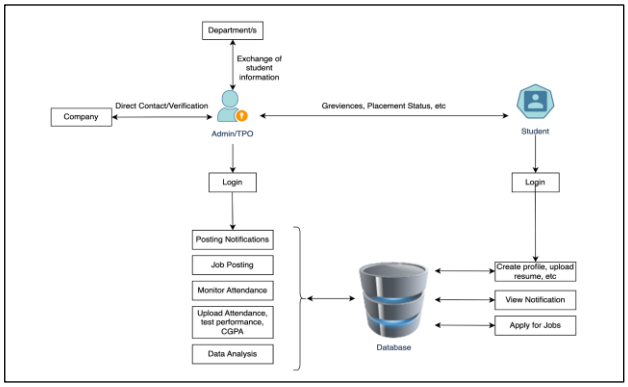

Fig (1) - Block Diagram of Campus Placement Management System

X. CONCLUSION

The majority of jobs in the placement system as it is, are carried out manually, which slows down the process of changing things. As a result, there are issues with updating student data, finding, and sorting student information, and alerting students in a timely manner. These processes are intended to be automated by the proposed system. The system enables the registration of students for upcoming placements, the creation of new users, notifications to students, information exchange, privacy protection for students, and administrator validation of information. Because all relevant information is precise, safe, and readily available, managing the placement process is made considerably simpler for the placement manager. By enhancing system and software dependability and making it simpler for the administrator to keep track of which businesses students have applied to and been accepted into, the suggested solution is anticipated to have a significant positive impact on pupils. Overall, it is anticipated that the suggested method will correct the flaws in the current manual system.

XI. FUTURE SCOPE

The future scope of the placement management system project can include:

- For a smooth hiring process, integration with other systems is necessary, such as HR management or firm recruitment portals.
- supplying data analytics and reporting to assist placement officials and businesses in making wise student placement selections.
- Making mobile apps that allow students to obtain information and updates on training and placement activities while they're on the go.
- using machine learning and artificial intelligence (AI) technologies to automate placement and provide students individualized suggestions.
- Adding services like résumé creation, skill evaluations, and tools for interview practice to the site to make it a one-stop shop for students' placement requirements.

The potential of the project is vast, and with ongoing development, it can revolutionize the way placements are managed in colleges and universities.

ACKNOWLEDGMENT

We would like to express our sincere gratitude to all those who have contributed to the successful completion of this paper on "Campus Placement Management System".

First and foremost, we would like to thank our academic supervisor, Ketki Balde & Divya Khushwah, for their valuable guidance, support, and encouragement throughout the entire process. Their insightful feedback, constructive criticism, and expert knowledge have been indispensable in shaping our ideas and improving the quality of this paper.

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Once again, we express our sincere appreciation to everyone who has contributed to the successful completion of this paper on "Campus Placement Management System".

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Contactless Attendance Monitoring System using Face Recognition and Image Processing

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***Abstract*— Attendance tracking is a basic requirement for all organizations. Recording and managing attendance on a regular basis is a tedious and time-consuming task. There are various conventional methods of monitoring attendance, but during the COVID-19 pandemic, all these contact-reliant attendance-taking systems felt inconvenient and sluggish. Systems relying on fingerprint scanners have a threat of spreading the pathogens, and taking attendance manually is a cumbersome process that requires manpower. Thus, in our project, we have implemented the concept of an automatic contactless attendance system using Image Processing Technique. The proposed system uses an infrared sensor to detect the presence of a human and only then activates the face recognition system. It uses a face detection algorithm to quickly detect faces, extract facial features, compare them to the images stored in the database, and record the attendance accordingly. Our system can be used in schools, colleges, offices, factories etc. to maintain a record of the attendance of various members of the respective organizations.**

Keywords*— *Attendance, biometric, face recognition, face detection, haar cascades, histogram of oriented gradient, opencv, dataset, camera, raspberry pi, infrared sensor.

I. INTRODUCTION

Attendance plays a crucial role in measuring, analyzing and enhancing organizational performance [1]. Traditional methods of taking attendance involve roll-call or maintaining registers where the members have to sign in order to mark their presence. These methods are prone to human error, consume time and require manpower. In schools and universities, when the class strength is substantial, taking attendance becomes a challenging task. Systems based on retina and fingerprint scans have been proposed but such systems are expensive and difficult to deploy at a large scale. Another popular approach adopted by various institutions and organizations is the smart card attendance system [2]. It works on the concept of radio frequency identification or RFID. This technology is straight-forward and easy to use but faces some critical issues. People can act fraudulently, giving the card to their peers to mark their attendance while they are not present. In order to combat these issues, a system reliant on face recognition can be used.

The Covid-19 pandemic has affected the entire world for nearly 3 years. It caused major distress among all of us. The government implemented social distancing norms to prevent the spread of the disease [3]. Employees were given the liberty to work from home, but keeping track of their activities became a painful task. Similarly, educational institutes had no way to make sure that the students were attending online lectures faithfully [4]. Face recognition technique is a great way to monitor attendance in a contact-free manner. It reduces the risk of contracting any direct contact diseases as it limits the spread of pathogens.

A face recognition system is a piece of computerized biometric software that can be used to determine or validate a person by comparing patterns based on their facial appearances. A face recognition system can divide the process of taking attendance into different phases such as image capturing, facial detection, image processing and facial classification [5]. Facial recognition method involves capturing images, detecting various faces that appear in those images, and then referring to the student database, where several photographs of the students of a particular class are stored [6]. A similar approach can be used in offices, warehouses etc. where photographs of all the employees of a particular department are stored in a database and their attendance can be marked accordingly.

Face Recognition is more efficient compared to the other biometric techniques. It is highly reliable and fool-proof as it uses a person's facial features, which are unique to every individual. Thus, it is a technique which has minimum flaws and avoids fraudulent activities, appropriate for usage in security systems [7]. A major advantage of using face recognition is that it can capture multiple faces at once, saving time and marking attendance immediately upon matching the captured image with the images present in the pre-existing database [8].

There are a few ways to implement Face Detection. The most commonly used method is the Viola-Jones Face Detection Technique, also known as Haar Cascades to identify faces in an image or a real time video stream [9]. This algorithm uses certain filters to extract features from a given image. These filters only work on one portion at a time, adding the intensity of pixels in the black portion as well as the white portions. These two summations are then subtracted, and the result denotes the extracted value. The 3 kinds of features as seen in Fig. 1, extracted using Haar cascade algorithms are: edge features (2 rectangular Haar features), line features (3 rectangular Haar features), and center-surround features.

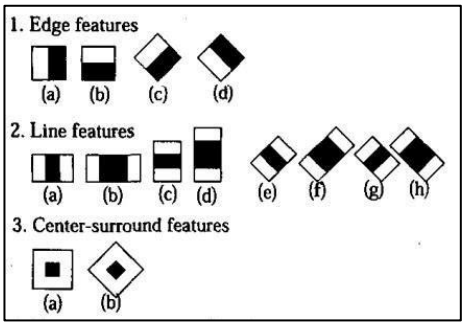

Fig. 1. Haar-like features

These Haar-like features pile up to a really high value which raises the difficulty of calculations [10]. A convenient way to ease the process is by using an integral image, shown in Fig. 2. This reduces the running time and makes the calculations easier [11]. A given pixel in the integral image is the sum of all the pixels on the left and all the pixels above it.

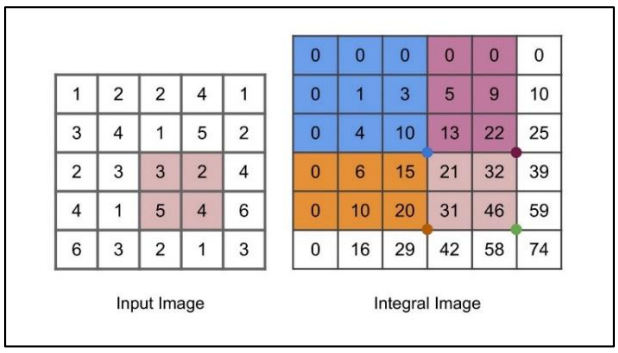

Fig. 2. Comparision between a regular image (left) and an integral image (right)

Histogram of Oriented Gradient feature descriptor is another method used in object detection as it is a powerful and robust tool. It divides an image into numerous small cells which are connected with one another. It computes a histogram for each cell, as shown in Fig. 3, and combines every histogram to form a single unique histogram, known as the feature vector [12].

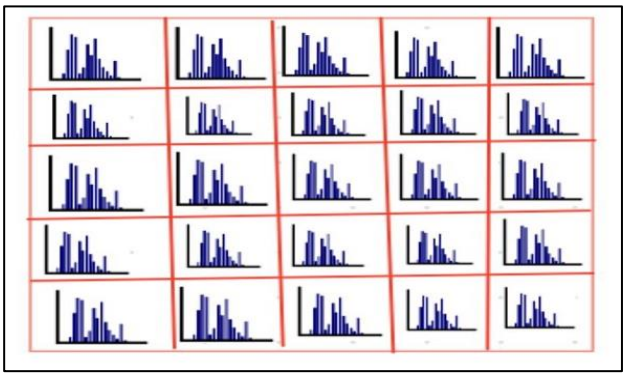

Fig. 3. Different sections of an image represented in the form of histograms

In this paper, we have proposed a contactless attendance management system by implementing the concepts of face recognition and image processing. In order to accomplish this, we have used the OpenCV library and we have implemented a Support Vector Machine (SVM) which creates a reliable face detection model. This algorithm is capable of detecting objects, regardless of their location and scale in an image. Moreover, it also detects objects in video streams. It is extremely fast and secure as it can be used to determine the validity of a user, making it suitable for our system.

II. OBJECTIVE

Face Recognition is extremely reliable, making it appropriate for usage in security systems. Our primary objective is to design a contact independent attendance management system which can detect objects of varying scales in an image. The design is fast and accurate, which helps in improving the security of our system. Furthermore, our system must be able to detect objects in live data streams, increasing the efficiency and making it suitable for working on real time data.

III. EXPERIMENTAL PLAN

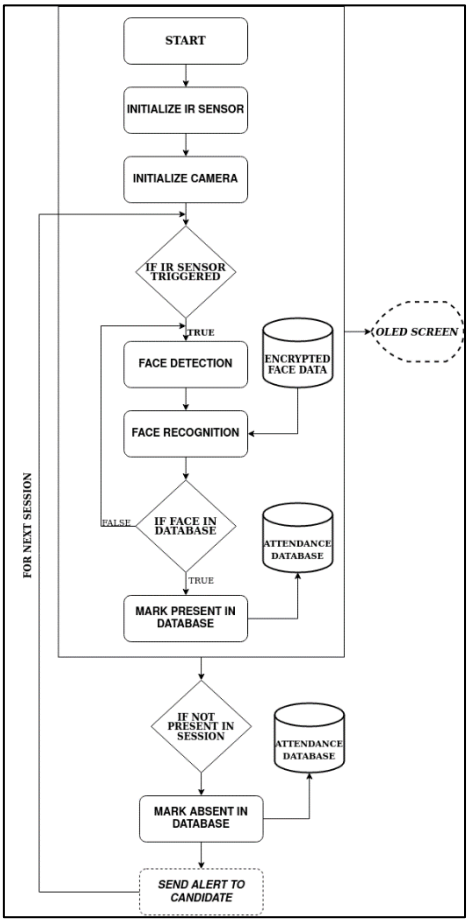

Fig. 4. System Overview

IV. METHODOLOGY

Our system, as shown in Fig. 4, is centred around the Raspberry Pi 4 board. We have used an infrared sensor which initiates the entire system. The camera module then takes an input image which detects the candidate's face and marks their attendance after it successfully recognizes the face.

A. Populating the Dataset

The foremost step is to populate the dataset with existing images of candidates by capturing frames using a camera. The images are captured with varying angles for optimal training of the recognition model. Accuracy of the model is proportional to the number of frames that are stored in the dataset with the drawback of consuming more space. Hence, we have limited the system to an optimal range of 64 to 86 Frames per candidate which ensures reasonable accuracy.

B. Training the Dataset

The dataset needs to be trained, with multiple photos of the same candidate with different angles to increase the accuracy of Face Recognition Algorithm substantially.

Initially 64 photos of the candidate are taken and stored in the system. After that each and every photo is encoded and stored in the form of symbols, letters and numbers.

The greater the number of photos more the accuracy, but after a certain number of photos the accuracy does not change substantially so 64 photos are taken which is optimal time wise and accuracy wise.

At the time of Face Recognition, the system will detect the face of the person in front of the camera and compare the parameters to the encoded data stored. If the data requirements are met then the name of the candidate is displayed on the screen or else "Unknown" is prompted on the video stream. This is the process used to train our system, as shown in Figures 5 and 6.

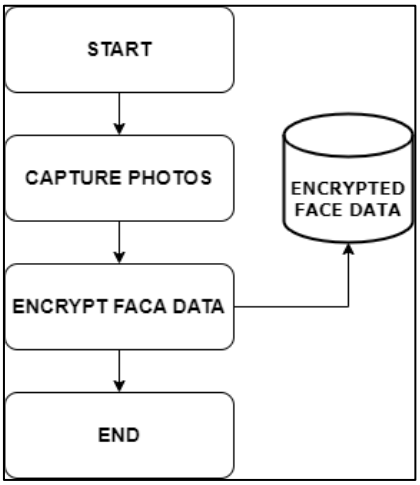

Fig. 5. Training our system

Fig. 6. "Unknown Prompt" displayed on the live video stream

The trained dataset successfully recognizes known candidates and detects the faces of other candidates and labels them as "Unknown". We can further improve the accuracy of our training model by increasing the number of pictures per candidate, but this increases the time requirement.

C. Initializing the system

In our project, the IR sensor is used to detect the presence of a candidate. The IR sensor is connected to the Raspberry Pi board via 3 pins: — V_{cc} , Ground and Digital Data Pin. The face recognition process will begin only when a person comes in front of the system otherwise, the system will remain dormant. We have used a camera module which captures the candidates'

image. It is connected to the camera port on the Raspberry Pi board.

D. Face Detection

Face Detection is used to verify the candidates' identity. The main purpose of this step is to conclude whether the candidates' faces emerge in the video stream, and to determine the location of these faces. The boxes on the video stream indicate areas which contain faces. This makes our system more robust.

E. Face Recognition

One of the most popular Python libraries for face detection and computer vision is OpenCV which utilizes Machine Learning Algorithms to detect faces. Once the faces are detected and encoded into proper format, they need to be compared with existing faces in the dataset to recognize the candidate that is present in front of the camera.

Face_Recognition Library used Dlib as a dependency to generate 128 Data points per face, which results in distinct parameters for the hash of each face across a number of photos stored in the database. Using Scikit-Learn Library, Support Vector Machine (SVM) uses the derived faces to create a Face recognition model that works with minimal latency when met with proper conditions.

This system utilizes a popular Python library named Face Recognition that uses deep learning algorithms to efficiently recognize faces. This library optimizes the Deep Learning algorithm used for Face Recognition automatically based on the processing power of the System. We have used Raspberry Pi 4 which is fairly powerful yet it maxes out its processing capabilities when we run heavy algorithms that are used in face recognition, hence the need of an easy to use and optimized library for face recognition is justified here.

Whenever a candidate is detected using the IR sensor the system starts the camera to recognize the candidate. The Candidate can even see the stream to better align their face for accurate detection and recognition of Face. After the Face is recognized, the system marks the attendance of that candidate in the cloud database.

F. Marking Attendance

The Face Recognition System will get activated once the IR Sensor is triggered i.e., if a person comes in front of the system. When the Face Recognition System is activated, it will detect the face of the person in real time and compare it with the encrypted face data stored in the database. If the face is recognized i.e., if the face is present in the database, then the person will be marked as present in the database along with timestamp and the photo capture of the person.

At the end of the session, the candidates other than the ones who are marked as present will be marked absent in the database and an alert will be sent to the concerned members of the organization.

As a backup, we can use QR Code to mark the attendance. The QR Code request will only be available after few failed attempts of recognizing the face.

Upon requesting a QR Code, a newly generated QR Code would be sent to the candidate's device. There is a possibility for candidates to use fraudulent methods and "proxy" their attendance by sharing their QR Code with their colleagues. In order to overcome this, the validity of the QR Code is just 5 seconds. Within a small time-frame, it becomes next to impossible to commit such malpractices.

We can add other features such as an OLED screen which would provide a visual confirmation to the users regarding the status of their attendance. We can also add an alert mechanism which would send an email to the candidate if they are marked absent.

Along with that, we can work on making a system that would make use of multiple cameras in order to keep track of a really large number of individuals. Creating a dashboard that shows the user's overall attendance, monthly attendance and allows new users to enroll is another essential feature that we are looking forward to include in our system.

These are some additional measures which we have considered in order to make our system more dependable, transparent and user-friendly.

V. CIRCUIT DIAGRAM

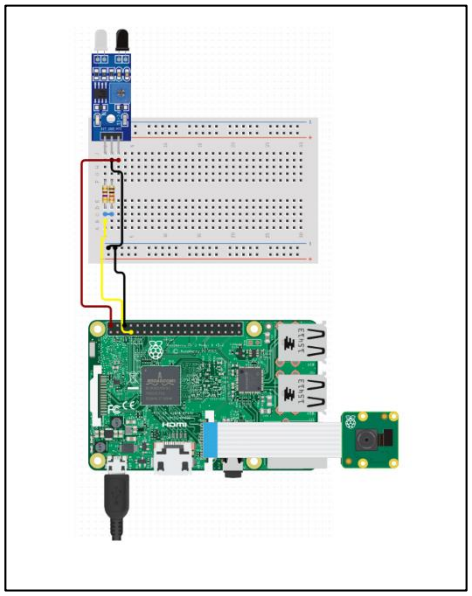

Fig. 7. Circuit Diagram

Fig. 7 shows the circuit used in our system. The Infrared Sensor and the camera module connected to the Raspberry Pi 4. The Raspberry Pi 4 is connected to a power source.

We used the following components and software:

1. Raspberry Pi 4 microcomputer

Raspberry Pi 4 is a small Single Board Computer which we are using in this project. It is based on Linux Operating System and has Thonny IDE for programming which uses Python Language. It has 4 GB RAM and a 1.5 GHz 64-bit quad core processor

which is capable of running Face Recognition Algorithms smoothly.

2. Raspberry Pi OS

Raspberry Pi OS is a Unix like Operating System based on debian Linux Distribution for the Raspberry Pi. It is an open Operating System which is optimised. This OS can be flashed on a SD Card which is then inserted in the Raspberry Pi. There are many packages available for variety of needs.

3. 5 MP CSI Camera Module

Raspberry Pi Camera is a specially designed 5 MP Camera Module with a ribbon connector. The Raspberry Pi has a special CSI port for this camera module where it is attached to. With few packages installed we can access the camera.

4. KY-032 Infrared Obstacle Avoidance Sensor Module

KY-032 Infrared Obstacle Avoidance Sensor Module is a proximity sensor whose distance and sensitivity can be adjusted as per use. When an obstacle comes in set distance range a signal is passed indicating an obstruction.
The main purpose of this sensor is to activate the system when a candidate approaches it, or else the system stays dormant.

VI. RESULT

The IR sensor's range was set in accordance with the ideal distance between the candidate and the apparatus. As the IR sensor detects the candidate's presence, the camera module starts recording and the live video stream is displayed. Image Classification for face detection was accomplished by training and encoding 64 images of each candidate with different facial expressions and poses. The trained datasets helped in detecting faces in a reliant manner.

In case the candidate's face is not recognized, the system detects and shows "Unknown" on the video stream. It stores all the detected faces on the Raspberry Pi so that the information regarding attendance is safe and secure.

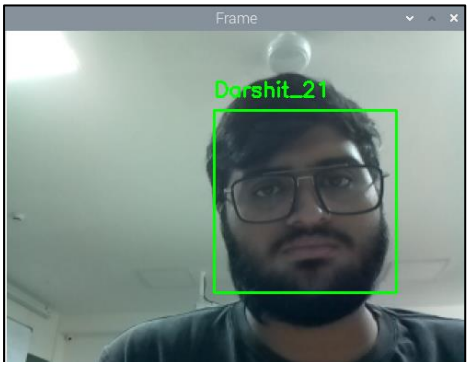

Fig. 8. Candidate 1, Darshit_21, face detected and recognized

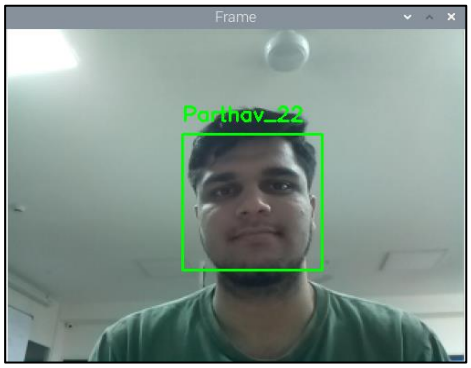

Fig. 9. Candidate 2, Parthav_22, face detected and recognized

Figures 8 and 9 show that the faces enrolled in our dataset are detected and recognized.

