

THAKUR COLLEGE OF ENGINEERING & TECHNOLOGY Autonomous College Affiliated to University of Mumbai

Approved by All India Council for Technical Education(AICTE) and Government of Maharashtra A - Block, Thakur Educational Campus, Shyamnarayan Thakur Marg,

Thakur Village, Kandivali (East), Mumbai - 400 101

Tel.: 022-6730 8000 / 8106 / 8107 Telefax: 022-2846 1890 • Email: tcet@thakureducation.org

Website: www.tcetmumbai.in www.thakureducation.org



International Conference on Humanities, Sciences and Technical Education 2023

Chief Patron

Mr. V.K. Singh, Chairman, TEG

Patrons

Ms. Karishma V. Singh, Secretary Mr. Karan V. Singh, CEO, TCET, TIMSR, TIMSCDR

Program Chair

Dr. B.K. Mishra, Principal, TCET

Program Co-Chair

Dr. Kamal Shah, Vice-Principal, TCET

Advisory Committee

- 1. Dr. Venkat Yaramasu, Associate Professor, Northern Arizona University, United State.
- 2. Dr. C.B. Rotti, Scientist, TIER, France.
- 3. Mr. Eshan Arya, Assistant Professor, La Trobe University, Melbourne, Australia.
- 4. Dr. D. A. R. Babu, Ex-Scientist, BARC, Mumbai.
- 5. Dr. K.N. Vijaykumar, Professor, D.J. Sanghvi College of Engineering, Mumbai.
- 6. Dr. S.K. Dubey, Associate Professor, University of Mumbai.
- 7. Dr. Vinayak Kulkarni, Professor, University of Mumbai.
- 8. Dr. Suresh Wakchaure, Ex-Associate Professor, Mithibai College, Mumbai.
- 9. Mr. Saurabh Srivastava, Assistant Vice-President, Reliance Jio Info Comm Ltd.
- 10. Dr. Manojkumar Kowar, Ex-Director, DIET, Chattisgarh.
- 11. Dr. Saylee Gharge, Associate Professor, VESIT, Mumbai.
- 12. Mr. Dilip Motwani, Exam In-Charge and Associate Professor, VIT, Wadala, Mumbai

Technical Chair

Dr. Lochan Jolly, Dean SSW, TCET

Dr. R.R. Sedamkar, HOD, Ph.D. & Director-IQAC (NAAC)

Convener

Dr. Sunita Pachori, Assistant Professor & F.E In-charge, ES&H

Joint Convenor

Dr. Zahir Aalam, Professor- COMP & TPO

Dr. Sanjeev Choudhary, Associate Professor, MECH Department, Controller of Examination

Co-convenors

Dr. Krishnakant Mishra, Assistant Professor & Deputy F.E In-charge, ES&H Mr. Vijaykumar Yele, Assistant Professor & Deputy Controller of Examination

Keynote Speakers

Dr. Salil Varma, Scientific Officer (H), Chemistry division, BARC- Mumbai.

Treasurer

Mr. Yogesh Bhalekar–Assistant Professor & Deputy FE In-charge, ES&H Mr. Ashwin Pathak– Assistant Professor, ES&H

Publication Committee

Dr. Krishnakant Mishra, Assistant Professor & Deputy FE In-charge, ES&H Mr. Rohit Kumar Singh, Assistant Professor & Deputy FE In-charge, ES&H Dr. Karuna Nikum, Assistant Professor, ES&H Mr. Karthik Sankararaman, Assistant Professor, ES&H Mrs. Kshama Shukla , Assistant Professor, ES&H Dr. Achala Khandelwal , Assistant Professor, ES&H Mrs. Ekta Ronak Desai , Assistant Professor, ES&H

COPYRIGHT

Thakur College of Engineering & Technology, Mumbai, India

Copyright©2023 by the International TCET. Permission is given without charge to create digital or hard copies of portions of his work for personal or classroom use, provided that the copies are not made or disseminated for profit or commercial gain, and that the copies bear this notice and the entire citation on the first page. Copyrights on components of this work owned by parties other than the above mentioned bodies must be respected, and abstracting with credit is permitted. All additional copies, reprints, server postings, or list distributions require prior authorization and/or payment. Request permission to republish from the TCET Publications Department. Copying of articles with a code at the bottom of the first or last page is permitted if the per-copy fee specified in the code is paid through the Copyright Clearance Center.