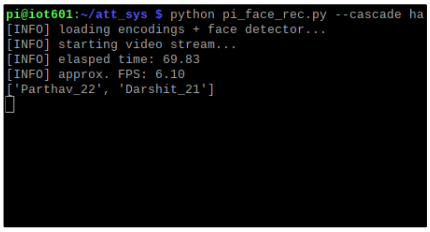

Fig. 10. Candidates present in the session

After successfully recognizing the faces, their attendance is marked. Fig. 10 shows the output terminal displaying names of the candidates that were present in the session, as recognized by our system. Our system was successful in detecting and recognizing faces which were enrolled in the dataset as long as there wasn't a drastic change in lighting conditions. The system was well suited for accurate detection and recognition of multiple faces at once.

VII. CONCLUSION

Faces with a high degree of change in angles from the captured images weren't always detected. The face was recognized in ambient lighting as well as in a bit shady lighting. Every candidate's attendance was monitored, then a monthly report was generated along with name, roll number, entry time, exit time, attendance percentage and time spent in the premises, as shown in

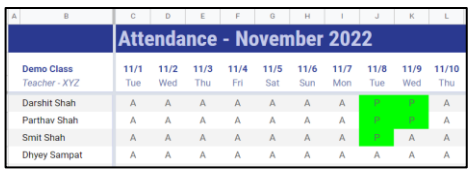

Fig. 11.

Fig. 11. Attendance monitoring for the first 10 days of the month

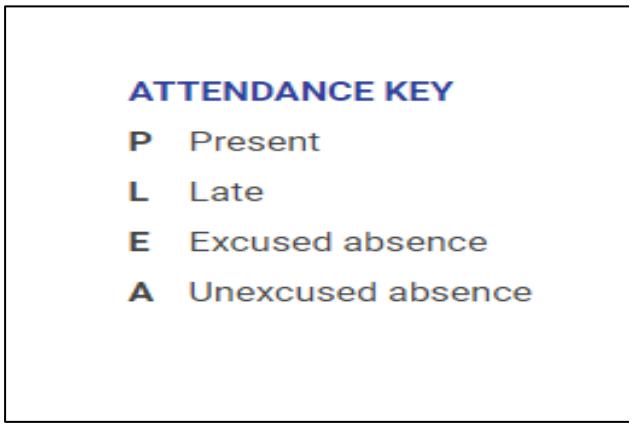

Fig. 12. Attendance Key for reference

Fig. 12 shows the attendance key used to mark attendance. The administrator has access to update the attendance of candidates in special cases.

It sends an alert to the administrator in case any candidate is absent. The administrator can monitor everyone's progress individually. The system has low response time and is ~95 % accurate. The process of capturing, encoding and recognizing is also very quick.

The system is very user friendly as it is very easy to use, but at the same time secure and reliable. It has huge future scope to expand its features and functionalities.

VIII. FUTURE SCOPE

Recording Attendance is a task which needs utmost Accuracy as system failures, false records, discrepancy can cause the organization loss of valuable Time and Money. Hence to avoid such errors we plan to optimize our Facial Recognition Algorithm to be more accurate and make our system more secure. There are a number of other additions that we will implement in future as suggested below.

1. Developing Web and Mobile Application interfaces to make it easy for Organizations to manage and analyze attendance is crucial. We will implement this by building Web and Mobile Application interfaces for Candidates as well as Administration.
2. Instead of Candidates forming queues at the attendance terminal, an array of high precision Cameras can be placed at point of entries to automatically detect and record attendance without interruption. This can be achieved by installing Camera Nodes with enough processing capabilities so that it can send images to the main master terminal which can perform the heavy Deep Learning Tasks to detect faces, perform facial recognition and further send the record to cloud Databases. This method evidently proposes a Fog Computing System.
3. Another Method that can be implemented is Mobile Application based Facial Recognition Attendance system that can record attendance using candidates' Smartphone. This System reduces the manufacturing cost by great extent and makes the product more accessible. To tackle the issue of False Attendance record, Geofencing nodes can be installed in sections of organization to ensure that the candidate is truly present when the attendance is recorded. This can be Further improved by letting the Administration decide the time at which the Candidate can get access to record attendance.

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We are extremely grateful to the head of our department, the Department of Internet of Things, Dr. Sujata Alegavi, along with all our faculty members, lab assistants, and batchmates, for their technical and intellectual assistance. Their valuable insights truly helped us keep our work on track.

Our college's Research and Development Cell also played a vital role in providing us with all the components required to make a functional system.

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Game based Learning / Gamification

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***Abstract*— The gamification of education can enhance levels of students' engagement similar to what games can do, to improve their particular skills and optimize their learning. On the other hand, scientific studies have shown adverse outcomes based on the user's preferences. The link among the user's characteristics, executed actions, and the game elements is still an open question. Aiming to find some insights for this issue, we have investigated the effects of gamification on students' learning, behavior, and engagement based on their personality traits in a web-based programming learning environment. We have conducted an experiment for four months with 40 undergraduate students of first-year courses on programming. Students were randomly assigned to one of the two versions of the programming learning environment: a gamified version composed of ranking, points, and badges and the original non-gamified version. We have found evidence that gamification affected users in distinct ways based on their personality traits. Our results indicate that the effect of gamification depends on the specific characteristics of users.**

Keywords—Gamification, web-based, badges, games, methodolody, leaderboard, feedback, learning.

I. INTRODUCTION

Game-based learning and gamification is a trend that has been implemented in many settings including workplace training, education, and social media. Many people have been exposed to game-based engagement techniques in one form or another, whether they've been aware of it or not. Popular social media apps like Untappd and Foursquare engage their users by allowing them to share with their peers what beer they are drinking or where they have been. These apps allow users to log their experiences, share with friends, and even earn badges for certain milestones like checking in the most times into a particular location.

It is an active learning strategy that is an intersection between game elements and the learning environment, using strategies typically reserved for games to encourage and enhance learning, practice, and assessment. Game-based learning relies on defined learning outcomes and often uses a cycle of failure, reflection, and repetition to provide safe yet meaningful learning experiences for students.

Game-based learning provides an opportunity for librarians to incorporate active learning into their instruction sessions, promote students' interest and engagement, and provide immediate feedback on performance. There is also a significant amount of research that suggests that game-based learning can increase student learning.

II. CURRENT APPLICATIONS

James Paul Gee, a prominent scholar in the field of game-based learning, describes some of the learning principles that games utilize, including the opportunity to experience the world through new roles and identities and the potential to encourage reflective practice by having players engage in a cycle of probing, hypothesizing, probing again, and rethinking their strategies . Because the experience of the game is unique for each player and dependent upon their actions and decisions, gamers are allowed to become producers, rather than just consumers, of content . Gee states that "good video games incorporate good learning principles, principles supported by current research in cognitive science".

Significantly, games provide an opportunity for learners to experiment, take risks, and learn from failure without fear of real-life consequences . Games also allow players to develop skills incrementally through practice and challenge players to push themselves without feeling like the tasks are insurmountable. By incorporating game-based learning in the in-person and online classroom, these attributes can be leveraged by librarian educators to create more compelling learning experiences.

Game-based learning has become increasingly popular in recent years. It is an effective way to engage students and help them retain information, as well as apply it in a meaningful way. Game-based learning is being used in educational settings for a variety of subjects, including language, math, science, and engineering, to name a few.

Game-based learning can also be used to assess the progress of students, allowing teachers to track their progress over time. This can be particularly useful in providing feedback to students and helping them better understand the material.

II. METHODOLOGY

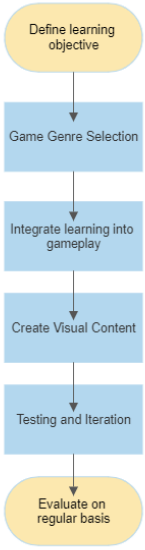

Fig.1: Method of building a learning-based game

A. *Define learning objective*

Choosing the right learning objective is critical to the success of a learning based game. Here are some steps to help you choose the best objective:

1. Identify the target audience: Who will be playing the game? What are their needs and interests? Understanding the audience will help you determine what kind of objective will be most relevant and engaging
2. Align with educational standards: Consider the educational standards or curriculum being used. Choose an objective that aligns with these standards and supports the learning outcomes desired by educators and students.
3. Make it achievable: The objective should be something that can be realistically achieved within the constraints of the game.
4. Make it measurable: Ensure that progress towards the objective can be easily tracked and measured. This will help players see their progress and feel motivated to continue playing.
5. Keep it clear and specific: The objective should be clear and specific, with a clear end goal in mind. This will help players understand what they are working towards and stay focused on their learning.
6. Consider the game mechanics: Make sure the game mechanics support the chosen objective and reinforce the learning experience. The objective and game mechanics should work together to create an enjoyable and effective learning experience.

By following these steps, you can choose a learning objective that is well-suited to your target audience, supports educational goals, and enhances the learning experience.

B. *Game genre selection*

Selecting the right genre for a learning-based game is important in ensuring player engagement and facilitating learning outcomes. Different genres appeal to different age groups and learning styles. Consider the interests and preferences of your target audience when choosing a genre. Different genres support different types of learning. For example, puzzle games can help develop problem-solving skills, while strategy games can help with critical thinking and decision-making.

Choose a genre that aligns with your desired learning outcomes. The genre should also match the subject matter being taught. For example, a simulation game may be a good choice for teaching financial literacy, while an adventure game may be more appropriate for teaching history. Make sure the genre and game mechanics work well together. The game mechanics should support the learning experience and reinforce the educational goals.

C. *Integrate learning into gameplay*

Gamification elements, such as points, levels, and rewards, can make the learning experience more engaging and motivate players to continue playing. Another elements are feedback mechanisms, such as progress tracking, help players see their progress and identify areas where they need to improve.

D. *Create virtual content*

Conduct thorough research on the subject matter to ensure that the virtual content is accurate and up-to-date. Consider the target audience and their learning needs and preferences to ensure that the content is relevant and engaging. Conduct thorough research on the subject matter to ensure that the virtual content is accurate and up-to-date. Consider the target audience and their learning needs and preferences to ensure that the content is relevant and engaging. Plan the content for each level or section of the game, including interactive elements and feedback mechanisms. Ensure that the content aligns with the learning objectives and supports the educational goals.

E. *Testing and Iteration*

Start by testing the game with a small group of players to gather initial feedback. This can help identify any major issues that need to be addressed. Based on the feedback from initial testing, refine the game design and make necessary changes to improve player engagement and enhance the learning experience. Analyze the data collected during testing to identify trends and patterns in player behavior. This information can be used to refine the game mechanics and improve the learning experience.

By following this process of testing and iteration, you can ensure that the learning-based game is effective, engaging, and well-received by players. The process of testing and iteration also helps to identify areas for improvement and ensure that the game is continually evolving and enhancing the learning experience for players.

F. Evaluation on regular basis

Analytics software can track player behavior and engagement metrics, such as session length, completion rates, and levels completed. This data can help identify areas of the game that are working well and areas that need improvement.

Learning management systems (LMS): LMSs can be used to track and measure player progress and provide feedback on learning outcomes. This information can be used to continuously improve the game and ensure that it is meeting its learning objectives.

Surveys and feedback: Surveys and feedback mechanisms, such as in-game polls and questionnaires, can be used to gather player feedback and identify areas for improvement.

Fig.2: Leaderboard used in a learning-based game

III. REQUIREMENTS

1. Web Server

Amazon Web Services (AWS) is a cloud computing platform that provides a wide range of services for businesses of all sizes. Its services can be used for a variety of purposes, including website hosting, big data processing, software development, and disaster recovery.

2. Database Server:

MongoDB is a NoSQL database that is used for storing, retrieving, and managing large amounts of unstructured data. It is known for its scalability, performance, and flexibility, making it a popular choice for modern web applications.

3. Server-side language:

Python is a high-level programming language that is widely used for web development, scientific computing, data analysis, artificial intelligence, and more. It is known for its simple and readable syntax.

4. Front-end Development:

HTML (Hypertext Markup Language) and CSS (Cascading Style Sheets) are fundamental technologies for building and styling websites. HTML is used to structure content and create web pages, while CSS is used to add style and visual layout.

5. Game Engine

Unity is a powerful game engine that is used to create 2D and 3D games and interactive experiences for a variety of platforms including mobile, desktop, etc.

IV. CONCLUSION

In conclusion, game-based learning is an effective and engaging method for education and training. Studies have shown that games can improve motivation, knowledge, and problem-solving skills in learners of all ages. Additionally, the interactive and immersive nature of games can provide a unique learning experience that is not possible with traditional methods.

While game-based learning is still in its initial stage, the potential for its use in education and training is vast. However, further research is needed to fully understand its impact and to optimize its design and implementation. Overall, game-based learning represents a promising direction for the future of education and training

Fig.3: Another leaderboard example in a learning based game

V. FUTURE SCOPE

Game-based learning has seen a surge of interest in recent years, with the advent of advanced technologies and the growth of the gaming industry. The use of games in education and training has the potential to revolutionize the way people learn, offering a more interactive, engaging, and effective method of delivering information. The future scope of game-based learning is bright, as more and more educational institutions, corporations, and governments are beginning to explore its potential.

One of the key areas of growth for game-based learning is in the development of virtual and augmented reality games. With VR and AR technologies becoming more accessible and affordable, it is likely that game-based learning will soon extend beyond the screen and into immersive, interactive environments. This has the potential to revolutionize the way we learn, making education and training more interactive and engaging than ever before.

Another area of growth for game-based learning is in the development of personalised and adaptive games. With advances in machine learning and artificial intelligence, it is becoming possible to develop games that can adapt to the needs and abilities of individual players, providing a more personalised and effective learning experience.

Finally, the growth of mobile and online gaming has opened up new opportunities for game-based learning.

With the increasing availability of smartphones and high-speed internet, it is now possible to deliver educational games to a wider audience, regardless of location or resources.

In conclusion, game-based learning has the potential to transform the way people learn and develop new skills. With advances in technology, the future of game-based learning is promising and holds tremendous potential for growth and innovation.

Acknowledgments

We are extremely grateful to the head of our department, the Department of Internet of Things, Dr. Sujata Alegavi, along with all our faculty members, lab assistants, and batchmates, for their technical and intellectual assistance. Their valuable insights truly helped us keep our work on track.

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Indoor Navigation using Unity and AR Foundation

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Abstract—In today's world, there are many navigation applications for Outdoor but when it comes to indoor , the navigation is still hard , Majorly due to Multiple floors . Indoor Navigation is hard as it requires positioning the Marker above the ground , there is a high chance that there are two or more markers at the same point if looked from top. So , for Indoor navigation a normal 2D view map will not be working or else it needs to show written directions which specify the floor or We can use Augmented Reality with navigation which will help Navigating the people to their location with ease. Hence, we are proposing a low-cost model that uses Augmented Reality (AR) which places the Virtual Marker to navigate the user to location. The markers are permanently placed in many locations and any marker can be selected by the user according to the point they want to reach. This Model can be extended with many different apps too to tell users more about the Surrounding (e.g. with Aarogya Setu app, which can help us tell the routes where more covid patients were present.)

Keywords—Navigation,Augmented Reality, Geospatial API, Anchor, Maker.

I. INTRODUCTION

Mobile communication is the most popular type of communication in the twenty-first century, which shows how significant a part smartphones play in people's lives. Initially, utilizing phones as mobile devices meant that landlines may be portable gadgets. They benefit in several ways, though, and their rate of development is rapid. Smart phone-mounted sensors (such as an accelerometer and compass), connected devices (such as a wristband, Bluetooth receivers, and modems), and user-created applications have all served as indicators for phones that they may be utilized in a variety of contexts. Different apps (games, social media, etc.) can be made for mobile phones by people whose jobs demand mobile devices and by those who build applications.

In everyday life, navigation is critical. The evolution of services from 2D maps to real-time location via GNSS (Global Navigation Satellite System) has significantly altered how people travel. Furthermore, when compared to outside navigation,

indoor navigation requires AR technology more urgently since GNSS signals are not always accessible and stable in indoor environments. Meanwhile, more immersive visualization technologies, such as augmented reality (AR), are now widely available, allowing individuals to travel more enjoyably but also altering how people view their surroundings, perhaps with negative consequences. To lead the design of a better user interface for navigation, a thorough Study of perceptual and cognitive difficulties is required.

AR is widely employed in a variety of fields, including healthcare, education, manufacturing, navigation, and gaming. As the years pass, this new technology matures, and academics have already considered cognition and usability in AR. Augmented reality is the simultaneous perception of virtual and real items by the user. The following characteristics are present in the scenario using augmented reality:

• Virtuality and reality coexist.

• It communicates in real time.

II. LITERATURE SURVEY

The subject of indoor maps has been extensively studied. Since the problem of indoor navigation has been brought up by many businesspeople as well as regular people, the topic has attracted the interest of several study academics. The study on indoor navigation has mostly been influenced by the methods used for outdoor navigation because the concept is new and extensive research has previously been done on its counterpart, outdoor navigation. Here is a summary of the research papers that this research has cited.

A. Studies Carried out in Demirel University[6].

Demirel University examined the Indoor Mapping and modelling and the Problem Associated with it. As GPS is not helpful in Indoor Area therefore in this study, an indoor navigation system has been designed and developed that only uses the accelerometer, the camera and the compass components on the phone and does not require satellite signals for positioning. To provide independence from the map in this application, augmented reality is applied during the routing process by utilizing built-in camera of the phone and no map is used.

This idea, which concerns an augmented reality-based indoor navigation system, is given in two parts. In the first section, the user enters information about the starting point and the final location. The routing procedure then starts, and the fastest route is found. The idea depends on the user's device to for Navigation. Now-a-day's every mobile phone has the Pedometer (sensor which count the step) and they are calculating the shortest path possible, which is show in augmented reality section on device display. The System Architecture consist of the following points:-

a) Pedometer Algorithm.

b) Step Length Calculation

c) Calculation of the Distance and the Angle Between Points

d) Finding the Shortest Path with Dijkstra

e) Adding Augmented Reality to the Application

After Testing of application the average accuracy was 95% which is affect due to low accuracy of the pedometer of Devices.

B. Studies Carried out in Technical University of Munich[5].

Liqiu Meng, Bing Liu created the designed of an interface for indoor navigation on HoloLens, gathered feedback from users. The idea presented is they created application using the Mixed Reality Toolkit (MRTK) v2 and Unity. The application is used an Hardware component called Microsoft Hololens(1st Generation) ,it is highly mobile, untethered, hands-free ,thus suitable for Navigation.

Navigation service is a widespread geoinformation service and can be embedded in an augmented reality (AR). In this work-in-progress, the aim on user interface of AR-based indoor navigation system, which could not only guide users to destinations quickly and safely, but also improve users' spatial learning. The test of the application was in the main campus of Technical University of Munich. Two Experiment and there result was analyze.

C. Studies Carried out by Zafer Tan C¸ankırı and Team[7].

The research focuses on indoor navigation systems that use a variety of technologies, such as Wireless Local Area Networks (WLAN), Radio Frequency Identification (RFID), Inertial Measurement Unit (IMU), and Simultaneous Localization and Mapping (SLAM) (SLAM). According to research, utilising these technologies by itself is ineffective in terms of accuracy and expense. We suggest a marker-based Augmented Reality (AR) indoor navigation system with integrated SLAM and IMU to solve this problem. Unity's AR Foundation Framework was used for highly accurate results with minimum hardware requirements.

The Quick Response (QR) codes was used for determining the visited places. The data of the currently visited place needs to be fetched to enable user interaction.

During Experimentation it was find that no correlation between the physical coordinates and the corresponding error rate. Therefore it was conclude that the error is mainly user-dependent, and also caused by the sensor calibration errors. The final analysis showed that the suggested indoor positioning system had a 99.2% accuracy rate and an average error rate of 0.78%.

D. Studies by Adam Satan[9].

In this research, an unique Bluetooth Beacon-based indoor navigation system for Android is proposed. It described the creation of an Android Indoor Navigation System based on Bluetooth Beacons. Radio frequency signals that are emitted by Bluetooth beacons can be utilised to calculate distance. The location of the user is estimated based on their distance from the beacons. The Bluetooth Beacons' proximity was used to link the wayfinding to well-known graph puzzles. So, for route planning, Disktra's shortest path algorithm was employed. Two intuitive navigational interfaces were created. The

applicability of the offered Indoor Navigation Application is supported by experimental findings.

Symbolic positioning was used in the system, where we linked the calculated positions to predetermined coordinates distributed throughout the building. The navigation system compensated for the positioning system's errors. Position misplacement to nearby positions and position losses occurred when the application was unable to determine our position due to a deliberate lack of signal coverage. It was accomplished by configuring the positioning system to only use beacons within 5 metres rather than the standard 12, leaving 2 metres of space between beacons uncovered. Coverage was also found to be best in corners, where dedicated beacons could be used to improve results. These coordinates are the most important because they indicate where the image or arrow changes direction.

E. Study Carried out by Xingya Yan and Team[2].

This study proposes an interior guide idea that integrates WiFi location technology with mobile AR technology in order to address the low precision and poor engagement in the current traditional indoor navigation system of digital map. In addition, by integrating FASE and SURF, the conventional natural feature extraction algorithm is enhanced. The robustness and real-time performance requirements can be satisfied with FAST-SURF. The digital museum uses a brand-new Android-based mobile augmented reality indoor guide system. The system exhibits high positioning and matching precision, good real-time performance, and high positioning navigation precision, demonstrating enhanced practicability and extensive application prospects. This system is built using the ARToolKit software development package and the Android platform for development. Constructed an Android development environment and installed the Android SDK, ADT, and JDK.

The fingerprinting approach algorithm is used to locate the location of a mobile phone. The positioning procedure is separated into two major steps, which are , 1] To begin with, the training stage's goal is to create a fingerprint position recognition database for a given indoor environment. And then the Position was determined by some calculation.

When the positioning module calculates the location and orientation of the mobile terminal, pre-storage data sets can be used to establish its surroundings. The character detection module constructs the matching feature points between the current frame and the off-line environment pictures. The results of the experiment demonstrate the great accuracy of the location fingerprint recognition method. The average success rate was found to be 95.4%. The location inaccuracy ranges from 0.2 metres to 2.5 metres, with 1.2 metres being the average. Three test locations had placement errors of less than 0.5 metres each.

- Comparison between all the Ideas in Literature

	Accuracy(Latitude, Longitude,altitude)	Required Additional hadware
A	95.4%	NO
B	Close to 100%	NO
C	99.2%	NO
D	Close to 99%	YES
E	99%	NO

Table 1: Comparison between all the Ideas

III. RESEARCH GAPS

This Indoor Navigation is Important and Essential. There are many places where these are needed but are not available, or are slow or inaccurate in Processing, for example Navigating in Grocery stores, Museums etc. We aim to make Indoor navigation accurate and easily accessible at all times in all circumstances. Some Challenges in indoor navigation are taking accurate location of the user because GPS will show the same point on mapping and it’s impossible to identify the floor in which the user is present. We are using AR in this application , as it allows us to make sure that a smartphone is only required hardware component to use in Our Project. With almost everyone having a smart phone the user has to pay no additional money. All the updates will be coming to software which can be handled remotely like normally any Application get update. We can implement the AR for mapping in many ways like by using Android Studio , Android NDK, Unity Engine, Swift(Cocoapods), Unreal

Engine. All the Software listed has ARCore Geospatial API support which, this API helps in detection of points in the real world by placing Anchor.

The Proposed Idea aims at limiting the use of hardware and any other Unnecessary hardware by using Augmented Reality, it also helps to overcome challenges faced in indoor Navigation. The Architecture uses Client side /server architectur, it is a computing model in which server hosts, delivers, and manages most of the resources and if any services requested by client is also managed by host. It is also known as the client Server network as all requests and services are delivered over a network.

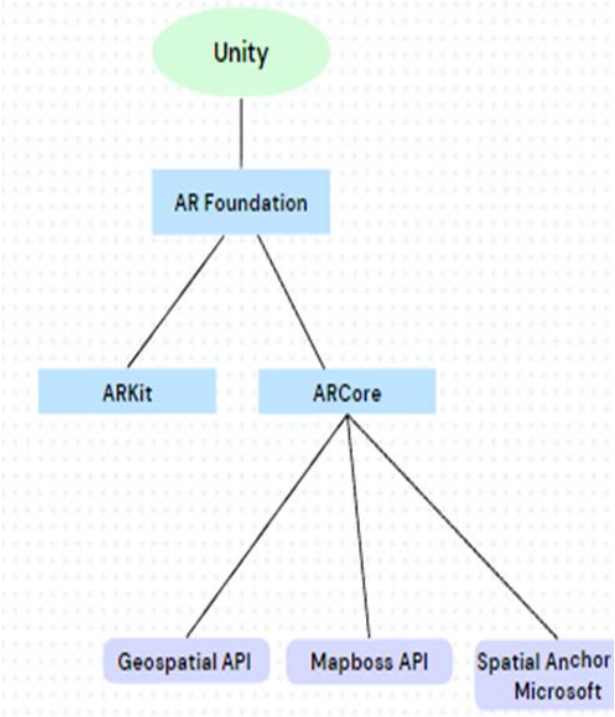

Figure 1: Tree Representation for the Implementation of Proposed Idea.

We are using Unity because of the AR Foundation package provided in Unity which lets us work in Augmented Reality platform in a Multi-platform way within Unity. It is a MonoBehaviour and API for dealing with devices that support many functions with Augmented Reality.

We can also separate devices by using different libraries, for our project we are going with ARCore XR Plugin which Supports Android Devices. For Using maps there are many API's which are available such as Mapboss API, or there is Spatial Anchor provided by Microsoft[4] but we are going to use the ARCore Geospatial API which is used to get the Visual Positioning System(VPS) to determine the exact location of the user. Visual Positioning System(VPS) is a technology that allows Augmented Reality Application to determine a location in the real world using Visual signal. All the API's almost has same base functioning just the implementation is little different.

IV. PROBLEM DEFINITION

Finding the classroom and staffroom might be difficult for new students or those attending college for the first time. To overcome this challenge of finding things inside an Building premises we can use Indoor Mapping, but it is still new and it is hard to find an Indoor mapping Application and there are very low chances that it will be free to use. We are proposing an Idea of using the Unity with AR Foundation to build an Application which has an data set stored with the Anchors and by the Search option in Application we will be able to select the Location we are finding.

V. PROPOSED METHODOLOGY

With the use of GeoSpatial API we can track the user's current location which is normally given in Longitude and Latitude by GPS of the user's Device[1] , by this we can place the marker/anchor at that location and Now it is ready to show the direction for the ground Level. For putting markers at a certain altitude, we will need the Altitude of the device and we can find the location in Vector3 format. Vector3 format is storing the data in 3-dimensional value (in our case <Latitude,Longitude,altitude>), for ground level altitude will be zero. Now when the next user gets near that location their device Location (Latitude, Longitude, altitude) will be compared with the Marker/anchor location and according to the result the user is directed toward the Location they want to reach[10]. To place markers in location and make them stay at that location we can anchor management Components (Components are like a set of defined functions available in unity to ease our work). There are many order components which can help to make users show some direction animation in the application which make the User Experience better.

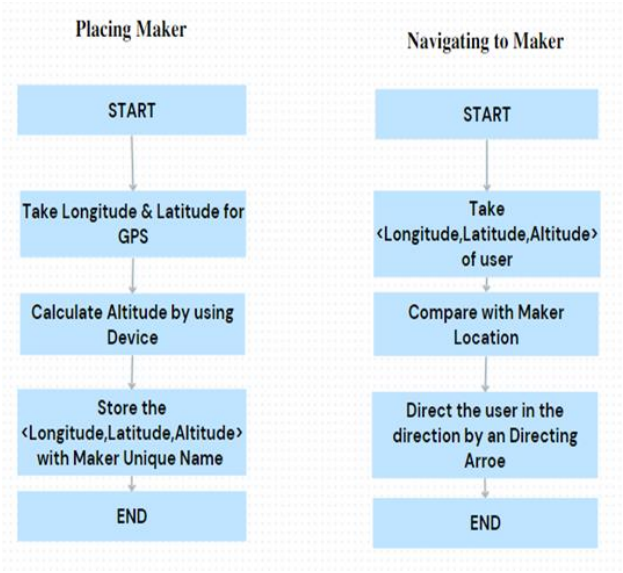

Figure 2: Flow of placing Maker & Navigating to Maker

By comparing the output of user Location and Maker location we will be able to get a clear direction to the location and it will also direct the user towards the marker by showing the animation. The final result of the application would be that the user will have an User Interface where they can search for location from the search bar at the top. After clicking on the Location you want to go, there will be directing arrow that will come up on the screen which will show the Visual Direction in real world which getting capture by camera of device.

Figure 3: User Interface Idea of Application

VI. CONCLUSION

In conclusion, this research paper highlights some of the Idea on the Indoor Mapping come from different part's of world and done an Analysis about there accuracy provided by the application idea which has been presented. Also an Idea was Proposed for the implementation of Indoor mapping using Unity as a Software and ARFoundation. The idea Presented uses the Geospatial Library which help getting the navigation due it's predefined functions. The location tracing will be done by comparing the vectors of location of the user(user's Device) and Vector location of the marker. Drawback of the normal GPS system of not being able to give correct location for different floor was solved in the proposed idea as it take the User's device altitude which detected by the sensor which is now-a-days available in almost all the devices. There is no Extra hardware required for the implementation of this idea, only the internet connection is required.

Overall, the study highlights the continuous research in the field of indoor mapping and the potential for new technological solutions to address the current challenges and limitations of indoor mapping. The is not just single Navigation application ,it can be applied with the other application to get information about that area, for example Aarogya Setu which can give us more about the medical Condition in area like was there any patient affect with corona present or many other way the idea can be combined with other application and can be created a application with large Database which contain information about the Different Areas.

VII. ACKNOWLEDGMENT

We would like to Dr. Sujata Alegavi, Thakur College Of Engineering and Technology for sharingher knowledge and expertise in Indoor Mapping. We are also grateful to all the faculties and industry experts guiding us for this project.

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IOT Based
Smart Dustbin

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ABSTRACT: -

The aim of this project is to create a smart dustbin that will improve the cleanliness of our environment and promote eco-friendliness. This idea was inspired by the Swachh Bharat Mission. The dustbin is designed using Sensory Environment and the Arduino platform. It features a microcontroller based system with ultrasonic sensors that monitor the bin's usage. The lack of proper maintenance of regular dustbins can lead to an unhealthy environment and pollution, which can impact our health. This proposed technology aims to address these issues by using the Arduino UNO, ultrasonic sensor, servo motor, and battery jumper wire. The smart dustbin system will be activated once all the hardware and software connections have been made. The dustbin lid will open automatically when someone is near, and will close once they have disposed of their waste. The goal is to make this technology available and affordable to a wide range of people, from all social and economic backgrounds, to promote health and hygiene.

I. INTRODUCTION: -

The rapidly growing population in our country has resulted in a significant increase in waste, leading to environmental problems. Dustbins are containers used to store and collect waste, whether recyclable or no recyclable, decomposable or non-decomposable. They are commonly used in homes, offices, and other places, but often become overflowing and spill waste onto the ground. The area surrounding a dustbin can also contribute to increased pollution levels and the spread of harmful bacteria and viruses, leading to potential health problems. (1)

To address these issues, we have designed a smart kit that can convert any normal dustbin into a smart dustbin. This IOT-based project offers a smart and innovative way to keep our homes and surroundings clean. The kit is equipped with a sensor that detects when an object is being thrown into it and opens the lid using a motor.(2) The smart dustbin is not only practical, but also fun and interactive, which makes it appealing to children and helps to promote cleanliness. The dustbin can be used for a variety of waste and will open its lid when someone or an object is nearby. It will then wait for a specified amount of time before automatically closing the lid. The lid will only open when necessary, making it a convenient and efficient solution for waste management. This makes it easy for users to dispose of waste without having to touch the lid, ensuring a cleaner and hygienic environment.

The detachable kit is another key feature of the smart dustbin, allowing users to upgrade their existing dustbins without having to buy a new one. The use of Arduino and servo motor makes the operation of the smart dustbin efficient and user-friendly. (6)

II. LITERATURE SURVEY: -

The literature survey conducted on smart dustbins highlighted a lack of technology and IoT integration in the existing systems. However, the research paper in focus presents an innovative solution that uses an Arduino sensor environment and servo motor to convert a regular dustbin into a smart one. The smart dustbin also comes with a detachable kit that can be easily connected to any normal dustbin, making it a cost-effective solution for users who do not want to replace their existing dustbins.

The Arduino board in the smart dustbin constantly monitors the surrounding environment using the ultrasonic sensor. When an object comes within the range of the sensor, it calculates the distance and activates the servo motor to open the lid. This makes it easy for users to dispose of waste

without having to touch the lid, ensuring a cleaner and hygienic environment.

The detachable kit is another key feature of the smart dustbin, allowing users to upgrade their existing dustbins without having to buy a new one. The use of Arduino and servo motor makes the operation of the smart dustbin efficient and user-friendly.

In summary, this research paper presents an innovative solution that addresses the existing lack of technology and IoT integration in smart dustbins. The detachable kit and the use of Arduino and servo motor make it costeffective and user-friendly, providing an effective solution for smarter waste management.

III. REQUIRED SOFTWARE: -

- ARDUINO IDE

IV. REQUIRED HARDWARE: -

1. ARDUINO UNO

Specification: (2)

- Microcontroller- ATmega2560
- Operating Voltage -5V
- Input Voltage (recommended)- 7-12V
- Input Voltage (limit)- 6-20V
- Digital I/O Pins 54 (of which 15 provide PWM output)
- Analog Input 16

2. ULTRASONIC SENSOR

Specification: (2)

- Power Supply - +5 DC
- Quiescent Current - <2mA
- Working Current – 15mA
- Effectual Angle - 180°
- Resolution – 0.3 cm
- Measuring Angle – 30°
- Ranging Distance – 2cm – 400 cm/1″ – 13ft

3. SERVO MOTOR
4. 9V BATTERY
5. JUMPER WIRES

V. PROCEDURE: -

Arduino refers to an open-source electronics platform or board and the software used to program it. Arduino is designed to make electronics more accessible to artists, designers, hobbyists and anyone interested in creating interactive objects or environments. An Arduino board can be purchased pre-assembled or, because the hardware design is open source, built by hand. Either way, users can adapt the boards to their needs, as well as update and distribute their own versions.

An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound (i.e. the sound that humans can hear). Ultrasonic sensors have two main components: the transmitter (which emits the sound using piezoelectric crystals) and the receiver (which encounters the sound after it has travelled to and from the target).

In order to calculate the distance between the sensor and the object, the sensor measures the time it takes between the emission of the sound by the transmitter to its contact with the receiver. The formula for this calculation is

$$D = \tfrac{1}{2} T \times C$$

(where D is the distance, T is the time, and C is the speed of sound ~ 343 meters/second).(4) (5)

A servomotor is a linear actuator or rotary actuator that allows for precise control of linear or angular position, acceleration, and velocity. It consists of a motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.

After successfully servo motor is placed now it's time for sensor, so HC-SR04 Ultrasonic sensor is placed at the front of the kit so that it senses the object behaviour and works accordingly.

The final step in the build process is to make the necessary connections using long connecting wires as per the circuit diagram and securing these wires so that they don't hang around. All the wires from both the components i.e. Ultrasonic Sensor and Servo Motor are connected to respective pins of Arduino. This finishes up the build process of the Smart Dustbin. In Arduino Code has been submitted, and with all hardware and software connection in Dustbin. We will run our dustbin, wait its working or not.

VI. CIRCUIT DIAGRAM :-

The Smart Dustbin project using Arduino is a technology-driven solution aimed at maintaining cleanliness and improving the environment. The project uses the Arduino Uno board, an ultrasonic sensor, a

servo motor, a 9V battery, and a dustbin. The Arduino board comprises the ATmega328 P microcontroller, which is the heart of the board, and other components like the power supply, ultrasonic module, and servo motor. [Fig No.01] (4) (3)

The ultrasonic sensor is used to detect the distance between the hand and the dustbin. The sensor sends out ultrasonic bursts at 40 KHz and waits for the reflected signal. When an object is detected, the echo pin of the module is set high, and the distance is calculated based on the duration of the

reflected pulse. The servo motor is used to open and close the lid of the dustbin.

The circuit also includes an ON/OFF switch to activate and deactivate the dustbin, and a pull-up resistor of 10K is connected in series to solve the debouncing problem. The software part of the project is straightforward and easy to understand, with the program checking the distance using the "Servo.h" library function for servo operation. The servo motor can assume any angle of rotation using the "myServo.write(angle)" function, but in this project, it only has two positions: zero degree (closed) and 180 degrees (open).

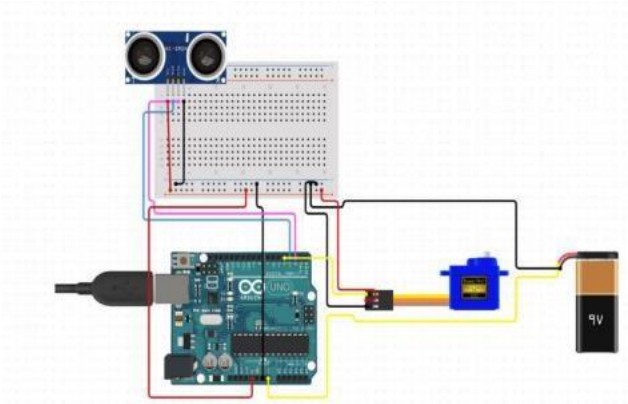

Fig No.01

Circuit Diagram of Kit

VI. WORKING: -

Smart Dustbin using the Arduino is to make sure that all the devices and components are connected properly. The code must be uploaded to the Arduino board and power must be supplied to the circuit.

The first step is to connect all the components of the system properly. The ultrasonic sensor should be mounted at the top of the dustbin, and the servo motor should be connected to the lid of the dustbin. The Arduino board should also be connected to the power supply. When the system is powered on, the ultrasonic sensor starts emitting ultrasonic waves. When an object comes within the range of the sensor, the waves bounce back, and the time taken for the waves to return is measured. The Arduino board then calculates the distance of the object from the dustbin using this information.

When the sensor detects an object, such as a hand, the Arduino calculates the distance to that object. If the distance is less than a predetermined value, the servo motor activates, which in turn opens the lid of the dustbin through an extended arm.

If the calculated distance is less than a predetermined value(distance<50), the Arduino board activates the servo motor. The motor rotates a certain number of degrees, which causes the lid to open. The user can then dispose of their waste in the dustbin without having to touch the lid. The lid remains open for a set amount of time. This allows the user to dispose of their waste without having to physically touch the lid and helps to keep the environment clean and hygienic.

After a set amount of time, the lid automatically closes. This time can be set according to the user's preference. The servo motor rotates in the opposite direction, which causes the lid to close.

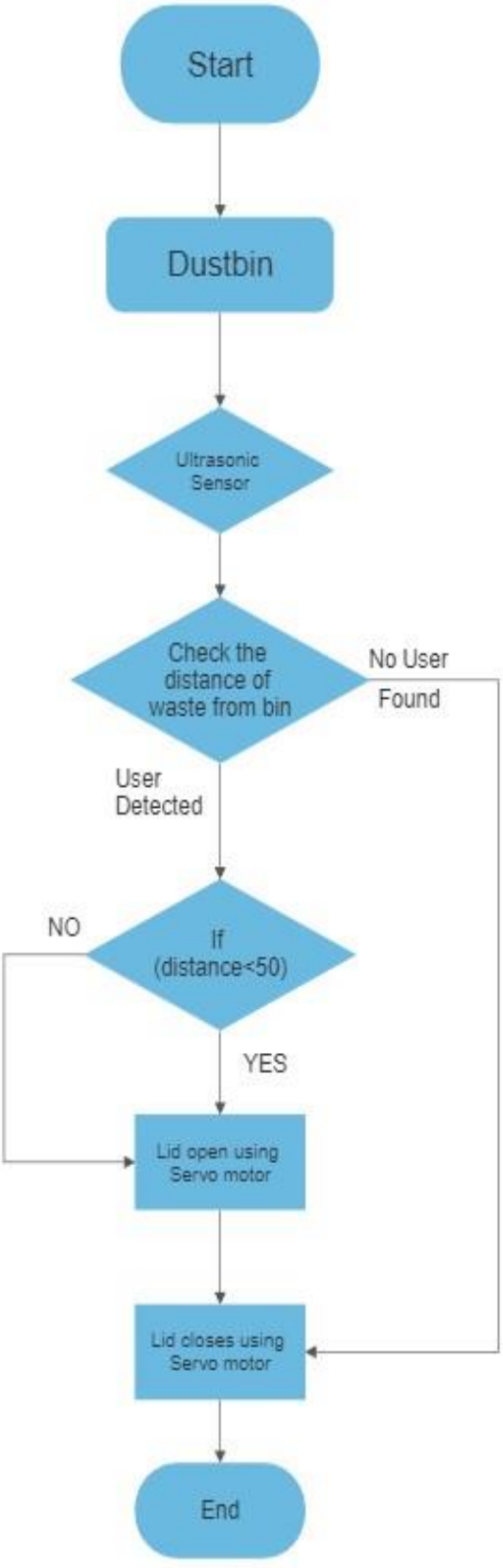

Fig No.02

VII. FEATURES: -

- This project consists of a kit which is detachable and can be easily installed to any normal dustbin to convert into smart dustbin as per user choice.
- The implementation of a smart dustbin can lead to a number of benefits for both the environment and the communities that use them.
- One of the main benefits is a reduction in the frequency of waste collection, which can lead to lower emissions, fuel consumption, and traffic congestion. This reduction is made possible by the fact that smart dustbins are equipped with sensors that can detect when they are full, and only then trigger a waste collection.
- This can help to maintain a cleaner and more hygienic environment, as overflowing waste and unpleasant odors will be reduced.
- Moreover, the implementation of smart dustbins represents a step forward in terms of technology and environmental cleanliness. It shows that communities are willing to adopt innovative and sustainable solutions to help preserve the environment and keep their communities clean and healthy.
- In addition, smart dustbins can also provide valuable data and insights into waste management practices, allowing for more effective and efficient decision-making and resource allocation. This can help to further optimize the waste collection process and reduce waste in general.