Notice to Past Authors of MULTICON-W Published Articles

TCET intends to create a complete electronic archive of all articles and/or other material previously published by TCET, if you have written a work that was previously published by TCET in any journal or conference proceedings prior to 2015 and do not want it to appear in the TCET digital Library, please notify multiconw@thakureducation.org, stating the title of the work, the author(S), and where and when it was published.

ISBN Numbers ISBN: 979-8-9879839-3-5 Printed in India Thakur College of Engineering & Technology, Mumbai, India

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 levelsand is recognized and awarded by different certifying and accrediting bodies of India. Moreover, the institute is conferred an autonomous status for 10 years from 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 Humanities, Sciences and Technical Education (ICHSTE) is one of the conferences under the banner of MULTICON-W which attracted various scholars in the field of Humanities, Sciences and Technical education. ICHSTE 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 41 selected research papers on various topics such as basic and engineering sciences, humanities, skill development and technical education. All 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 ICHSTE was a team effort of Engineering Sciences and Humanities Department, 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 ES&H 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 acknowledge 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 proceeding.

Convener

Dr. Suntia Pachori, Assistant Professor F.E. In-charge, ES&H Department

Index

S.No	PAPER TITLE	PAGE NO.	
1	Study of Kinetic Stability and Oxidation of Some Amino Acids in Acidic Oxidant <i>Sainath Bhavsar, Sunita Pachori</i>	1 to 3	
2	Study of Integral Transform involving Bessel Functions and Modified Bessel Functions <i>Vinita Agarwal</i>	4 to 7	
3	Access of Health and Education for Street Children in Mumbai: A Study Report Ashwin Pathak, Ela Agarkar	8 to 10	
4	Synthesis, physiological and biological activity studies of oxadiazole derivatives of bicyclic heterocyclic compound <i>Jitendra Patil, Rajesh Kenny</i>	11 to 13	
5	Effect of Hard Chrome and its alloy Coatings on Wear Resistance and other characteristics of Base material in rolling process- A Literature Review <i>Sajjan Kumar Lal</i> , <i>V.R. Gaval, Sanjay Rukhande</i>	14 to 17	
6	Effect of Mass and Heat Transfer on MHD Free Convection Flow Past over Infinite Vertical Plate under Constant Heat Flux through a Porosity Medium <i>Satish Kumar</i>	18 to 23	
7	Strategies for Improving Interview Skills in Students Shrikrishna Sonawane, Bhumika Malhotra	24 to 26	
8	Diversity in the workplace for sustainable company development <i>Ela Agarkar, Kiran Sanap, Ashwin Pathak, Neha Mishra</i>	27 to 29	
9	Neurofilament nanocomposite protein as biomarkers to track neurological disorders and the success of treatment <i>Neha Mishra, Kiran Sanap, Ela Agarkar, Rohitkumar singh</i>	30 to 32	
10	Disease Prediction: Various Symptoms using Machine Learning Meghna Singh, Ashish Richhariya, Brijesh Gupta	33 to 36	
11	Advancement of Sensors in Iot applications Kshama Shukla, Karuna Nikum	37 to 40	
12	Automation of Seating Arrangement for Exams using Excel <i>Vikas Nagve, Soma Karmokar, Karishma Bhandari</i>	41 to 43	

13	A Review on Energy Security in India Karthik Sankararaman, Shivram Poojari	44 to 47
14	Evaluation of Application of Roller Compacted Concrete as the Pavement Material: A Review Yogita Sagare, Prajakta Kamble	48 to 54
15	Social Issues among people living with HIV in India <i>Manjiri Dorati, Aafiya Siddiqui</i>	55 to 57
16	Twenty-First Century Skills from the Perspective of NEP 2020 Jyoti Vanawe, Sarika Awasthi	58 to 60
17	Design And Development Of Automated Spray Painting Process Siddhesh mane, Suraj Singh	61 to 64
18	Emergence of Sustainability is tool model for Manufacturing Environment-A review Anup Chavan	65 to 69
19	Selective Harmonic Elimination using ANN Controller <i>Minal Bhoir</i>	70 to 73
20	Study of NEP 2020 and it's effects on the Student Life. <i>Radha Sonvadekar</i>	74 to 77
21	Imperative Aspects Influencing Transformation of Wind Energy <i>Achala Khandelwal</i>	78 to 82
22	Comparison of Asymmetrical Multilevel Inverter Topologies for Photovoltaic System <i>Ekta Desai, Archana Kulkarni</i>	83 to 87
23	Faculty Tracker using RFID and Raspberry PI Amol Joglekar	88 to 92
24	Invariant point results in cone metric space for Rational Expression Sneha Khandait, Sonal Gaikwad, Brijesh Gupta	93 to 95
25	Graphene: a wonder material <i>Shivani Singh</i>	96 to 98