VIII. CONCLUSION : -

They won't be any kind of diseases and the people will be fit and are not prone to diseases caused by these waste materials. The mission Swachh Bharat can also be implemented easily. It will take power supply with the help of Battery. Various features such as durability, affordability, prevention against damage and maintenance issues are addressed when these smart dustbins are designed. But since the technology is new in India, proper awareness should be created among the public before it is implemented on a large scale. Otherwise, sensitive devices like sensors might be damaged due to rough action of the users.

IX. FUTURE SCOPE : -

1. Solar Panel can be used for further advancements in smart dustbin.
2. Virtual Server can also be added for monitoring and analysing proposes.
3. As dustbin contains both dry and wet wastes water and dirt proof circuits and setup can be the best solution for long life of kits.
4. Both dry and wet sections can be divided and wet waste can start is fertility process to generate soil fertilizer.

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IoT-Based Smart Agriculture System

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***Abstract* — This research paper discusses the importance of agricultural development to address the issue of hunger due to population growth. The paper highlights the need for a shift in farming practices and the integration of cutting-edge technology in agriculture, such as smart agriculture and IoT-based systems. IoT-based smart farming utilizes sensors and actuators to collect real-time data on soil moisture, nitrogen, ammonia, and phosphorus levels in the soil. This data helps farmers determine the root cause of crop growth disorders and provide appropriate solutions. The goal of the project is to track every motion on the farm and collect and analyze data to provide solutions to farmers to meet the rising demand for food production. Overall, IoT-based smart farming has the potential to bring significant changes to agriculture that were previously unforeseen.**

Keyword – ***Internet of Thing(IoT), Raspberry Pi, Arduino UNO, ESP8266 WiFi module, Soil Npk sensor, GSM Module***

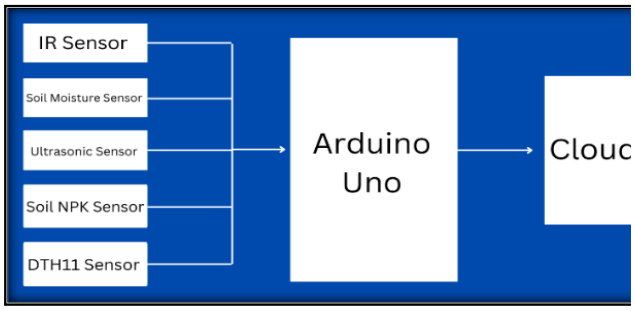
I. INTRODUCTION

The world population is rapidly increasing, and it is becoming increasingly challenging to meet the growing demand for food. India, as a major agricultural powerhouse, could benefit from this by increasing food production and opening up new markets. To achieve this, the use of cutting-edge technology, such as the Internet of Things (IoT), in agriculture is necessary. IoT-based smart farming is a high-tech method that combines connected devices and advanced IoT technology to cultivate crops in a sustainable manner, providing real-time monitoring of farm fields and controlling various parameters such as humidity, temperature, and soil moisture. The goal of our project is to integrate different types of sensors to create an intelligent IoT environment for crop development that will help cultivate the quality and quantity of food grains. This will allow farmers to save time and money and increase productivity while achieving high crop yields. Precision farming, another effective use of IoT in agriculture, is employed in our project to analyse the data supplied by the sensor and respond accordingly, allowing farmers to act quickly on the received information. Overall, our project aims to contribute to the creation of an environment conducive to efficient and sustainable farming.

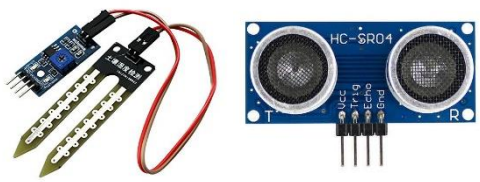
II. PROBLEM STATEMENT

The problem statement of our project includes crop damage by animals such as deer, wild pigs, rabbits, elephants, and monkeys, etc.; the use of ineffective pesticides and insecticides; issues with watering systems, such as low water levels and overwatering; bad soil health; and a lack of nutrients in the soil due to continuous harvesting. These problems can lead to a decrease in crop yield and, ultimately, a loss of income for farmers. To address these challenges, the project proposes the use of IoT-based smart farming technologies, which can help farmers monitor crop health, control pests, optimize water usage, and improve soil quality. The project's primary objective is to create an intelligent IoT environment for crop development that will help in cultivating the quality and quantity of food grains. By integrating various sensors and IoT devices, the project aims to provide farmers with real-time information on crop health and environmental conditions, allowing them to make data driven decisions to improve crop yield and efficiency.

III. METHODOLOGY



To catch animals trespassing in the field, we're going to install some motion detector sensors. These sensors will warn the farmer and sound a loud alarm to frighten the animals and make them flee. We'll also employ ultrasonic animal deterrents. We are also developing an application that will gather information from several farmers across the city on the insecticides and pesticides they use to control various insects and how efficient they are in order to assist local farmers in deciding which fertilizers to use for their specific challenges.



In the other section, we are making a prototype of a smart irrigation system. So, we are building a sophisticated watering system. Before creating our application, we used a few sensors to measure the soil's moisture and humidity levels. As a result, it will start watering the crops on its own whenever they need it. This gadget will also keep an eye on the water levels and let the farmer know if anything changes. We will also combine this approach with weather prediction to avoid overwatering. With the help of the application, the farmer will be able to remotely manage the pump and have total control over the system.

Apart from that, we are incorporating some sensors to detect the proportions of all the nutrients present in the soil that are necessary for crops to develop properly. The pH level will also be detected. We could create a soil health report using all of this information. A farmer could use this report to learn how to use fertilizer to grow crops and get a decent harvest.

IV. LITERATURE SURVEY

The Internet of Things (IoT) is driving the advancement of smart farming, which is revolutionizing the agricultural industry. The integration of IoT technology in agriculture is transforming traditional farming practices into high-tech farming. A variety of research studies have already been conducted on the application of IoT in agriculture. This paper outlines some of the research studies in detail.

One of the studies proposes a soil-based fertilizer recommendation system that utilizes IoT to monitor soil fertility and plant growth based on pH value and moisture content. The authors use an analogue pH sensor kit and appropriate circuitry to estimate soil moisture content. The system is built using an Arduino Uno and includes an ESP8266 WiFi module for real-time nutrient analysis.[1]

Another study proposes a fully automated IoT-based system for monitoring, irrigation, and security in agriculture. The system uses sensors to detect motion and monitor moisture levels and humidity. The water pump, cutter, and sprayer are automatically activated or disabled based on the sensor data. The system also includes sensors in the warehouse for theft and humidity detection.[2]

A Bluetooth-based smart irrigation system is proposed in another study, which connects the farmer's smartphone to a microcontroller for automatic irrigation. The system includes sensors to monitor soil, water, and temperature content and utilizes an LDR to detect light emitted by the AC load.[3]

The final study proposes an automatic irrigation system with rainfall detection that saves water by automating the amount of water required for the field. The system includes an ARM microprocessor and a GSM module to inform farmers about rainfall levels and automatically adjust water irrigation. The

prototype's results show that automation produces the greatest results in terms of water utilization.[4]

V. CONCLUSION

The conclusion of our project highlights the advantages of IoT-based smart farming techniques to improve agriculture productivity and crop yield while reducing human labour. The paper presents different challenges faced by farmers in the agricultural sector, such as crop damage caused by animals, the need for appropriate irrigation, the use of pesticides, and bad soil health. The paper proposes an IoT-based smart agriculture system that uses sensors to detect soil moisture, pH level, and nutrient content and gather information about the most effective pesticides for farmers. The system also includes an automatic irrigation system and a motion detector to detect animals trespassing in the field. By implementing the IoT-based smart agriculture system, farmers can increase their crop yield, save water, reduce the use of harmful pesticides, and ultimately reduce their costs.

VI. ACKNOLEDGEMENT

We'd like to thank our teachers in particular for providing us with the opportunity to work on this fantastic project regarding smart agriculture. They also encouraged us to conduct an extensive study, which enabled us to discover a great deal of fresh knowledge. We are quite grateful to them.

Second, we would like to thank our parents and friends for their significant contributions to the prompt completion of this project.

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Study Of IOT Based Smart Traffic Management System

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***Abstract* — One of the significant challenges faced by major cities today is traffic management. The possible reason for this can be increasing number of vehicles, lack of proper infrastructures, improper roads, growing population etc. Increased accidents and pollution levels has been observed as most common problems in major cities. All this gives rise to the need of IOT based Traffic control system which continuously detects, monitors, and adjusts the timing of traffic signals according to the actual traffic load. This paper describes Study of different methods for controlling and monitoring traffic**

***Keywords — IOT, Smart Traffic Management, Density measurement, Infrared Sensors , traffic congestion, ease of traffic , priority signaling , emergency vehicle*, signal monitoring**

I. INTRODUCTION

Today, Traffic Congestion in modern cities is a serious issue. Traffic congestion occurs due to number of vehicles exceeding the road capacity. Traffic Jams, accidents and increased pollution levels has been observed as most common problems in major cities. Well-Organized traffic management may result into a convenient flow of traffic and may reduce congestions. The existing method of traffic system is outdated in which signals are allotted with specific predetermined timings. Each lanes are allotted Signals with fixed time and the signals switches automatically depending on these fixed timer values. This traditional method is not sufficient enough to meet the requirements of a growing traffic related problems. All this gives rise to the need of IOT based Traffic control system which continuously detects, monitors, and adjusts the timing of traffic signals according to the actual traffic load. On the Other Hand, It has been observed that Emergency vehicles are stuck at lanes due to heavy traffic due to scheduled traffic signal, Which in turn results in delay for the emergency vehicles to move . Emergency vehicles needs to be prioritized before any other vehicles. Delayed arrival of emergency vehicles to destination may cause a problem. So, the lane through which emergency vehicles will be approaching can be made free by halting the traffic light for vehicles in other lanes. This may minimize the delays and help during emergency situations.

The implementation of Internet of Things is a far better alternative Solution in solving the congestion issues that many urban areas are facing today. With the popularity of internet, cities can be more developed to resolve traffic related problems. With the help of Internet of things, the updated system may help resolve many challenges related to traffic daily by predicting the minimum route the vehicles can take, reducing the waiting time, less congestion, reducing travel cost, eliminating the need of Traffic Police., etc. So in order to get rid of all these problems, there becomes a need to implement newer scheme by using sensor based automation technology in the field of existing traffic signaling system.

II. LITERATURE REVIEW

Shashank S [1] Proposes a Time Based Smart Traffic Management system by utilizing camera data, Communication and algorithms. The system focuses mainly on the timings of traffic signal. The primary element used is Camera, which interacts with physical conditions by monitoring the presence and absence of vehicles. These cameras sends data to the processor which processes and analyzes data. Then the resultant data is sent to the controller through the connectivity medium (Wifi , Internet) which makes use of the data collected to perform the Traffic Routing algorithm. System makes use of a database to predict the timing control of the signals. The calculated timings are then compared to the current actual timings of the signal lights. Based on this, the processor then makes the decision. For eg: If the current timings of green signal is less than the calculated timings, the decision is made to increase the timings for green signal otherwise, decreasing the green signal timings.

Priyanka Sharma [2] Proposes a PLC (Programmable Logic Controller) based traffic diversion system to reduce heavy traffic and congestion. The primary aim of this method is to cut down the vehicular traffic to the half by implementing smart traffic control system based on PLC Technology. This method includes sensors which will sense the weight and the data will be fed to PLC. This weight data is then used by the PLC to figure out the route having maximum number of vehicles. The Arduino Board will make the comparison with each routes and will allow the

route having highest number of vehicles to pass through. The weight sensors are placed at key locations under traffic circle which will sense the weight and will send the data signals to PLC. Arduino board compares the data arriving from each route and will check for the higher weight. Using this data the PLC will work accordingly and will halt all the routes except for the route having highest weighted data.

Ninad Lanke [3] Used RFID as a primary element in his method. It consists of: RFID Controller: The RFID controller consists of an RFID interrogator, which is used for the communication with the RFID tag. The interrogator sends data/signals to RFID controller. The controller components send commands and data messages using Messaging Interference. RFID Tag: RFID tags are wireless devices which make use of radio frequency electromagnetic fields to transfer data, which is used for identifying and tracking the objects Controller core is present inside RFID Controller. RFID tags can be installed in each vehicle which stores all information regarding vehicles, vehicle number etc. This will help identify each vehicle uniquely and can be helpful for drivers with some important traffic related messages. The existing signaling system can be combined with the RFID controller. Each signal can contain information about every vehicle that passes by it and thus when a vehicle passes by a signal, the signal automatically keeps the count of the vehicles passing by it, and helps in detecting traffic congestion. Each signal is stored with threshold value for red signal and green signal. The timer can now be dynamically controlled depending on the frequency of vehicles passing the traffic light every second. A minimum value of frequency of vehicles passing by the signal should be stored into the controller of each signal. When this minimum frequency reaches the required value, the controller should command the signal to turn red and thus the signal is controlled dynamically.

R Srinivasan [4] Image processing involves signal processing with photograph or video frame as input and image or characteristic parameters of image as output. An algorithm is developed to control and process the images that are received from the cameras . An image is interpreted as a two- dimensional signal by using standard signal-processing techniques. The binary digital data of image is used to extract relevant information after image enhancement, edge enhancement and brightening . A common architect of traffic control incorporates image acquisition, preprocessing and density calculation and efficient detection of moving objects. To make this system more adaptive and efficient, it is essential to install cameras at every intersection and roadside, which will help regulating timings of traffic lights, analyzing traffic build up from start-point to end-point besides localized congestions, and synchronizing multiple traffic lights aimed at mitigating traffic congestions for free traffic flow over large areas. Development of algorithms for image processing techniques for identification of emergency vehicles for prioritizing their movement will also be beneficial .

Abubakar Muhammad [5] The model proposed in this paper for connecting vehicles to intersection control stations is based on client-server communication. Here, the main control station acts as a server node, while the vehicles act as client nodes. Each vehicle sends job requests to the job queue that need to be processed when it passes through the intersection. These vehicles are equipped with a DBTL (dashboard traffic light). It shows the signal colour on the screen itself as well as the countdown timer. The vehicle enters the communication range of the intersection system, and then it connects to the intersection system. As soon as the vehicle is connected to the interaction system, the communication component issues a request message. The vehicle then waits for a response from the intersection control station. It would get one of two responses: 1) a green light with a countdown timer, or 2) a red light with a countdown timer. 3) A red light with two countdown timers, one for red and one for green. After passing through the intersection, the vehicle will then send an exit message to the intersection control system along with the lane it is currently in.

Harsha. J [6] This paper aims to develop a convenient traffic system that allows a smooth movement of cars which will help build a smarter city. The traffic system currently implemented in many areas is not based on the density of traffic and every road is allotted a preset time. This results in traffic congestion due to large red-light delays and timings allotted for roads in a city that should vary during peak on-off hours, but in reality don't. These traditional systems are not adaptable and fail to support traffic during an unexpected situation or during an accident, and this makes them inefficient. In order to calculate the density of traffic various sensors can be used, each having their merits and demerits.In the proposed system Ultrasound Sensors are used along with Image Processing (using live feed from a camera) that works on a Raspberry Pi platform and calculates the vehicle density and dynamically allots time for different levels of traffic. This in turn allows better signal control and effective management of traffic thereby reducing the probability of a collision. By using Internet Of Things (IoT) real time data from the system can be collected, stored and managed on a cloud. This data can be used to interpret the signal duration in-case any of the sensing equipment fail, and also for future analysis This system uses ultrasonic sensor and image processing and it using raspberry pi to calculate the vehicle density and allots time based on the same

Technological Solution to mitigate Groundwater Depletion

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***Abstract*—Groundwater depletion is a major environmental concern caused by over-extraction of groundwater resources. the Internet of Things (IoT) offers innovative solutions to mitigate groundwater depletion. This paper explores the potential of IoT solutions for groundwater management, including the use of IoT sensors for monitoring water levels, IoT-based activated carbon injection system , and cloud-based water management systems. The advantages and limitations of these solutions are discussed in detail, and the paper concludes with a summary of the findings and recommendations for future research**

Keywords—IOT, activated carbon, groundwater, monitoring, mitigation

I. INTRODUCTION

Underground water mitigation refers to the process of reducing or eliminating the potential harm caused by contaminated groundwater. The use of IoT (Internet of Things) and activated carbon injection are two possible approaches to mitigating underground water contamination.

IoT technology can be used to monitor groundwater contamination levels in real-time. Sensors placed in the ground can gather data about the levels of pollutants, temperature, and other factors that can affect the quality of groundwater. This data can then be transmitted to a central database where it can be analyzed and used to determine the best course of action for mitigating the contamination. Activated carbon injection is another approach to mitigating groundwater contamination. Activated carbon is a form of carbon that has been treated with oxygen to make it highly porous and highly effective at absorbing contaminants from liquids. By injecting activated carbon into the contaminated groundwater, the carbon can remove pollutants from the water, thus reducing its contamination levels. This method can be used in conjunction with other remediation techniques to achieve the desired level of contamination reduction.

II. EASE OF USE

Underground water mitigation using IoT and activated carbon injection involves several steps:

A. Site Assessment

A site assessment is carried out to determine the extent of groundwater contamination and to identify the source of the contaminants. This assessment also helps to determine the appropriate technologies to use for mitigation.

B. IoT Monitoring

IoT sensors are placed in the contaminated area to monitor the levels of pollutants in real-time. The sensors transmit data to a central database where it can be analyzed and used to determine the effectiveness of mitigation efforts.

C. Data Analysis

The data collected by the IoT sensors is analyzed to determine the levels of contamination and to identify trends in the contamination levels over time. The data can also be used to determine the areas that require more attention and the areas that have reduced contamination levels.

D. Activated Carbon Injection

Activated carbon is injected into the contaminated groundwater to remove pollutants from the water. The injection process can be done using a network of wells or by injecting the carbon into the contaminated aquifer directly. The activated carbon attracts and binds to the contaminants, reducing their concentration in the groundwater.

E. Continual Monitoring

The process of monitoring and mitigating groundwater contamination is ongoing, and regular monitoring is required to ensure that the contamination levels remain low and that the groundwater remains safe for use.

F. GPS-based Groundwater Management

GPS technology can be used to create detailed maps of groundwater resources, including their locations, depths, and quality. Such maps can be used to identify areas of high and low groundwater levels, monitor changes in water quality, and locate areas where groundwater is being over-

extracted. This information can help policymakers and groundwater managers make more informed decisions about groundwater management.

III. MANAGEMENT SOLUTIONS AND CHALLENGES

Treatment can often solve depletion due to quality considerations, while volumetric depletion can only be mitigated by reducing discharge or increasing recharge. Recharging of treated municipal wastewater and stormwater has been effective in restoring groundwater levels. In the coming years, the utilization of improved infiltration and recharge techniques is expected to increase, enabling better capture of runoff and treated wastewater[6].

To conserve groundwater, reducing the use of pumps can be achieved through various methods such as administrative, legislative, or management controls, and also by providing economic incentives to lower demand. It is crucial to implement measures that effectively reduce water usage. For instance, in agricultural regions, improving efficiency can be attained by lining irrigation canals to minimize seepage.

A. Optimization techniques

Optimization techniques can be utilized to place pumping centers strategically, with the aim of increasing withdrawals while mitigating adverse impacts such as stream depletion and well interference. This could prompt future water managers to establish appropriation zoning or mandate well permits that set varying allowable pumping rates based on factors like hydrogeologic properties, proximity to boundaries, and unit responses of surface water[6].

B. Lack of awareness:

- Many people do not understand the importance of groundwater or the impact of their actions on groundwater resources. This lack of awareness can lead to over-extraction and contamination of groundwater..

- Groundwater is often extracted at a rate that exceeds its natural replenishment rate. This leads to a decline in the water table and a reduction in the volume of available groundwater.

- Changes in precipitation patterns and rising temperatures can have a significant impact on groundwater recharge rates. This can result in decreased groundwater availability in some areas and increased salinization of groundwater in others..

C. Irrigated System

The utilization of GRACE (Gravity Recovery and Climate Experiment) satellites has sparked significant interest in monitoring changes in groundwater storage at the basin level, as they offer continuous global coverage and complement long-term water-level monitoring and regional hydrologic modeling. GRACE satellites gauge changes in total water storage, which are then utilized to estimate variations in groundwater storage (GWS) by subtracting changes in snow storage (snow water equivalent) obtained from the Snow Data Assimilation System, surface water monitored via reservoirs, and soil moisture derived from Global Land Data Assimilation System models[8].

In many areas, there is limited monitoring and regulation of groundwater use for irrigation. This can lead to unsustainable levels of extraction, particularly in areas where groundwater recharge is slow or limited.

In addition to depletion, irrigation systems can also contribute to groundwater contamination through the use of fertilizers, pesticides, and other chemicals. This can further reduce the availability of usable groundwater resources.

Biotransformation was enhanced by injecting methane and oxygen-containing groundwater in alternating pulses into the zone of contamination in the subsurface. These field experiments have demonstrated that microbial transformations observed in the laboratory can be promoted in-situ in the field when proper conditions are observed.

D. Some Common challenges

- Lack of regulations: In many areas, there are few regulations in place to manage groundwater resources. This can lead to over-extraction and contamination, as well as conflicts between different users of the resource.

- Data limitations: There is often a lack of data on groundwater resources, including the amount of water available, recharge rates, and the location and extent of aquifers. This can make it difficult to manage groundwater resources effectively.

- The reallocation of water resources is expected to play a significant role in managing groundwater in the future. Methods such as water markets, leasing, and trading can transfer limited water from lower to higher productivity sectors, offering an alternative to further depletion. However, to ensure fairness and minimize damages, rules must be established for effective reallocation[6].

- Lack of Adequate Data: One of the major challenges in groundwater depletion management is the lack of adequate data. In many regions, there is a lack of data on groundwater availability, usage, and recharge. Without this data, it is difficult to develop effective management strategies.

- Complex Hydrogeology: Groundwater management is complicated by the complex hydrogeology of many regions. Groundwater is often stored in complex geological formations, making it difficult to accurately estimate the volume of available water.

- Land use change: Changes in land use, such as urbanization and deforestation, can affect the infiltration of water into the ground, leading to reduced groundwater recharge.

- Reallocation of water resources between economic sectors offers possibilities to enhance conjunctive use[6].

- Complex Hydrogeology: Groundwater management is complicated by the complex hydrogeology of many regions. Groundwater is often stored in complex geological formations, making it difficult to accurately estimate the volume of available water.

IV. GROUNDWATER DEPLETION AND GLOBAL CLIMATE CHANGE

The depletion of groundwater over the past century has resulted in a significant volume of water that cannot be accounted for by increases in other sources of water storage such as soil, natural channels, lakes, or the atmosphere. This suggests that the missing groundwater has likely made its way to the oceans, contributing to sea-level riseIn fact, the amount of groundwater depletion from the High Plains aquifer alone is estimated to account for about 0.5% of the observed sea-level rise during the 20th century. While reducing future groundwater depletion and increasing storage may only have a small impact on sea-level rise, it is still an important step towards mitigating its effects.[5].

A. Depletion of groundwater

In certain semi-arid and arid areas, the depletion of groundwater resources may lead to a similar decision as made by Saudi Arabia to abandon the goal of irrigated agriculture for grain self-sufficiency due to the unsustainability of groundwater mining. In contrast, other regions may choose to continue large-scale water transfer projects to maintain activities and populations that rely on or benefit from groundwater depletion, even if this results in environmental impacts in the water-exporting basin[9].

In the past, when faced with floods and droughts, society has typically responded by constructing dams to impound surface water and release it as needed. However, due to a lack of suitable locations for new dams and increased awareness of their negative ecological impacts, this response may be hindered in the future, despite the predicted increase in frequency and intensity of hydrologic extremes. With long-term temperature rises, the need for water storage will also increase to distribute water over longer dry seasons. One potential solution is to use excess runoff to artificially recharge depleted aquifers, effectively transforming them into underground "reservoirs" that can supplement the flood- and drought-buffering capacity of existing surface-water reservoirs[9].

B. Impacts/Effects of Pollution

the impacts/effects of pollution on the Earth include environmental deterioration, impacts on the health of living organisms, global warming, depletion of the ozone layer and reduced efficiency or infertility of farm lands and crop fields. Few of the impacts/effects of pollution are discussed below.

The hydrologic systems around the world will be significantly impacted by global climate change. Melting glaciers and rising ocean temperatures will cause sea levels to rise. On land, there will be an increase in the frequency and severity of both floods and droughts, and higher temperatures will lead to a reduction in winter snowpack and accelerate spring snowmelt from mountainous regions. Unrestricted depletion of groundwater can further worsen the effects of these changes. Conversely, regulated management of groundwater depletion can help mitigate the impacts of climate change [9].

The most common pollution sources are the anthropogenic ones. This category generally includes: disposal of wastewater and solid waste, disposal of industrial wastewater, use of fertilizers, pesticides and insecticides, disposal of by-products and waste from mining activities and nuclear energy waste. Anthropogenic sources can be caused by different activities such as over-pumping, unlimited use of fertilizers, mining activities, waste dumps, extended urban development, change of climatic conditions (microclimate), misuse of chemicals, disposal of organic and inorganic elements, heaps and sewage storage, river network interruption, mineral processing of radioactive minerals and cemeteries.

C. Figures and Tables

a) pollution sources as a result of origin could be natural or anthropogenic, geometry of the source could be point source (landfills, waste dumps, septic tanks, underground tanks), linear (roads) and diffused (nitro pollution, acid rain, uranium decay) while the transmission rate represents continuous and recurrent transmission of pollutant.

Industrial wastewater refers to wastewater from various industries, excluding the wastewater from the staff facilities and is another point source of groundwater pollution. This type of wastewater is a result of the water used in the industrial processes, which contains various compounds in low or high concentrations, both biological (e.g., wastewater of the food industry, paper industry and textile treatment) and non-biological (wastewater of the chemical industry containing pollutants such as acids, bases, chlorine, metals, cyanide, salts, hydrocarbons, phosphates). Compared to municipal wastewater, industrial wastewater contains some toxic substances and presents difficulties to effective treatment.at the present time, there have been only a limited number of studies that have transferred laboratory experiments to field situations. In one study, coal tar chemicals, many of which were polynuclear aromatic hydrocarbons (PAH) were being mineralized in-situ by microorganisms adapted to PAH waste

ACKNOWLEDGMENT *(Heading 5)*

Groundwater resources are vital for human life and health, societal development and the preservation of the natural ecosystems. Quality degradation of groundwater bodies as a result of pollution represents a major worldwide issue. Various and multiple sources of groundwater pollution have been identified which include a series of both natural and anthropogenic sources. Human activities such as over abstraction, insufficient wastewater treatment, disposal and industrial activities and use of fertilizers in agriculture represent the main sources of groundwater contaminants. Seawater intrusion is another source of groundwater pollution which results in the salinity increase in coastal groundwater bodies and makes them inappropriate for use as drinking water.

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Abstract: The student tracking system is a web-based application. Currently in schools and college teachers track the student's learning based on the report cards which is very common procedure to know about students' academic. And also, it is impossible for teachers to know about every student and find out the best in child. Students thar are not good at academics can be good in co-curricular activities and being good in academics is not the only way ahead. Hence there is a need for a solution to track all activities of a student including the academic and extra activities to keep track on student overall progress. Based in students' data, it become easy to guide the student to reach the goal and providing the feedback that can enhances his/ her skills. The aim of this project is to develop a web-application to solve the problem faced by student, parents and teachers by providing better recommendation to student and helping teacher and parent to know about the child's progress.

Key Words: Web-app, objectives, growth tracking, student data

I. INTRODUCTION

With an advance of the technology, student progress tracking has emerged as a useful tool for parent, students and teachers. These systems provide real time performance of student allowing for timely intervention and support. This system is a digital platform that collect, stores and present information about student academic progress. The system allows user to tracks his progress over time, identify area of strengths and weakness, available activities conducted by institute, remaining task and deadlines and make informed decision about student education. Web-based student progress tracking system provide numerous advantages over paper-based system. They allow real time update and easy accessibility anywhere anytime. These systems generate automated reports and identify area where support may be needed. By using this Student tracking Performance, it will eliminate parents and teachers time and distance constraint of monitoring their children ***Abstract*** progress and help student to evaluate their actions making necessary improvement.

II. LITERATURE REVIEW

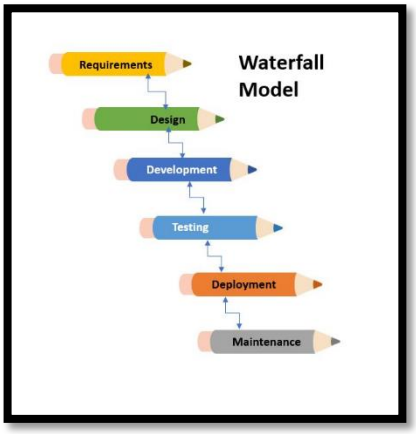
Literature review of student tracking systems using web-based technology can provide insights into the effectiveness and challenges of using technology to track student progress.

Studies have shown that web-based student tracking systems have the potential to improve educational outcomes by enabling teachers to regularly monitor student performance and provide timely feedback. These systems can also support data-driven decision making by providing insights into areas where students are struggling and where additional support may be needed. There have also been concerns about the accuracy and reliability of student data in web-based systems, as well as the security and privacy of student data.

Overall, the literature suggests that while web-based student tracking systems have the potential to support student learning, they should be used with caution and in conjunction with other educational approaches that promote student-centered, collaborative, and creative learning. It's essential to ensure that these systems are designed to meet the needs of diverse students, respect student privacy, and support high-quality education. There are a lot of advantages that we can get through the use of a mobile application. As for my project that focusing on education, there are several benefits that involve in those fields such as the students can learn without any boundaries. The mobile application helps the students easily to access the information on different subjects at anytime and anywhere. They also can check their exam schedule, their results for the examination and they also keep in touch with their teachers to discuss their problems regarding their studies. Meanwhile, the parents also get to track their children's performance using this mobile application. Indirectly, both parents and teachers can keep on track their child's and students' performance. Besides, this system application also can encourage students to study and learning. Based on the study, the use of mobile and web application helps students' study more efficiently and they can perform better in the class application is more interactive ways to stimulate students mind rather than use traditional methods likes using the textbooks and whiteboard for teaching. Nowadays, internet is used widely in our daily life. Most of the people had a gadget that was used to connect with each other, get to know the news about what really happens at their surroundings and this gadget also provides an easy way for the teachers to assist and encourage the students for learning. This application is being made keeping the student consent in mind. Many times, student prefer external courses that cost them money. With the help of this system teacher can give students the respective and necessary courses that a student shall do to complete its certification and to meet institute demand as well. This will help the student to make the certifications and strong skill building in their core knowledge field which further helps to build a good resume.

III. METHODOLOGY

The waterfall model of the System Development Life Cycle (SDLC) is used in this project. This model consists of five phases which are starting from the Requirement, Design, Development, Testing, Deployment, Maintenance. The potential requirements of the application are analyzed. This phase involves understanding the needs and goal and identifying the functional and nonfunctional requirement of system. The second phase is the design which is the interfaces. In this phase, the architecture and design of system is determined, including the system component, data structure, user interface and navigation. The third phase is implementation where the developments of the project begin. The actual software development takes place, including coding, testing, debugging, and fixing any issues. The fourth phase is testing to ensure that the system meet requirement and work an expected. These include functional testing, security testing. Once the system is tested and verified to be working, it is deployed to production making it available to the user and followed by the last phase, which is maintenance where any problems that occurred in the testing phase will be solved and updating of software will be done. All of the phases in the Waterfall model must be completed before the next phase can be proceed. Below diagram shows the diagram of the Waterfall System Development Life Cycle.



1.Waterfall Model

The requirement phase is the base for completing the project. This phase is where the initiation of the project occurs. In this project, hardware and software requirements are needed. Hardware requirements for this project are laptop. Software requirements for this project are python, HTML, CSS, EXPRESS, REACT,

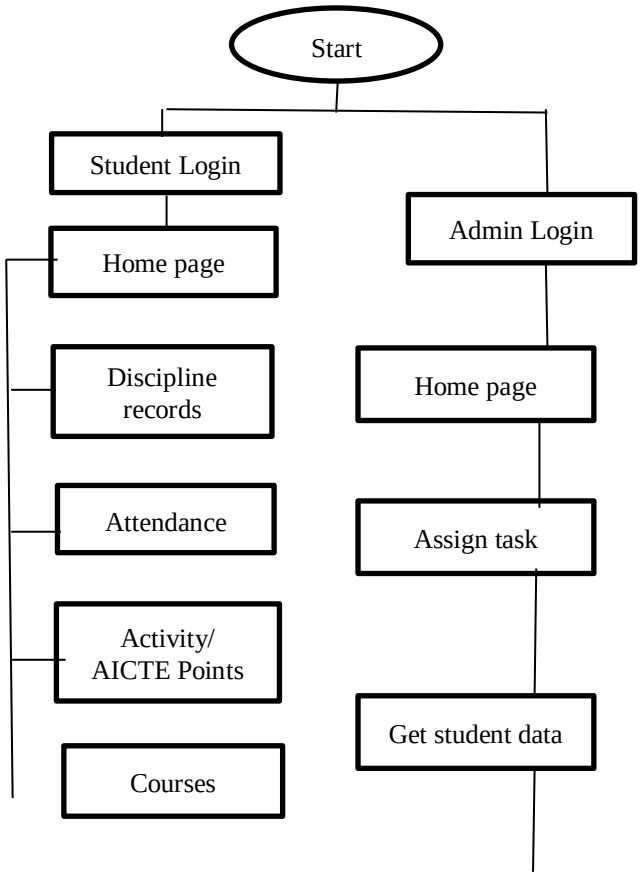
NODE JS and PHP for the database. This helps in data collection and later the data is used for analysis purpose to create the outcome. Design is able to help in specifying project requirements and hardware, which help in determining overall system architecture. The project is developed based on a specific design from the previous phase. Testing is done in small units where each unit is tested to measure the performance of the building web application. After testing each unit is done, the units are integrated into a system.

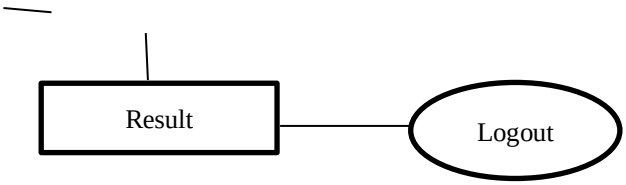
The designated project needs to go through continual testing to detect any errors or flaws. After the continual testing, the

installation of the project takes place in the cloud. The modification and adaptation process for the project to improve the performance takes place in this phase. The maintenance may occur by the request of client.

IV. PROTOTYPE DESIGN

Based on the user requirements gathered, the development of Student Tracking SYSTEM is to develop an application that can provide two ways communication between student and teachers. Furthermore, it also acts as monitoring tool for parents of their children's academic performance. Parents can view their children's examination records, discipline records, attendance records and weak and strong area of their children. Below shows the flowchart of the Student Performance Tracking





FLOWCHART STUDENT TRACKING SYSTEM

The figure above shows the flow of web application from the user login until the user logout from the application. Every time the user starts this application, the first screen that will be seen is the Login page. User need to insert a username and password. For student page, On the Main menu page, there are multiple options which are Examination Result, Attendance Record, Discipline Record,

Activity Hours, AICTE points. The Examination Result button will navigate the user to the examination records sorted by subjects or examinations and the user will choose between these two to view their children's examination records. The Attendance Record button will navigate the user to them attendance records where it is updated by their children's class teacher. The Discipline Records button will navigate the user to their children's discipline record and the same as the Attendance Record page. Course is place that will address the student with multiple workshop and certification courses that can help student to build strong resume. AICTE points and activity hour section will consist of the event conducted by the college and student has to make sure to acknowledge the events attended by them in order know the amount of time they need to spend in completing hours. Student can track their activity regularly and even teachers and parent can track student activity. In a similar way, teachers can use the system to explore the factors, which will influence the student behavior. Here are some educational big data research topics: Is there a relationship between the family economics and the student academic performance? For example, if a student has abundant working experience, will he/ she be able to find the job easily? Is there a relationship between the certification and the career development? Which course has helped the student most in getting job? Is there a relationship between GPA and getting job? etc.

V. Conclusion

This paper explains about the problems that faced by teachers regarding their student academic performance at the school because the teachers does not have enough time to monitor every student. So, this proposed application was developed to help teacher solved their problems and provide student perfect guidance. A tracking system on student development would be an ideal instrument. Ordinary database software can only

achieve functions like query and input. Database cannot achieve the exploration of correlation. This data generated by student can also be exported from the database specialized tools of data analysis such as R or Python can be used to produce analysis on vast scale to encounter the behavior of student. In conclusion, educational big data has lots of potential significances which are of great importance to university administrators and students, for it is the precious resource to elevate working and learning efficiency. Our hope is that we can integrate results of correlation analysis to the tracking system of student development and provide more guidance and help for teachers and students.

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Fog Vision System for Road and Rail

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***Abstract*-A state-of-the-art system called the Fog Vision System is designed to increase visibility for road and rail traffic during foggy weather. In order to improve safety and lower the risk of accidents, this system uses a mix of sensors and cameras to identify the presence of fog and present drivers or train operators with real-time visuals. The technology connects with other safety technologies as well to offer a complete remedy for foggy driving circumstances. This cutting-edge technology is intended to increase visibility for road and rail traffic during foggy weather. This technology uses sensors and cameras to detect fog and give drivers or train operators real-time visuals, improving safety and lowering the likelihood of accidents. The technology is also connected with other safety measures to offer a complete remedy for moving through dense fog.**

I. INTRODUCTION

The use of advanced driver assistance systems (ADAS) has increased. In reality, this idea is currently frequently used in applications that are added to cars as extras to increase comfort and safety while driving. Applications of this type include automatic cruise control, automatic beam switching on and off, and parking assistance. In order to decrease expenses and increase intelligence, computer vision is crucial in the development of these systems. There are various ADAS issues that need to be resolved using computer vision technologies. One of these issues is the difficulty in detecting fog, which is influenced by the weather (cloudy, foggy, wet, sunny, etc.) and lighting circumstances Since fog prevents ADAS from functioning effectively, automatic fog detection can be very helpful in turning these systems on and off. Because it depends on unknown factors including depth, weather, and lighting conditions, fog detection is a difficult problem. If only a black-and-white on-board camera is employed or real-time computing is required, the problem is under constrained. Without considering real-time constraints, numerous approaches have been proposed in the literature that use multiple images or extra information. The Fog Vision System is a device designed to enhance visibility for road and rail traffic during foggy conditions. It combines sensors and cameras to detect the presence of fog and provide the driver or train operator with real-time views. The technology helps to boost safety and lower the danger of accidents by enabling a better vision of the road or track ahead, especially in dense fog. The technology can also be integrated with other safety systems, such anti-lock brakes and controlled slowing, to boost overall rail and road transport safety.

II. SWOT ANALYSIS

A SWOT analysis would look at the strengths, weaknesses, opportunities, and threats of a fog vision system for road and rail transportation. The following is an example of a SWOT analysis:

1) Strengths:
1. Increased safety: A fog vision system can make objects and obstacles more visible to train operators and drivers in low-light situations, lowering the chance of accidents.
2. Improved efficiency: By assisting train operators and drivers in making wiser decisions, the technology enables quicker and more effective travel.
3. Cost Saving: Fog vision systems can help save money on repairs, insurance, and missed productivity by lowering the amount of accidents.

2) Weakness:
1. Technical challenges: Creating a dependable and efficient fog vision system can be technically difficult, particularly when it comes to assuring precise object recognition in real-world scenarios.

2. High cost: Manufacturing and implementing a fog vision system can be costly, especially if new hardware and software must be installed.
3. Possibility for malfunctions: A fog vision system is prone to errors and other technical issues, which can lessen its efficiency. This is true of any complicated system.

3) Opportunities:

1. Growing market demand: Demand for solutions that boost safety and efficiency is projected to rise as the world's population keeps expanding and more people depend on the roads and trains for transportation.
2. Integration with other systems: Fog vision systems can be integrated with other systems, such as advanced driving assistance systems (ADAS), to give users numerous benefits.
3. Extension into new markets: The technique could be modified for use in different contexts, such as aviation, where weather conditions frequently affect visibility.

4) Threats:

1. Competition: Similar solutions from other businesses could cut into the market share and profitability of the fog vision system.
2. Rules and standards: The adoption and use of the fog vision system may be impacted by modifications to the rules or specifications governing road and rail transportation.
3. Technical developments: The fog vision system may become obsolete due to the quick pace of technology change, necessitating ongoing investment to stay up with new improvements.

To sum up, a SWOT analysis of a fog vision system for road and rail transportation can assist in identifying the major difficulties and opportunities faced by such a system, offering crucial information for development and implementation.

III. STEEP ANALYSIS

A STEEP analysis would look at the social, technological, environmental, economic, and political issues that might have an impact on the creation and application of a fog vision system for road and rail traffic. The following is a possible STEEP analysis:

1) Social:

1. Customer preferences: A fog vision system's marketability and demand may be affected by the choices and attitudes of consumers.
2. Public awareness: A fog vision system's adoption and use may be influenced by public knowledge of its advantages.
3. Public worries: The design and rollout of the system may be driven by public worries about security and privacy.

2) Technological:

1. Advancement in Technology: Technological developments can have an impact on the creation and efficacy of a fog vision system in fields including artificial intelligence, computer vision, and sensors.
2. Competition: The amount of rivalry between businesses creating comparable solutions can affect the development and success of the fog vision system.

3) Environmental:

1. Climate change: Climate change may increase the need for a fog vision system due to changes in weather patterns and an increase in the frequency of foggy conditions.

4) Economic:

1. Market demand: The level of demand for a fog vision system may have an impact on its profitability and commercial success.
2. Cost of development and deployment: A fog vision system's viability and competitiveness may be impacted by the cost of developing and deploying it.
3. Economic expansion: The economy has an effect on the system's level of funding and investment.

5) Political:

1. Government funding: The amount of government funding made available for the creation and application of a fog vision system may have an effect on its development and effectiveness.
2. Transportation laws: The adoption and use of the fog vision system may be impacted by laws and standards for air, land, and rail transportation.
3. Trade policies: Foreign trade agreements and policies may have an impact on the supply of the system's component parts and materials.