26	Automatic Attendance Monitoring System for Students Archana Kulkarni, Priyanka Pehelke, Ekta Desai	99 to 103
27	Mangroves as Urban Open Space Case example Mumbai Saylee Soundalgekar, Shruti Deshpande, Ruchira Patkar	104 to 107
28	My City- Not A Utopia Esa Shaikh, Daniel D'souza, Dhruvin Soni	108 to 110
29	Investigating the impact of encroachment by the Hawkers in a planned neighbourhood: A case of Thakur Village, Mumbai <i>Anshul D Sinha, Bhakti Godambe, Smit Goghari</i>	111 to 118
30	Knowledge, Perception and Attitude of undergraduate students about plagiarism: A cross-sectional survey in Mumbai <i>Pooja Mehta, Kasturi Pradhan</i>	119 to 122
31	Heavy Metal Toxicity Present in the Mulund Salt Pans Meghna Talpade, Ayushi Singh	123 to 125
32	Rejuvenation of Historic Forts of Mumbai Arundha Nagargoje, Mitali Harmalkar, Vibhuti Mhatre	126 to 128
33	Survey Of Avenue Tree Diversity Of Mira Road, Thane District Subham Mishra, Bindu Gopalakrishnan	129 to 131
34	Radiation Damage Study Of Gallium-Arsenide Single Junction Solar Cell Ansari Abdul Wadood Mohammad Haroon, Kashi Vishwanath Sankarsubramanian	132 to 133
35	Stylistics as a tool for Enhancing Linguistic and Literary Competence: An Activity Based Teaching <i>Tulshiram Kudale, Hanmant Ashok Metkari</i>	134 to 136
36	Why Inclusive Growth is Top Priority of Nations Shiv Kumar Shrivastava	137 to 140

Study of Kinetic Stability and Oxidation of Some Amino Acids in Acidic Oxidant

Sainath Bhavsar Department of Engineering Sciences and Humaniti Thakur College of Engineering & Technology Mumbai, Maharashtra, India <u>sainath.bhavsar@tcetmumbai.in</u>

Abstract—Amino acid being a versatile chemical entity its oxidation is very important from a chemical point of view and it has more impact on the mechanism of metabolism by amino acid. Various kinetic investigations on the oxidation of amino acids have been carried out under various oxidants and varying experimental conditions. This paper focuses on the kinetic and mechanistic approach of the oxidation of various amino acids. The future scope of this study has also been stated at the end of this paper.

Keywords— Oxidation of amino acids, Kinetic study, Oxidants, Amino acid metabolism.

I. INTRODUCTION

Amino acids are the complex molecules which contains both amine and carboxylic acid groups. Amino acids served as the building block of body as they are the main constituent of the protein. Protein needed by human body for growth and well development of body. Proteins on hydrolysis give the mixture of amino acids which acts as chemical messengers for communication between cells. When the diet of high content of proteins is consumed then there is increase in the volume of urine which is the indication of oxidation of amino acid as the body is unable to store excess of proteins. The two groups of research scholar have been studied that the oxidation of amino acid is facilitated and amino group is excreted to the liver [1, 2]. Excess of amino acids converted into many useable products through deamination which converts nitrogen of amino acids into ammonia and liver converts it into urea in the excretory cycle. With the view of this, oxidation of amino acids is very important as per the chemical point is concern. Various kinetic investigations have been performed on the oxidation of amino acids by various oxidants under different experimental conditions [3, 4]. However, the mechanism is different in different reaction system. These oxidation evidences the profound mechanism reaction of decarboxylation and oxidative deamination [5]. Most of the amino acid contains the alkyl groups, but only the amino and carboxyl functional groups brought about the changes that made them useful in many of the chemical transformations and thus hydrocarbon moiety remains intact during these chemical changes. There are many different types of chemical reactions and wide variety of techniques may be employed to investigate the mechanism of oxidation of amino acids. Considerable amount of efforts have been performed to study the kinetics and reaction mechanism in solution phase. In many ways the investigations provides the most satisfactory way of testing of basic theories of reactions. The maximum attention of the chemists and researchers has been gained by the reactions in liquid phase Sunita Pachori Department of Engineering Sciences and Humanities Thakur College of Engineering & Technology Mumbai, Maharashtra, India <u>sunita.pachori@tcetmumbai.in</u>