III. MICRO MIND MAP

You can organise, arrange, and brainstorm thoughts with the use of a mind map. It begins with a main notion and then digresses into relevant side issues. The following is a written description of a micro mind map for a rail and road fog vision system:

Fog Vision System for Road: To ensure visibility on the road in foggy conditions, a Fog Vision System can be used - it consists of sensors such as cameras, LIDAR, radar and more. Edge devices allow for data processing and analysis in real-time, while network connectivity ensures secure and reliable data transmission. Data storage and analysis is done via cloud computing, algorithms, and machine learning models. This is accompanied by a user interface (web or mobile app) to control the system, with added security through encryption, access control, and audit trails.

IV. EMPATHY MAP

A tool for comprehending the ideas, emotions, and actions of a specific group of individuals is an empathy map. An empathy map for a fog vision system for road and rail is described in writing here: Road users might be wondering if this system will make their commute safer, while rail passengers may be curious as to how this system could improve their rail experience. Meanwhile, operations personnel are likely wondering how this system can help them better manage and maintain the road/rail network. Feelings around these questions could range from relief and satisfaction to skepticism among road users, excitement or optimism to concern among rail passengers, and confidence or challenge to overwhelm among operations personnel. Behaviors in response might include the willingness of road users to use the road network more frequently or avoidance of it, increased use of the rail network or switching to other modes of transportation by rail passengers, and adoption and use of the system, seeking additional training and support, or resistance to change by operations personnel.

V. AFFINITY MAP

When it comes to developing a fog vision system for roads and railways, an affinity map can be extremely helpful. It's essentially a diagram or graphic representation which shows the connections and interactions between various system components. With its assistance, making design decisions, discovering bottlenecks and optimizing the system architecture become easier. The map includes info such as data flow, communication protocols, computing distribution and storage systems in order to help you make the best of the resources available and efficiently distribute workloads - ultimately improving the performance, reliability and scalability of your system.

VI. APPENDIX

Appendix A: Technical Details of the Fog Vision System:

1. Sensors: The Fog Vision System takes advantage of a mix of sensors, namely ultrasonic, radar, and lidar, to detect fog and ascertain its density in real-time.
2. Cameras: High-resolution cameras are also incorporated in the system to render real-time visuals of the route or track ahead. These cameras are powered by cutting-edge image processing algorithms to render clear images even in dense fog.
3. Integration with Other Safety Systems: This system can be combined with other safety systems like anti-lock brakes and automatic slowing down to give an all-encompassing solution for foggy weather conditions when it comes to transportation.
4. User Interface: Drivers or train operators have access to a user-friendly interface which allows them to view real-time images and obtain warnings should visibility be reduced.

Appendix B: Benefits of the Fog Vision System:

Visibility Improvement: The Fog Vision System offers clear visuals of the path ahead, even in dense fog, bettering visibility for drivers or railroad operators and diminishing the likelihood of accidents.

Increased Security: This system is designed to empower overall safety in foggy weather conditions by providing up-to-date information and warnings to drivers or train operators.

Compatibility with Other Safety Features: The Fog Vision System is able to be combined with other safety systems, such as anti-lock brakes and automatic slowing, to generate a comprehensive plan for foggy weather conditions in transportation.

User-Friendly Graphical Interface: The system comes with a straightforward graphical interface for drivers or train

operators, which makes use and comprehension simple.

Appendix C: Conclusion

The Fog Vision System is a cutting-edge technology that has been devised to enhance visibility in road and rail transportation amid foggy weather. This system functions by combining sensors and cameras, which can identify the presence of fog and also supply real-time images to drivers or train operators to heighten safety levels and reduce the chances of accidents. Moreover, it integrates with other safety systems for a comprehensive approach for transportation during foggy conditions, rendering it an indispensable technology for road and rail transportation in the future.

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TELE-MEDICINE AND TELE-SURGERY

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Abstract*— Telesurgery uses wireless networking and robotic technology to allow surgeons to operate on patients who are distantly located. This technology not only benefits today's shortage of surgeons, but it also eliminates geographical barriers that prevent timely and high-quality surgical intervention, financial burden, complications, and often risky long-distance travel. The system also provides improved surgical accuracy and ensures the safety of surgeons. In this paper, we describe the current trend of telesurgery's innovative developments and its future.

I. INTRODUCTION

A popular teaching strategy in recent years is project-based learning (PBL). PBL places a strong emphasis on practical, real-world problem-solving exercises that let students experiment with and put what they have learned to use. The method is intended to give students a deeper comprehension of the subject matter and to help them improve their communication, teamwork, and critical-thinking abilities. One important aspect of PBL is the use of various analytical tools such as STEEP analysis, mind maps, empathy maps, and affinity maps. STEEP analysis, for instance, is a tool that allows students to examine the Social, Technological, Economic, Environmental, and Political factors that influence a situation or decision. This analysis provides students with a comprehensive understanding of the context in which a problem exists and helps them to develop creative solutions that consider multiple perspectives. Mind maps, on the other hand, are visual tools that can help students brainstorm, organize, and structure their ideas. They allow students to capture the relationships between different concepts and to see the big picture of the problem they are trying to solve. Empathy maps, on the other hand, are used to understand the experiences, thoughts, feelings, and actions of a particular person or group. This tool is important in PBL as it helps students to understand the perspectives of different stakeholders and to develop solutions that take into account the needs and concerns of all parties involved. Finally, affinity maps are employed to classify and arrange data, ideas, and concepts. Finding patterns, connections, and similarities between the elements being mapped is the goal. This application makes it simpler for students to concentrate on the most crucial elements of their projects by assisting them in synthesizing information and prioritizing activities.

II. STEEP ANALYSIS

A STEEP analysis of real-time fire detection monitoring devices would involve evaluating the following five aspects:

A. Social

Increased demand for minimally invasive procedures: As people become more aware of the benefits of minimally invasive surgery, demand for tele-surgery systems like the Da Vinci system is likely to increase.

Changing demographic trends: An aging population and an increase in the number of people with chronic conditions may drive demand for tele-surgery systems, as these systems can help to reduce the risk of complications and speed recovery times.

B. Technological

Advancements in surgical robotics: The Da Vinci System leverages cutting-edge surgical robotics technology to perform complex surgeries. Continued advancements in this technology will help to increase the efficiency and accuracy of tele-surgeries.
Integration with other medical technologies: The Da Vinci System may be integrated with other medical technologies, such as medical imaging and data analytics, to improve surgical outcomes and reduce the risk of complications.

C. Economic

Cost-effectiveness: Tele-surgery systems like the Da Vinci System are becoming increasingly cost-effective, which may help to increase their adoption.
Reimbursement policies: Reimbursement policies for tele-surgeries may impact the adoption of the Da Vinci System. In some countries, tele-surgeries may not be covered by insurance, which could limit their use.

D. Environmanetal

Energy efficiency: The Da Vinci System is designed to be energy-efficient, which can help to reduce its environmental impact and lower costs.

Waste reduction: Tele-surgeries performed with the Da Vinci System generate less waste than traditional surgeries, which can help to reduce the environmental impact of surgery.

E. Political

Regulatory approval: The Da Vinci System must be approved by regulatory agencies in each country where it is used. The approval process can be lengthy and may impact the adoption of the system.

Healthcare policies: Healthcare policies and regulations in each country may impact the adoption of tele-surgery systems like the Da Vinci System. Policies that support the use of tele-surgery systems may help to increase their adoption, while policies that limit their use may limit their impact.

III. MIRO MIND MAP

You can organise, arrange, and brainstorm thoughts with the use of a mind map. It begins with a main notion and then digresses into relevant side issues. My miro mind map has several branches, including types of telesurgery, robotics in telesurgery, its utilization, IoT in telesurgery, and benefits.

A. Types Of Tele-Surgery

There are three types of tele-surgery:

- Telepresence: Use of virtual reality technology.
- Telerobotics: It includes two types of surgeries, Microsurgery and Macrosurgery. These help in major surgeries done by robots.
- Telementoring: Provides real-time guidance and quick assistance.

B. Robotics in Tele-surgery

Robotics in health-care can assist in remote patient monitoring and allow specialists to consult on cases in rural hospitals.

For example, Autonomous tele-health robots can navigate to patients in hospital rooms, allowing clinicians to interact with patients from afar.

C. Utilization

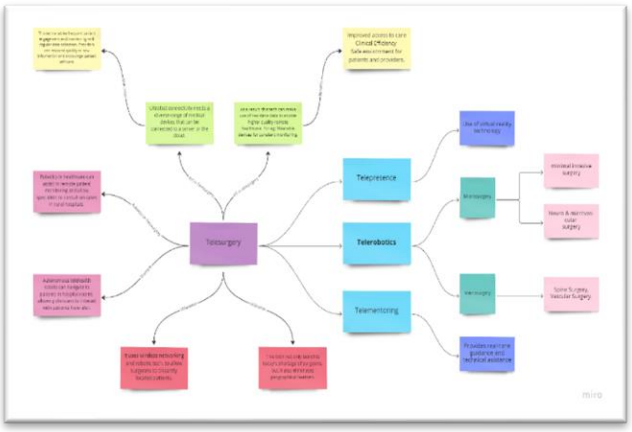
It uses wireless networking and robotic technology to allow surgeons to patients who are distantly located. This technology not only benefits today's shortage of surgeons, but it also eliminates geographical barriers.

D. IoT in Tele-Surgery

Ultrafast connectivity needs a diverse range of medical devices that can be connected to a server or the cloud. As a result, this tech can make use of real-time data to enable higher quality remote healthcare. For example, wearable devices can be used for constant monitoring. The main idea behind this technology is that this technology enables frequent patient engagement and monitoring with regular data collection. Providers can respond quickly to new information and encourage patient self-care.

E. Benefits

- Improved access to care.
- Clinical Efficiency
- Safe environment for patients and providers.



IV. EMPATHY MAP

An empathy map is a tool that helps to understand the thoughts, feelings, and needs of a specific user or customer. When filling in an empathy map for a person who would be using telesurgery should aim to capture the following information in each of the four quadrants:

A. Thoughts:

In this quadrant, list the user's thoughts and perceptions about telesurgery, their health, and the device. For example, I think that the telerobots should be given small cases just to decrease the workload of the surgeons. This implies that the doctors these days are being burdened with the rise in number of patients and diseases day by day, just so as to relieve their stress and pain they should be assisted by some telerobots. These robots should be configured in such a way that they should be able to take out a solution for small-scale cases.

B. Feelings:

In this quadrant, list the emotions the user experiences related to telehealth, their health, and the device. For example, I feel that telesurgery should be given a boost to our society to solve major problems in our society. This will not only reduce our doctor's workload but it will also help improve our society (upliftment).

C. Hear

In this quadrant, list the user's needs and wants related to telehealth, their health, and the device. For example, The technology in this should be worked upon and major changes should be made. Telerobots made should be trustworthy to deal with any patient. The AI should be so strong that the doctors should be capable to give the patients control that means full trustworthy control to the telerobots.

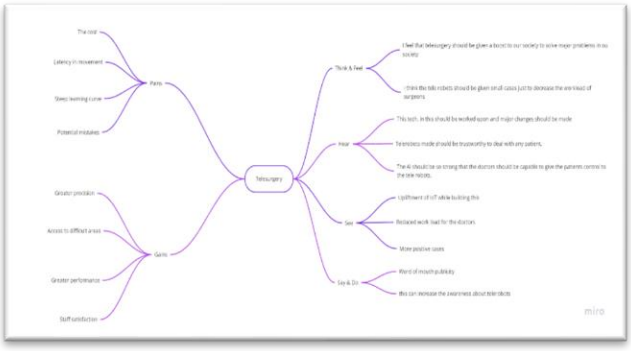
1.1. D. See

In this quadrant, list the user's vision and wants related to telehealth, their health, and the device. For example, upliftment of IoT while building this, this means that while this whole development of telesurgery

was happening the publicity of IoT was working at full fledged rate. Reduced workload of the doctors and more positive cases. This means that the mistakes which were caused due to lack of concentration of the doctors have been reduced at a great span with the introduction of this technology to the society. Thus, this proves that this technology is dependable to some extent.

1.2. E. Actions:

In this quadrant, list the actions the user takes to address telesurgery, their health, and the device. For example, word of mouth publicity, this means that through the method of speaking or probably sharing knowledge the awareness of telesurgery should always be increasing and growing to help reduce the burden on the doctors. This method not only will help unburden the doctors pressure but it will also increase the awareness of telerobots in the public.



V. AFFINITY MAP

An Affinity Map is a visual tool used in user research and design thinking to organize and categorize large amounts of information. It helps to identify patterns and relationships in data, and to understand user needs, behaviors, and motivations.

The following information can be written on cards or sticky notes when making an affinity map for a real-time air quality monitoring device:

A. Planning:

Telesurgery users wireless networking and robotic technology to allow surgeons to operate on distantly located patients.

A major problem here is latency time. A latency time of less than 100 millisecond can be achieved with today's high speed fiber optic and a dedicated asynchronous transfer mode.

B. Benefits:

Telesurgery promises to provide surgical care to people worldwide, especially the remote areas such as rural areas or battlefield and inaccessible areas such as spacecraft.

Telesurgery is an excellent solution to get medical attention without patients' need to travel beyond their local hospitals through which surgical expertise can provide surgical care for patients from anywhere around the world.

C. Limitations:

The cost of robotic systems and the affordability of high-speed telecommunication is a problem, especially in developing countries.

To make telesurgery a feasible option for anyone in the world, there is a need to develop a good global network that allows patients in any part of the world to get treated without traveling for a long distance.

D. Proposed approach:

In a telesurgery operating room, there is a high-resolution 3D - 360 degree view camera and a robotic system is required. High speed 5G network is also required.

The surgeon looks at the patient's surgery site on the screen and uses his haptic arm to place the robotic arm in the operation theater in the proper way.

VI. CONCLUSION

In conclusion, PBL is an effective teaching method that provides students with the opportunity to engage in meaningful and relevant problem-solving activities. By using analytical tools such as

STEEP analysis, mind maps, empathy maps, and affinity maps, students can develop a deeper understanding of the subject matter, enhance their critical-thinking and problem-solving skills, and learn how to work collaboratively and communicate effectively.

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Conservation Of Natural Resources

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Abstract **- This paper aims at providing an overview on the work done in the field of Conservation of natural resources. Natural resources are resources that are drawn from nature. Natural resources are part of humanity's natural heritage or protected in nature reserves. Naturalresource allocations can be at the center of many economic and political confrontations both within and between countries. Some of these resources, like solar energy, air, wind, water, etc. are continuously available and their quantities are not noticeably affected by human consumption.**

INTRODUCTION

Problem-Based Learning (PBL) is a teaching method in which complex real-world problems are used as the vehicle to promote student learning of concepts and principles as opposed to direct presentation of facts and concepts. One important aspect of PBL is the use of various analytical tools such as STEEP analysis, mind maps, empathy maps, and affinity maps. STEEP analysis, for instance, is a tool that allows students to examine the
Social, Technological, Economic, Environmental, and Political factors that influence a situation or decision. This analysis provides students with a comprehensive understanding of the context in which a problem exists and helps them to develop creative solutions that consider multiple perspectives. Mind maps, on the other hand, are visual tools that can help students brainstorm, organize, and structure their ideas. They allow students to capture the relationships between different concepts and to see the big picture of the problem they are trying to solve. Empathy maps are used to understand the experiences, thoughts, feelings, and actions of a particular person or group. Affinity maps are used to categorize and organize information, thoughts, and ideas. The objective is to identify patterns, relationships, and similarities between the items being mapped. This tool helps students to synthesize information and to prioritize tasks, making it easier for them to focus on the most important aspects of their projects.

1.STEEP ANALYSIS

STEEP Analysis of Conservation of natural resources. STEEP analysis of the conservation of natural resources:

S - Social:

Social values and attitudes towards natural resources can affect conservation efforts. Education and awareness campaigns can help to increase support for conservation. Community involvement and engagement can help to build support for conservation.

T - Technological:

Green technologies can help to reduce the impact of resource use on the environment. Monitoring technologies can help to track and measure the impact of conservation efforts.

E – Environmental:

Climate change and other environmental factors can impact the availability and sustainability of natural resources.
Conservation efforts can help to mitigate the impact of environmental changes on natural resources.

Sustainable use and management of natural resources can help to reduce the impact of resource use on the environment.

E – Economic:

Natural resources can be a source of economic value and contribute to economic growth. Conservation efforts can support sustainable economic growth by promoting the responsible use and management of natural resources.

P – Political:

Government policies and regulations can impact the conservation of natural resources. International agreements and partnerships can support conservation efforts across borders. Political support can be critical to the success of conservation efforts.

Overall, a STEEP analysis highlights the importance of considering social, technological, environmental, economic, and political factors when developing conservation strategies.

2. MICRO MIND MAP

A mind map is a diagram used to visually organize information. It starts with a central idea creating a tree-like structure. Mind maps can be used to capture and organize thoughts, ideas, and information, and can help to increase creativity, memory retention, and problem-solving ability.

To reduce dependence on fossil fuels and by using alternative fuels such as electricity, hydrogen, biofuels, and natural gas. To conserve the natural resources by caring and protecting it for future generations. This can be accomplished through sustainable usage models and through conservation practices. Examples of conservation practices include reducing water, land and air pollution, decreasing the amount of resources used, and increasing conservation activities such as planting trees or restoring habitats. It also includes preserving biodiversity, protecting endangered species, and promoting efficient and renewable energy sources.

Types of Conservation Resources:

1)**Renewable Resources**: Renewable resources are natural resources that can be regenerated over time, making them essentially unlimited in availability. These resources are often used as sources of energy and are considered to be more environmentally sustainable than nonrenewable resources, such as fossil fuels. Some examples of renewable resources include:

i) **Solar energy**: Energy from the sun that can be converted into electricity using solar panels.

ii)**Wind energy**: Energy generated by the wind turning turbines to generate electricity.

iii)**Hydro energy**: Energy generated by moving water, such as from dams or turbines.

2)**Non-renewable resources**: Nonrenewable resources are natural resources that are limited in availability and cannot be replenished once they are used up. Nonrenewable resources are a finite resource and their use has a significant impact on the environment. The use of non-renewable resources has led to a number of environmental problems, including air and water pollution, climate change, and the destruction of natural habitats. Examples of non-renewable resources include:

i) **Fossil fuels**: Coal, oil, and natural gas, formed from the remains of ancient plants and animals.

ii) **Minerals**: Copper, iron, and aluminum, which are extracted from the Earth's crust.

iii)**Metals**: Gold, silver, and platinum, which are also extracted from the Earth's crust.

3. EMAPTHY MAP

An empathy map is a tool used to understand and empathize with a target user or customer. Empathy maps can be used to gain insights into customer needs and inform design decisions, as well as to facilitate collaboration and alignment among team members.

1) **Says**: The people need to do more to protect our planet for future generations.We need to reduce waste and recycle more to conserve resource. User also need to stop polluting our air and water.

2)**Thinks**: People need to shift to renewable energy to reduce our reliance on fossil fuels. It helps to need to work together to address climate change

3)**Feels**: It is very important what people concerned about the impact of human activities on the environment mostly people frustrated by the slow pace of change and lack of action from governments

and corporations. Hopefully that we can able to make a difference if we take action now.

4. AFFINITY MAP

An affinity map is a tool used in brainstorming, problem-solving, and decision-making processes to organize and group ideas or information based on their similarity or relatedness. It helps to identify patterns, connections, and themes among various ideas.The information is usually grouped into categories or themes, and the map is used to identify areas for further exploration, opportunities for innovation, or to inform design decisions.

1) **Resource conservation**: Reducing water usage, conserving fuel, reducing waste, using energy-efficient appliances. There are many different ways to conserve natural resources, from reducing waste and energy usage to conserving habitats and ecosystems.

2) **Nature conservation practices**: Planting trees, conserving wildlife habitats, conserving forests, conserving soil health, conserving marine ecosystems. Resource conservation and nature conservation are interconnected and can have overlapping benefits.

3)**Sustainable living practices**: Using public transportation, switching to renewable energy sources, using reusable bags and containers, composting, using sustainable agriculture practices. Sustainable living practices can help reduce the impact of human activities on natural resources and ecosystems.

Conclusion

In conclusion, conservation of natural resources is important for sustaining our planet's health and biodiversity. By conserving natural resources, we can reduce our impact on the environment, maintain ecosystems, and ensure that future generations have access to the resources they need to thrive. By taking action to conserve natural resources, we can help create a more sustainable future for ourselves and for the planet. Also, PBL is an effective way to provides students the opportunity to engage in meaningful and relevant problem-solving activities. By using analytical tools such as STEEP analysis, mind maps, empathy maps, and affinity maps, students can develop a deeper understanding of the subject matter, enhance their critical-thinking and problemsolving skills, and learn how to work collaboratively and communicate effectively.

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Carbon Footprint Reduction

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Abstract - This paper aims at providing an overview on the word done in the field of alternative fuel-based transportation. Air pollution has become a major environmental concern in many cities around the world. It has been linked to various health problems and has a significant impact on the quality of life. In this context, smart transportation has become an important task. In this paper, we present a alternative fuel based transportation that help to know how we switch the electrical vehicle. It is designed to be user-friendly and provides real-time data that can be accessed through a mobile application. The device uses sensors to measure the levels of pollutants and a microcontroller to process the data and transmit it wirelessly to the mobile application. This device has the potential to provide valuable information to individuals and communities about the surrounding in their local environment and can help raise awareness about the importance of reducing air pollution.