as these reactions are more feasible and produce excellent result [6]. Oxidation of amino acids in solid phase needs more attention as limited amount of work has been done in this era [7].

II. RESULTS AND DISCUSSION

The major kinetic investigations are concerned with the reactions whose rates can be measured without the use of instrumental methods [8]. During recent years, due to development of new electronic techniques, a sound deal of efforts has been devoted to study the reactions that are very difficult to study by conventional methods. In general there are two kinds of problems that arise in any kinetic investigations, first is the establishment of the relationship between the velocity and various factors such as concentration, solvent, catalyst, ionic strength, temperature etc. and the second is to arrive at interpretations of the empirical laws in terms of reaction mechanisms. There are two key factors that decide the productivity of the reaction, Thermodynamics which explains the extent of reaction whereas the kinetic provides the information about the mechanism of the reaction.

Radhey S. Verma and co-workers [9] studied the rate of oxidation of various amino acids in aqueous sulphuric acid and perchloric acid solutions .It has been observed that the order of the reaction is two for a given concentration of listed acids. Various hypotheses for the mechanism of acid catalysis have been studied and found that Brunett's hypothesis worked excellent. The remarkable observation was that the amino acids with an even number of atoms in carbon chain are more easily oxidized in acidic media than those with odd number of atoms in carbon chain, which was in good agreement with the view of Pokrovskava. S.K.Joshi et al.[10] have been examined the kinetics of oxidation of amino acids such as Glycine, Alanine and Valine by Manganese (III) acetate in aqueous sulphuric acid medium. The rate law equation have been derived which shown that the reaction was first order in substrate, second order in Mn(III) and inverse first order in sulphuric acid. The inverse dependence on the concentration of sulphuric acid might be resulted from formation of protonated species of the substrate which is non-reactive in oxidation process.

Rao et al.[11] has investigated the kinetics of oxidation of glycine, alanine, serine, threonine aspartic acid, glutamic acid by permanganate in the presence and absence of silver ion. The order of the reaction was found to be one with respect to substrate and oxidant. The silver ion was responsible for catalyzing these reactions. B.Thimme Gowda and Mahesh Shetty[12] had employed twelve sodium salts of N-Chloroarylsulphonamide as oxidants for investigating the mechanism of two amino acids i.e. aspartic acid and glutamic acid. The reaction was found to follow second order kinetics in oxidant, fractional order in amino acid and shown the inverse dependence of concentration of hydrogen ions. In these entire Cl⁺ ion was an effective oxidizing species. From the study it has been observed that introduction of electron-withdrawing group enhance the ease of Cl⁺ions which further increases the oxidizing strength of the employed substrates.

Shanu Mathur et al.[13] has studied the kinetics of oxidation of Lysine with Chromium(VI) in perchloric acid medium. The order of reaction with respect to lysine was less than one and for chromium (VI) it was found to be one. It was also observed that increase in concentration of acid accelerates the rate of reaction. The final oxidation Products were identified as chromium (III) and 5-aminopentaldehyde. Dhan Raj, Manju Bala Yadav &Vijay Devra [14] studied the oxidation of serine by cerium(IV) in presence of Mn(III) as a catalyst. From the study it has been observed that formerly rate of reaction was slow in acidic media but when catalyst was introduced the reaction rate increased significantly. Ce(SO₄)₂ was found to be a reactive species. S.Parimala Vaijayanthi & N.Mathiyalagan[15] has carried out the oxidation of various amino acids by novel oxidant N-chloropyrazinamide (NCPZA) in acetic acid medium in presence of hydrochloric acid. The study revealed that the reaction was first order in novel oxidant and H+ and Cl-. The order with respect to amino acid was zero. One significant observation was noted that on addition of novel oxidant the rate of reaction retarded.