INTRODUCTION

Problem-Based Learning (PBL) is a teaching method in which complex real-world problems are used as the vehicle to promote student learning of concepts and principles as opposed to direct

presentation of facts and concepts. In addition to course content, PBL can promote the development of critical thinking skills, problem-solving abilities, and communication skills. One important aspect of PBL is the use of various analytical tools such as STEEP analysis, mind maps, empathy maps, and affinity maps. STEEP analysis, for instance, is a tool that allows students to examine the Social, Technological, Economic, Environmental, and Political factors that influence a situation or decision.

This analysis provides students with a comprehensive understanding of the context in which a problem exists and helps them to develop creative solutions that consider multiple perspectives. Mind maps, on the other hand, are visual tools that can help students brainstorm, organize, and structure their ideas. They allow students to capture the relationships between different concepts and to see the big picture of the problem they are trying to solve. Empathy maps, on the other hand, are used to understand the experiences, thoughts, feelings, and actions of a particular person or group.

This tool is important in PBL as it helps students to understand the perspectives of different stakeholders and to develop solutions that take into account the needs and concerns of all parties involved. Finally, affinity maps are used to categorize and organize information, thoughts, and ideas. The objective is to identify patterns, relationships, and similarities between the items being mapped. This tool helps students to synthesize information and to prioritize tasks, making it easier for them to focus on the most important aspects of their projects.

1. STEEP ANALYSIS

A STEEP analysis is a tool used to identify and analyse the socio-cultural, technological, economic, environmental, and political factors that may impact a specific issue or industry. Here is a STEEP analysis on the carbon footprint of transportation:

- **Socio-Cultural Factors:**

Increasing public awareness and concern about climate change and the impact of transportation on the environment. Changing attitudes towards car ownership and a growing preference for low-carbon modes of transportation, such as biking and public transit. Demographic changes, such as urbanization and an aging population, which may influence transportation patterns and preferences.

- **Technological Factors:**

The development and adoption of electric and hybrid vehicles, as well as advances in fuel efficiency technology for traditional gas-powered vehicles. Innovations in transportation technology, such as ride-sharing services and autonomous vehicles, which may have an impact on carbon emissions. The use of alternative fuels, such as biofuels and hydrogen fuel cells, for transportation.

- **Economic Factors:**

The cost of fuel and transportation, which may impact the affordability and accessibility of low-carbon modes of transportation. Economic incentives and regulations, such as taxes and emissions standards, which may influence consumer behaviour and industry practices. The economic impact of climate change on transportation infrastructure and systems.

- **Environmental Factors:**

The impact of transportation-related emissions on air quality and public health. The impact of climate change on transportation infrastructure and systems, such as increased flooding and storm damage. The impact of transportation-related emissions on biodiversity and ecosystems.

- **Political Factors:**

Government policies and regulations related to transportation, such as emissions standards and incentives for low-carbon modes of transportation. The political will and leadership necessary to address transportation-related carbon emissions and climate change. International agreements and cooperation, such as the Paris Agreement on climate change, which may influence transportation policies and practices.

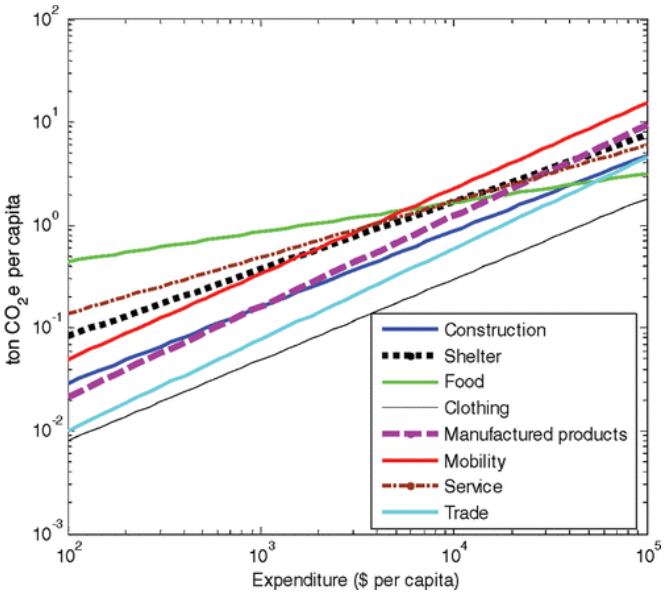

Fig 1. Regression lines for the carbon footprint of different consumption categories as a function of expenditure level.

MICRO MIND MAP

A mind map is a diagram used to visually organize information. It starts with a central idea or concept, and branches out to include associated concepts and ideas, creating a tree-like structure. Mind maps can be used to capture and organize thoughts, ideas, and information, and can help to increase creativity, memory retention, and problem-solving ability.

1) Main Idea: To reduce dependence on fossil fuels and decrease greenhouse gas emissions by using alternative fuels such as electricity, hydrogen, biofuels, and natural gas.

2) Sources of carbon emissions: Gasoline and diesel fuel combustion in cars, trucks, and buses, Air travel and shipping. Manufacturing and maintenance of transportation infrastructure

3) IOT: This branch covers the Real-time monitoring and control of vehicles and infrastructure. Smart charging management for electric vehicles. Optimization of routes and vehicle performance and monitoring the emission of alternative fuel vehicles, hence reducing pollution caused by transportation.

4) Impact of carbon emissions: Climate change and its various impacts (e.g., extreme weather, sea level rise).Public health impacts from air pollution. Economic impacts (e.g., fuel costs, disruptions to transportation systems).Equity impacts (e.g., low-income and marginalized communities often affected most)

5) Strategies to reduce carbon emissions: Promotion of low-carbon modes of transportation (e.g., walking, biking, public transit).Adoption of electric and

hybrid vehicles. Investment in public transportation infrastructure. Development of alternative fuels and propulsion technologies. Implementation of policy and regulatory measures to incentivize carbon reduction in transportation

3. EMPATHY MAP

An "empty map" on carbon footprint through transportation might refer to a lack of information or understanding about the carbon emissions associated with different modes of transportation.

To provide a starting point for exploring this topic, here are some basic facts about the carbon footprint of various transportation options:

1. **Cars:** On average, cars emit about 4.6 metric tons of CO2 per year, with larger or less fuel-efficient vehicles emitting more. Factors that affect emissions include driving habits, vehicle age, and fuel type.
2. **Public transportation:** Buses, trains, and other forms of public transportation can be more energy-efficient per passenger than individual cars, but the overall carbon footprint depends on factors like the type of vehicle, the distance travelled, and the number of passengers.
3. **Air travel:** Air travel is generally one of the most carbon-intensive forms of transportation. The carbon footprint of a flight depends on factors like the distance travelled, the type of aircraft, and the number of passengers.
4. **Bicycles and walking:** These forms of transportation have a very low carbon footprint, as they do not emit any carbon emissions.
5. **Other options:** Other modes of transportation, such as motorcycles, scooters, and electric vehicles, have varying levels of carbon emissions depending on factors like the type of vehicle and the source of electricity.

4. AFFINITY MAP

An affinity map is a tool used to organize and analyse data during the research phase of a design project. It is a visual representation of information, ideas, and insights gathered from various sources, such as customer interviews, surveys, or observations. The purpose of an affinity map is to help teams identify patterns and connections in their data, and to facilitate discussion and decision-making. The information is usually grouped into categories or themes, and the map is used to identify areas for further exploration, opportunities for innovation, or to inform design decisions.

1) User needs: How to make people aware about carbon footprint?

They may need guidance on how to calculate their own carbon footprint, which is the total amount of greenhouse gas emissions that result from their activities. This could include information on how to track energy consumption, transportation usage, and other factors that contribute to carbon emissions.

2) User pain points: What are the challenges or difficulties that people face when it comes to carbon footprint?

Lack of awareness: Many people may not be aware of the impact of their daily activities on the environment, and therefore may not know how to reduce their carbon footprint.

Limited options: Some people may not have access to environmentally friendly products or services, such as public transportation, renewable energy sources, or sustainable food options.

3) Environmental factors: What factors in the environment can affect carbon footprint?

The type of energy source used to power homes, businesses, and transportation can greatly impact carbon footprint. Fossil fuels such as coal, oil, and gas produce large amounts of greenhouse gas emissions, while renewable energy sources such as wind, solar, and hydro power are cleaner and produce fewer emissions.

4) Technical requirements: What are the technical requirements for the device for carbon footprint?

Carbon dioxide sensor: A carbon dioxide sensor is essential for measuring carbon footprint. The sensor should be able to accurately detect carbon dioxide levels in the air, and should be calibrated regularly to ensure accuracy.

Data storage and processing: The device should have the ability to store and process data. This may involve a microcontroller or a computer, depending on the complexity of the device.

5) User feedback: What feedback have users provided about carbon footprint?

Need for guidance: Some users have reported that they would like more guidance on how to reduce their carbon footprint. They may be unsure of what actions they can take or how to prioritize different actions to make the most impact.

Positive impact: Many users report feeling a sense of satisfaction or accomplishment when they are able to reduce their carbon footprint. This positive feedback can help to motivate users to continue making sustainable choices.

Conclusion

In conclusion, PBL is an effective teaching method that provides students with the opportunity to engage in

meaningful and relevant problem-solving activities. By using analytical tools such as STEEP analysis, mind maps, empathy maps, and affinity maps, students can develop a deeper understanding of the subject matter, enhance their critical-thinking and problem-solving skills, and learn how to work collaboratively and communicate effectively.

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4G/5G COMMUNICATION

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***Abstract*: 4G/5G communication refers to the fourth and fifth generations of mobile communication technology that provide faster data speeds, greater network capacity, and improved performance. The widespread adoption of 4G/5G technology has been driven by the growing demand for better mobile communication and the increasing number of connected devices. Technological advancements in 4G/5G technology have allowed for increased efficiency and productivity, leading to increased economic growth in many countries. However, the deployment of 4G/5G networks can have negative environmental impacts and the industry is subject to heavy regulation by governments. The continued growth and development of the 4G/5G communication industry will be impacted by a wide range of macro-environmental factors, including social, technological, economic, environmental, and political factors.**

INTRODUCTION

Problem-Based Learning (PBL) is a teaching method in which complex real-world problems are used as the vehicle to promote student learning of concepts and principles as opposed to direct presentation of facts and concepts. In addition to course content, PBL can promote the development of critical thinking skills, problem-solving abilities, and communication skills. One important aspect of PBL is the use of various analytical tools such as

STEEP analysis, mind maps, empathy maps, and affinity maps. STEEP analysis, for instance, is a tool that allows students to examine the Social, Technological, Economic, Environmental, and Political factors that influence a situation or decision. This analysis provides students with a comprehensive understanding of the context in which a problem exists and helps them to develop creative solutions that consider multiple perspectives. Mind maps, on the other hand, are visual tools that can help students brainstorm, organize, and structure their ideas. They allow students to capture the relationships between different concepts and to see the big picture of the problem they are trying to solve. Empathy maps, on the other hand, are used to understand the experiences, thoughts, feelings, and actions of a particular person or group. This tool is important in PBL as it helps students to understand the perspectives of different stakeholders and to develop solutions that take into account the needs and concerns of all parties involved. Finally, affinity maps are used to categorize and organize information, thoughts, and ideas. The objective is to identify patterns, relationships, and similarities between the items being mapped. This tool helps students to synthesize information and to prioritize tasks, making it easier for them to focus on the most important aspects of their projects.

1. STEEP ANALYSIS

The STEEP analysis is a tool used to analyse the macro-environmental factors that impact a particular industry or market The acronym STEEP stands for Social, Technological, Economic, Environmental, and Political factors. In this analysis, we will examine the 4G/5G communication industry in light of these five factors.

1. **Social**: The increasing demand for faster and more reliable mobile communication has led to the widespread adoption of 4G/5G technology. The rise of social media and mobile applications has also driven the need for better mobile connectivity. Additionally, the growing number of connected devices, such as smartphones and wearables, is driving the need for faster and more efficient communication networks.

2. **Technological**: The technological advancements in 4G/5G communication technology have allowed for faster data speeds and increased network capacity. This has led to improved performance and increased reliability in mobile communication. Additionally, the advent of 5G technology has the potential to

revolutionize the mobile communication industry by providing even faster data speeds and greater network capacity.

3. **Economic**: The increasing demand for 4G/5G technology has led to a growing market for mobile communication services. This has resulted in increased investment in the industry and the creation of new jobs. The increased efficiency and productivity resulting from 4G/5G technology has also led to increased economic growth in many countries.

4. **Environmental**: The deployment of 4G/5G networks requires the construction of new infrastructure, including cell towers and fiber-optic cables. This can have negative impacts on the environment, such as the destruction of natural habitats and the release of greenhouse gases from the production of electronic components. Additionally, the high energy consumption of 4G/5G networks can contribute to the emission of harmful pollutants.

5. **Political**: The 4G/5G communication industry is heavily regulated by governments, which can impact the development and deployment of new technologies. The allocation of spectrum for 4G/5G networks is also subject to government control, which can limit the availability of bandwidth for new technologies. Additionally, privacy concerns and the potential for government surveillance have led to increased regulation of the industry.

2. MIRO MIND MAP

Introduction: 4G and 5G are the fourth and fifth generations of mobile communication technology that provide faster data speeds, greater network capacity, and improved performance. The widespread adoption of these technologies has been driven by the growing demand for better mobile communication and the increasing number of connected devices.

1. **Technological Advancements**: Technological advancements in 4G/5G technology have allowed for increased efficiency and productivity, leading to increased economic growth in many countries. Some of these advancements include increased data speeds, greater network capacity, improved performance, and the advent of 5G technology.
2. **Impact on Society**: The widespread adoption of 4G/5G technology has had a significant impact on society. It has enabled the growth of social media and mobile applications, and has made mobile communication faster and more reliable. It has also created new job opportunities and has contributed to economic growth in many countries.
3. **Environmental Concerns**: The deployment of 4G/5G networks can have negative environmental impacts, such as the destruction of natural habitats and the release of greenhouse gases from the production of electronic components. Additionally, the high energy consumption of 4G/5G networks can contribute to the emission of harmful pollutants.
4. **Government Regulation**: The 4G/5G communication industry is heavily regulated by governments, which can impact the development and deployment of new technologies. The allocation of spectrum for 4G/5G networks is also subject to government control, which can limit the availability of bandwidth for new technologies. Additionally, privacy concerns and the potential for government surveillance have led to increased regulation of the industry.
5. **Future Developments**: The continued growth and development of the 4G/5G communication industry will be impacted by a wide range of macro-environmental factors, including social, technological, economic, environmental, and political factors. Future developments in 4G/5G technology are expected to include even faster data speeds, greater network capacity, and improved performance.

3. EMAPTHY MAP

An empathy map is a tool used in design thinking and customer research to help a team understand and connect with the thoughts, emotions, needs and behaviours of their target audience. Empathy maps can be used to gain insights into customer needs and inform design decisions, as well as to facilitate collaboration and alignment among team members.

1. **Think**: The widespread adoption of 4G and 5G technology has been driven by the growing demand for better mobile communication and the increasing number of connected devices. The deployment of 4G/5G networks can have negative environmental impacts, and the industry is subject to heavy regulation by governments. The continued growth and development of the 4G/5G communication industry will be impacted by a wide range of macro-environmental factors, including social, technological, economic, environmental, and political factors.
2. **Feel**: Customers feel excited about the faster data speeds, greater network capacity, and improved performance of 4G and 5G technology. However, they may also feel concerned about the negative environmental impacts of 4G/5G networks and the potential for government surveillance.
3. **Hear**: Customers hear about the benefits of 4G and 5G technology, such as faster data speeds and improved network capacity, but also about the potential downsides, such as environmental impacts and government regulation.
4. **Say**: Customers are likely to say things like "I love how fast my phone works now that I have 4G/5G", but may also say "I'm worried about the environmental impact of these networks".
5. **Do**: Customers are likely to adopt 4G/5G technology, as it provides faster and more reliable

mobile communication. They may also take actions to reduce the environmental impact of 4G/5G networks, such as reducing their usage or supporting environmentally-friendly technologies.

6. **Pain**: Customers may feel frustrated with slow data speeds and limited network capacity, leading to slow-loading websites and poor performance of mobile applications. They may also feel concerned about the potential for government surveillance and the negative environmental impact of 4G/5G networks.
7. **Gain**: Customers gain faster and more reliable mobile communication, improved performance of mobile applications, and increased efficiency and productivity. They may also feel more connected to others and better able to participate in online communities and activities.

5. AFFINITY MAP

An affinity map is a tool used to organize and analyse data during the research phase of a design project. It is a visual representation of information, ideas, and insights gathered from various sources, such as customer interviews, surveys, or observations. The purpose of an affinity map is to help teams identify patterns and connections in their data, and to facilitate discussion and decision-making. The information is usually grouped into categories or themes, and the map is used to identify areas for further exploration, opportunities for innovation, or to inform design decisions.

Affinity Map for 4G/5G Communication:

Categories:

1. Technological Advancements.
2. Impact on Society.
3. Environmental Concerns.
4. Government Regulation.
5. Future Developments.

Technological Advancements:

1. Increased data speeds.
2. Greater network capacity.
3. Improved performance.
4. 5G technology.

Impact on Society:

1. Growth of social media and mobile applications.
2. Faster and more reliable mobile communication.
3. New job opportunities.
4. Contribution to economic growth.

Environmental Concerns:

1. Destruction of natural habitats.
2. Release of greenhouse gases from production of electronic components.
3. High energy consumption leading to emission of pollutants.

Government Regulation:

1. Heavy regulation of the industry.
2. Allocation of spectrum subject to government control.
3. Increased regulation due to privacy concerns and potential for government surveillance.

Future Developments:

1. Faster data speeds.
2. Greater network capacity.
3. Improved performance.
4. Impacted by social, technological, economic, environmental, and political factors.

Conclusion

In conclusion, the 4G/5G communication industry has seen tremendous growth and development in recent years, driven by the increasing demand for better mobile communication and the growing number of connected devices. The technological advancements of 4G and 5G technology have brought about faster data speeds, greater network capacity, and improved performance, leading to a more connected and efficient society. However, the

industry is also subject to environmental concerns and government regulation. The future developments of 4G/5G communication will be impacted by a wide range of macro-environmental factors, including social, technological, economic, environmental, and political factors. As society continues to rely on mobile communication and connected devices, the importance of balancing technological advancements with environmental responsibility and government regulation will become increasingly critical.

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Automated Alerting System for Medical Emergencies

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***Abstract*—We consider a wearable-based automated alerting system for medical emergencies. An android application and a wearable hardware device make up the majority of this system's components. The wearable device has sensors that track the user's body temperature and heart rate, which are then shown on a display. These sensor readings are controlled by an android application and sent via Bluetooth to an android device. When these figures are anomalous, a warning is delivered to confidants by email or SMS. To further aid in assessing the user's health over time, the application has the ability to graph the recorded statistics for display.**

I. INTRODUCTION

Project-based learning has become a well-liked instructional technique in recent years (PBL). PBL puts a lot of focus on hands-on, real-world problem-solving activities that help students practice and apply what they have learned. The approach aims to deepen students' understanding of the material and to enhance their communication, teamwork, and critical-thinking skills. Both communication and problem-solving skills. The use of numerous analytical methods, including STEEP analysis, mind maps, empathy maps, and affinity maps, is a crucial component of PBL. Students can study the Social, Technological, Economic, Environmental, and Political variables that affect a scenario or choice using a tool called STEEP analysis, for instance. This analysis helps students build original solutions that take into account various viewpoints and gives them a thorough understanding of the context in which a problem emerges. On the other side, mind maps are visual tools that can assist pupils with idea generation, organization, and structure. They enable pupils to understand the connections between various ideas and to get a sense of the overall situation they are seeking to resolve. Empathy maps, on the other hand, are used to understand the experiences, thoughts, feelings, and actions of a particular person or group. This tool is important in PBL as it helps students to understand the perspectives of different stakeholders and to develop solutions that take into account the needs and concerns of all parties involved. Finally, affinity maps are used to categorize and organize information, thoughts, and ideas. The objective is to identify patterns, relationships, and similarities between the items being mapped. This application makes it simpler for students to concentrate on the most crucial elements of their projects by assisting them in synthesizing information and prioritizing activities.

II. STEEP ANALYSIS

A STEEP analysis of automated alerting systems for medical emergencies can be provide a comprehensive understanding of the various social, technological, economic, environmental, and political factors that can impact the implementation and adoption of such systems.

a) Social Factors:

Automated alerting systems for medical emergencies can have a significant impact on the social factors associated with healthcare. Such systems can improve the quality and timeliness of care, reduce the risk of medical errors, and increase patient safety. However, there may be concerns related to privacy and data security, as well as issues related to the access and affordability of healthcare services.

- Acceptance and adoption of technology in medical decision-making
- Cultural attitudes towards technology in healthcare
- Concerns around privacy and security of medical information
- Potential language barriers affecting the effectiveness of the system

b) Technological Factors:

The implementation of an automated alerting system requires the integration of various technologies such as sensors, wearable devices, cloud computing, and artificial intelligence. The reliability, accuracy, and compatibility of these technologies can impact the effectiveness and efficiency of the system. The system should be designed to work seamlessly with existing medical equipment and infrastructure, and there should be provisions for continuous upgrades and maintenance of the system. There may also be concerns about the reliability and accuracy of these systems, and the potential for false alarms.

- Advancements in software and hardware necessary for development and implementation
- Integration with existing electronic health records and emergency medical systems
- Accuracy and reliability of the system

c) Economic Factors:

Automated alerting systems for medical emergencies can have a significant economic impact on the healthcare industry. While the implementation of such systems can result in cost savings due to improved efficiency and reduced medical errors, there may be significant upfront costs associated with the implementation and maintenance of the system. The availability of funding and reimbursement for such systems can also impact their adoption.

- High cost of implementation and maintenance
- Potential for significant cost savings in the long run through improved patient outcomes and reduced medical errors

d) Environmental Factors:

The implementation of an automated alerting system for medical emergencies can have a positive impact on the environment by reducing the need for unnecessary travel and hospital visits. However, the production and disposal of the various technologies required for the system can have a negative impact on the environment.

- Minimal environmental impact, though the system may require a significant amount of electricity and computing power.

e) Political Factors:

The implementation of an automated alerting system for medical emergencies using IoT can be influenced by various political factors such as regulatory requirements, government policies, and healthcare laws. The availability of support and funding from the government can also impact the adoption and implementation of such systems.

- Approval and regulation by relevant regulatory bodies
- Allocation of funding for development and implementation
- Concerns around data privacy and security
- Potential for misuse by malicious actors

III. MICRO MIND MAP

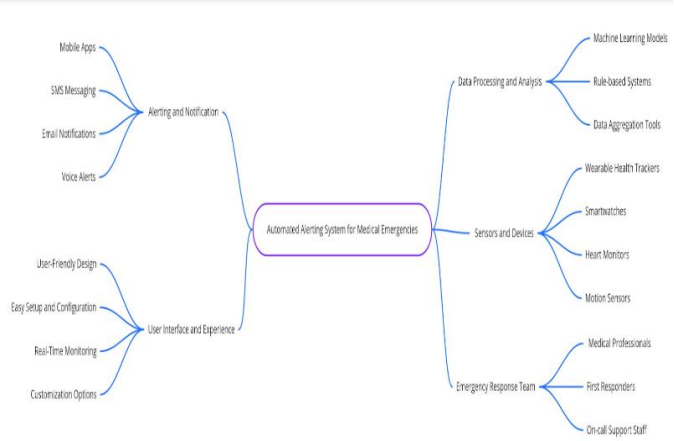

Fig:1 MIND MAP

A micro mind map is a brief and clear visual representation of information that demonstrates the connections between various concepts or ideas. A fundamental idea or notion serves as the basis, and from there, related ideas are usually derived. Information can be summarized and organized using micro mind maps to make it simpler to grasp and recall. They can be made manually or with the aid of programs with mind mapping features.

a) Sensors and Devices:

These tools may track a variety of physiological and environmental factors, including heart rate, blood pressure, oxygen levels, and activity. Smartwatches, heart monitors, motion sensors, and wearable health trackers are among examples.

b) Data Processing and Analysis:

This involves processing and analyzing the data from the sensors to identify abnormal patterns or events that may indicate a medical emergency. This can be done using machine learning models, rule-based systems, and data aggregation tools.

c) Alerting and Notification:

The right parties must be notified when a medical emergency is found. Mobile applications, SMS messaging, email notifications, and audio alerts are all ways to do this.

d) Emergency Response Team:

Once an alert is received, a team of medical professionals, first responders, or on-call support staff need to be dispatched to provide assistance.

e) User Interface and Experience:

A key consideration is the design of the system to ensure that it is user-friendly, easy to set up and configure, provides real-time monitoring, and offers customization options for the user.

IV. EMAPTHY MAP

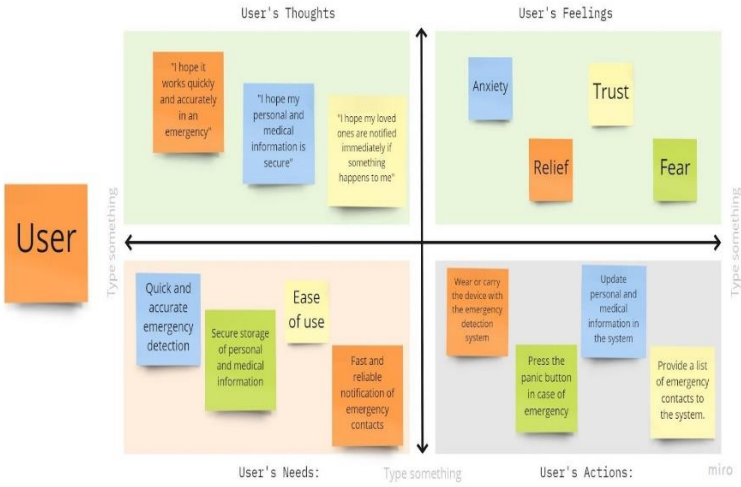

Fig:2 EMPATHY MAP

An information visualization tool known as a mind map is a diagram. It has a tree-like structure and begins with one main thought or notion before branching out to encompass related ideas and concepts. In addition to helping to improve creativity, memory retention, and problem-solving skills, mind maps can be used to record and organize thoughts, ideas, and information.

a) Thoughts:

What does the user Taught?
Visual alert message indicating the type of medical emergency and the location of the patient Visual display of the patient's vital signs and medical history

b) Feelings:

What does the user THINK and FEEL?
Worried and anxious about the patient's well-being Frustrated if the alerting system is not working as expected Relief if the alerting system is working effectively and help is on the way Pre-recorded voice message providing details about the medical emergency and instructions on what to do next Estimated time of arrival for emergency services

c) Needs:

What does the user NEEDS? Audible alarm or alert sound to grab their attention Pre-recorded voice message providing details about the medical emergency and instructions on what to do next.

d) Actions:

Follow the alerting system's guidelines to start the proper emergency medical assistance.
Make contact with other healthcare providers or family members to let them know about the problem.
Using the data, the alerting system has provided, determine the patient's status and take the necessary steps to assist or render first aid.
To ensure the system continues to be successful and efficient in the future, provide feedback on the system's performance and any areas that should be improved.
Thank the automatic alerting system and the emergency services for their prompt and professional response.

V. AFFINITY MAP

A design project's research phase includes the usage of an affinity map, a technique for organizing and analyzing data. It is a depiction of facts, concepts, and perceptions gleaned from numerous sources, including surveys, observations, and conversations with customers. Affinity maps are used by teams to assist them find patterns and relationships in their data, as well as to promote conversation and decision-making. Typically, the data is organized into categories or topics, and the map is used to point up potential research areas, chances for innovation, or to guide design choices.

a) User Needs:

Quick response time in case of medical emergencies. Clear and concise communication about the nature of the emergency. Accessibility for people with disabilities or limited mobility. Customizable alerts based on personal health conditions. Reliable and accurate notifications to emergency services and designated contacts.

b) User habits:

Using smartphones as primary means of communication. Keeping their mobile devices charged and on hand. Checking notifications regularly. Preferring easy-to-use interfaces and minimal steps to initiate an alert. Habitually carrying a medical ID or information card.

c) User pain points:

Fear of not being able to get help in time. Language barriers in emergency situations. Lack of clarity about what information to provide. Difficulty in initiating an alert while in distress. Concerns about privacy and data security.

d) Environment factor:

Availability of mobile networks or internet access. Noise or other factors that could affect hearing alerts. Weather conditions that could impact the functionality of the alert system. Availability of emergency services in the area. Lighting and visibility conditions in case of night-time emergencies.

e) Technical requirement:

Integration with emergency services and medical facilities. PS tracking to locate the user in case of an emergency. Reliable connectivity and minimal downtime. Compatibility with multiple devices and operating systems. Secure data storage and encryption.

f) Design consideration:

Clear and concise interface with easy-to-understand instructions. Customizable options for alerts and notifications. Integration with wearable devices for real-time health monitoring. In-app language translation for non-native speakers. Incorporation of voice-activated commands for hands free operation.

VI. CONCLUSION

PBL is an excellent teaching strategy that gives students the chance to participate in worthwhile and pertinent problem-solving tasks. Students can get a deeper knowledge of the material, improve their critical-thinking and problem-solving abilities, and learn how to work collaboratively and communicate effectively by using analytical tools like STEEP analysis, mind maps, empathy maps, and affinity maps.

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Real Time Air-Quality Monitoring Device

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Abstract **- Air pollution has become a major environmental concern in many cities around the world. It has been linked to various health problems and has a significant impact on the quality of life. In this context, monitoring air quality in real-time has become an important task. In this paper, we present a real-time air quality monitoring device that measures the levels of various air pollutants, including particulate matter, nitrogen dioxide, and ozone. The device is designed to be user-friendly and provides real-time data that can be accessed through a mobile application. The device uses sensors to measure the levels of pollutants and a microcontroller to process the data and transmit it wirelessly to the mobile application. The device is also equipped with an air quality index that provides an easy-to-understand representation of the air quality in a particular location. The results of the device have been compared with data from a reference air quality monitoring station and have shown good correlation. This device has the potential to provide valuable information to individuals and communities about the air quality in their local environment and can help raise awareness about the importance of reducing air pollution.**

I. INTRODUCTION

Project-based learning (PBL) is a teaching method that has gained popularity in recent years. PBL emphasizes hands-on, real-world problem-solving activities that allow students to explore and apply what they have learned. The approach is designed to provide students with a deeper understanding of the subject matter and to develop critical-thinking, collaboration, and communication skills. One important aspect of PBL is the use of various analytical tools such as STEEP analysis, mind maps, empathy maps, and affinity maps. STEEP analysis, for instance, is a tool that allows students to examine the Social, Technological, Economic, Environmental, and Political factors that influence a situation or decision. This analysis provides students with a comprehensive understanding of the context in which a problem exists and helps them to develop creative solutions that consider multiple perspectives. Mind maps, on the other hand, are visual tools that can help students brainstorm, organize, and structure their ideas. They allow students to capture the relationships between different concepts and to see the big picture of the problem they are trying to solve. Empathy maps, on the other hand, are used to understand the experiences, thoughts, feelings, and actions of a particular person or group. This tool is important in PBL as it helps students to understand the perspectives of different stakeholders and to develop solutions that take into account the needs and concerns of all parties involved. Finally, affinity maps are used to categorize and organize information, thoughts, and ideas. The objective is to identify patterns, relationships, and similarities between the items being mapped. This tool helps students to synthesize information and to prioritize tasks, making it easier for them to focus on the most important aspects of their projects.

II. STEEP ANALYSIS

A STEEP analysis of real-time air quality monitoring devices would involve evaluating the following five aspects:

A. Social

The social impact of air quality monitoring devices is significant. Poor air quality affects human health and well-being, and therefore, there is a growing demand for devices that can accurately monitor air quality in real-time. This demand is driven by the increasing concern over air pollution, which has been linked to a range of health problems such as respiratory diseases, heart disease, and stroke.

B. Technological

Advances in technology have enabled the development of sophisticated and accurate air quality monitoring devices. The use of sensors, microprocessors, and wireless communication technologies has made it possible to measure and transmit air quality data in real-time. The growing popularity of the Internet of Things (IoT) has further facilitated the integration of air quality monitoring devices with smart home systems, allowing users to access and control the data from their smartphones and other connected devices.

C. Economic

The cost of air quality monitoring devices has come down significantly in recent years, making them more accessible to a wider range of customers. This has been made possible by the economies of scale associated with mass production, as well as the growing competition in the market. The development of new and innovative air quality monitoring devices has also driven up the demand for these products, creating new economic opportunities.

D. Environmental

The increasing awareness of environmental issues and the need to protect the planet has led to a growing interest in air quality monitoring. Real-time air quality monitoring devices can play a crucial role in reducing air pollution by providing accurate data that can be used to inform policy-making and regulatory decisions. In addition, air quality monitoring devices can help individuals to make informed decisions about their own exposure to air pollution and to take steps to protect their health and well-being.

E. Political

Air quality is a major political issue, and governments around the world are taking steps to address this problem. The implementation of air quality monitoring programs is an important step in this direction. By providing accurate and real-time data, air quality monitoring devices can help governments to better understand the extent of air pollution, to identify the sources of pollution, and to develop effective solutions to reduce air pollution. The use of air quality monitoring devices can also help to build public awareness of air pollution and to raise the political profile of this issue, which is essential for driving meaningful change.

III. MICRO MIND MAP

A mind map is a visual tool that can help you brainstorm, organize, and structure ideas. It starts with a central idea and branches out to related subtopics. My micro mind map has several branches, including selecting sensors, hardware assembly, software development, data visualisation, power supply, and lastly calibration and testing.

A. *Choose sensors*

This branch covers the selection of different sensors that are used to measure pollutants such as particulate matter (PM2.5 and PM10), carbon monoxide and volatile organic compounds (VOCs). Some of the popular sensors used for measuring these pollutants are SDS011, MQ-135, MQ-7 and MQ-9.

B. Assemble hardware

This branch covers the assembly of the physical components of the device. This includes selecting a microcontroller (such as an Arduino or Raspberry Pi) to read the sensor data, connecting the sensors to the microcontroller using a breadboard and wires, and selecting a power source (such as a battery or power adapter) to power the device.

C. Write software

This branch covers the software development aspect of the project. It includes writing code for the microcontroller to read sensor data and sending it to a computer or cloud service for processing and storage. It also includes using MQTT protocol for sending data to the cloud or to a website.

D. Visualize data

This branch covers setting up a way to visualize the data. It includes creating a web app, a spreadsheet, or a data visualization library to display the data in real-time.

E. Power supply

This branch covers the power supply of the device. It includes selecting a power source such as a battery or a power adapter to power the device.

F. Calibrate and Test

This branch covers the final step of the project, which is calibrating the sensors and testing the device to ensure that it is working correctly.

IV. EMAPTHY MAP

An empathy map is a tool that helps to understand the thoughts, feelings, and needs of a specific user or customer. When filling in an empathy map for a person who would be using a real-time air quality monitoring device, you should aim to capture the following information in each of the four quadrants:

A. Thoughts

In this quadrant, list the user's thoughts and perceptions about air pollution, their health, and the device. For example, they may think that air pollution is a serious problem in their city, that it's affecting their health, and that they want a device that can accurately measure the air quality in their home.

B. Feelings

In this quadrant, list the emotions the user experiences related to air pollution, their health, and the device. For example, they may feel worried, concerned, or stressed about the air pollution in their city and its effects on their health. They may also feel excited or hopeful about the prospect of having a device that can help them monitor the air quality in

C. *Needs*

In this quadrant, list the user's needs and wants related to air pollution, their health, and the device. For example, they may need a device that is easy to use, accurate, and provides real-time data. They may also want a device that is affordable and can be easily integrated into their daily routine.

D. *Actions*

In this quadrant, list the actions the user takes to address air pollution, their health, and the device. For example, they may take actions such as staying indoors on days when the air quality is poor, buying air purifiers, or researching different air quality monitoring devices.

V. AFFINITY MAP

An Affinity Map is a visual tool used in user research and design thinking to organize and categorize large amounts of information. It helps to identify patterns and relationships in data, and to understand user needs, behaviours, and motivations.

The following information can be written on cards or sticky notes when making an affinity map for a real-time air quality monitoring device:

A. *User needs*

What are the needs and motivations of the people who will be using the device? What problems are they trying to solve with the device? "I need to monitor air quality in real-time to protect my family's health. I need accurate and reliable air quality readings to make informed decisions about outdoor activities. I need an air quality monitoring device that is easy to use and understand. I need an affordable air quality monitoring solution for my small business."

B. *User habits*

How will users interact with the tool? What are their practises and routines for keeping an eye on the air quality? "At least once a day, I regularly check the air quality. In a heavily polluted urban area, I'll be using the air quality monitoring device. I prefer to use a smartphone app to access air quality data."

C. *User pain points*

What are the challenges or difficulties that people face when it comes to monitoring air quality? "Existing air quality monitoring devices often give inaccurate readings. It's difficult to access air quality data in real-time. Most air quality monitoring solutions are too expensive for me."

D. *Environmental factors*

What factors in the environment can affect air quality, such as weather patterns, industrial activities, and transportation? "The weather patterns in my area frequently change, affecting air quality. There are many industrial activities and factories near my home. Traffic is heavy in my area, contributing to poor air quality."

E. *Technical requirements*

What are the technical requirements for the device, such as accuracy, reliability, and ease of use? "The air quality readings need to be accurate to within 5%. The device needs to be reliable and function continuously for at least 1 year. The air quality monitoring device must be user-friendly and easy to use."

F. *Design considerations*

What design features and considerations should be considered when creating the device, such as size, weight, and materials? "The device must be small and portable, so I can take it with me on trips. The device must be lightweight and easy to carry. The materials used in construction should be environmentally friendly. The device should be durable and withstand exposure to the elements."

G. *User feedback*

What feedback have users provided about similar devices or air quality monitoring systems in the past? "Users of similar devices have reported that the readings are often inaccurate. Users have said they prefer air quality monitoring solutions that are simple and easy to use."

In conclusion, PBL is an effective teaching method that provides students with the opportunity to engage in meaningful and relevant problem-solving activities. By using analytical tools such as STEEP analysis, mind maps, empathy maps, and affinity maps, students can develop a deeper understanding of the subject matter, enhance their critical-thinking and problem-solving skills, and learn how to work collaboratively and communicate effectively.

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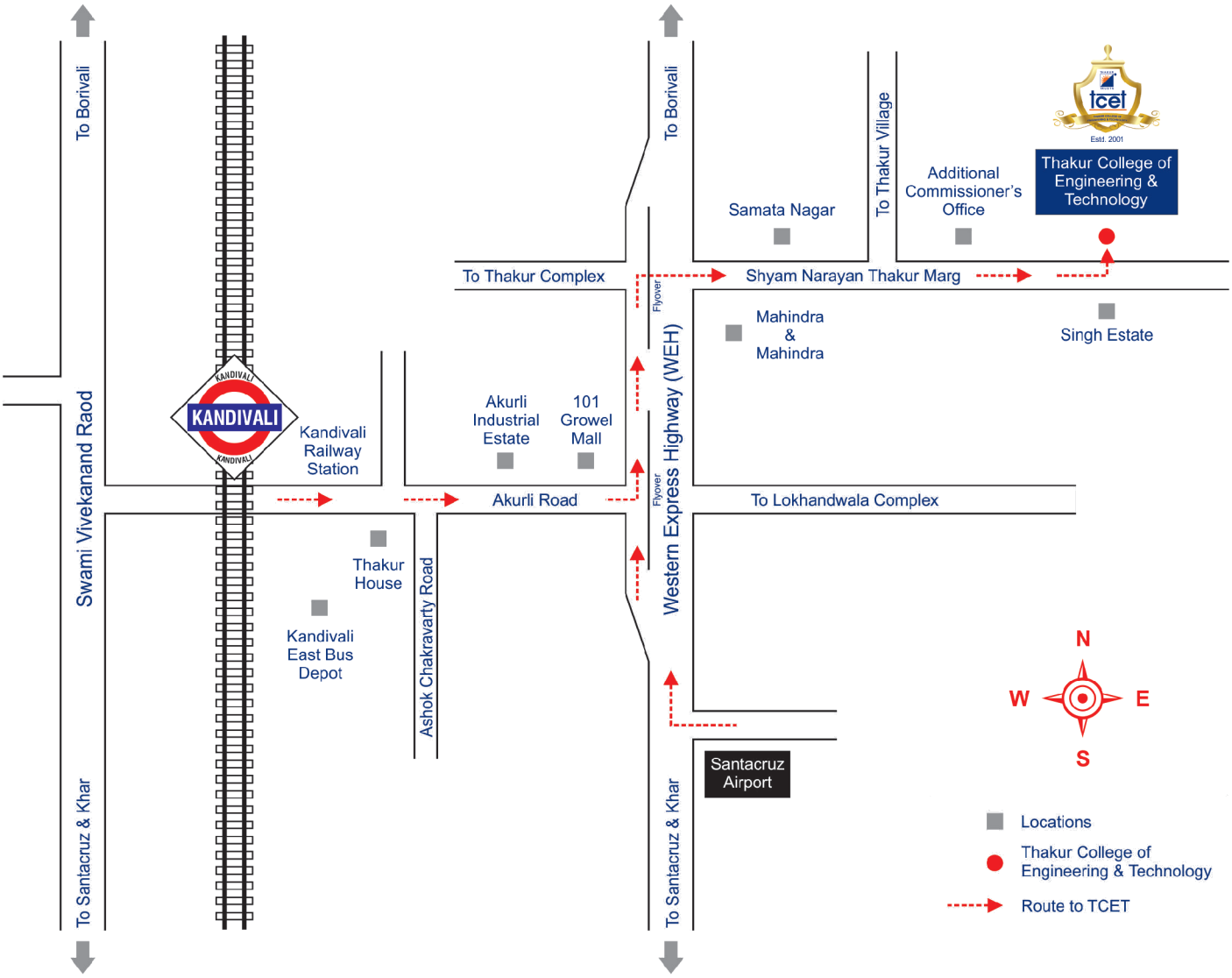
Location Plan



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