T. Sumathi et al.[16] have been investigated kinetic and mechanistic study of oxidation of L-methionine and Nacetyl L-methionine by Cerium (IV) in sulfuric acid medium. The sulfoxide forms of the substrate were found to be major oxidation products. Increase in concentration of acidic medium did not have any effect on the reaction rate. Under inert atmospheric condition polymerization process initiated which shown the generation of the free radicals. C.S.Chidan Kumar[8] and other investigated the kinetics of Mn(III)-Ala reactions in acid solutions. The stoichiometry in the reaction was found to be 2:1. It has been also investigated that the reaction was proceeds through the formation of transition state and the state was rigid and reaction was entropy controlled. K. Vivekanandam &R.Lakshmi Narayanan[17] has worked on the oxidative decarboxylation and deamination of essential amino acids by Nicotinium Dichromate (NDC) in perchloric acid medium. The reaction was found to be temperature dependent and follow pseudo-first order kinetics. B. L.Hiran and others [6] has found that the final oxidation product was aldehyde when oxidation of phenylalanine was carried out by PCC in DMF-water mixture in the presence of perchloric acid . The reaction was found to be first order in all respect and also it followed the Michelis-Menten mechanism. M.Sundar et al[18]. has studied the oxidation of lysine by oxone in a buffered medium concluded the non-existence of autocatalysis. Due to this further formation of Schiff base was discarded.

III. CONCLUSION

All the discussions made above emphasize the thermodynamic as well as catalytic dependency of oxidations of amino acids. From the literature survey it can be concluded that researcher can focus on the kinetic study of mixture of essential and non-essential amino acids, Research can be carried out in future with the view of following aspects:

- a) A conclusive evidence for reaction pathway
- b) Deciding the plausible mechanism of reaction
- c) Verifying the order of reaction
- d) Deciding various thermodynamic parameters such as activation energy, Gibb's free energy, effect of ionic strength, effect of change in temperature etc.

- M.A.Tarnopolsky et al. "Evaluation of protein requirements for trained strength athletes", *Journal of Applied Physiology*, 73(5),1992.
- [2] Ten Have et al., "Absorption kinetics of amino acids, peptides and intact proteins", *International journal of sport nutrition and exercise metabolism*", 17(S1), S21-S36,2007.
- [3] Sharma VK, Sharma K, Tiwari PS, Khare D, "Mechanism of quinquvalent vanadium oxidation of L-tryptophan in sulphuric acid medium," *Int. J.Pharm.Life Sci* 2: 1223-1225, 2011.
- [4] Khalid MAA, "Oxidative kinetics of ami no acids by peroxydisulphate sulphonamide:Effect of dielectric constant, 'Arabian Journal of Science and Engineering', 33: 199-210, 2007.
- [5] Katre Y.R., Singh A.K., Joshi G.K., Patil S., "Oxidation of DL-Valine and DL-alanine by sodium N-chloro-4-methyl benzene sulphonamide in micellar medium, A relative kinetic study", *Oxidation communication*, 29(1),137-146, 2006.
- [6] Hiran B., Jyoti Khuntwal, Khubilal, "Oxidation of phenyl alanine by pyridinium chlorochromate in acidic DMF –water medium, 'Arabian Journal of Chemistry', 9, S1801-S1806,2016.
- [7] Ajay Kumar Singh, Bhawana Jain, Reena Negi, Yokraj Katre, Surya P. Singh and Virender Sharma, "Kinetic study of oxidation of valine by N- bromopthalamide in presence of Iridium (III)Chloride as homogeneous catalyst", 'Synthesis and reactivity in inorganic, metal organic and Nano-metal chemistry,40,71-77,2010
- [8] C.S.Chidan Kumar, S.Chandraju, Netkal M. Made Gowda, Manganese (III) oxidation of alanine in aqueous ethanoic acid medium : A kinetic and Mechanistic study, 'Synthesis and Reactivity in inorganic, Metal-organic, and Nano-metal chemistry' 41(10), 1331-1337,2011.
- [9] Radhey S.Verma , Madhusudana J.Reddy, Vyayendra R.Shastry, "Kinetic study of homogeneous acid –catalysed amino acids by potassium permanganate in moderately concentrated acidic media", J.C.S Perkin II, 4, 469-473,1976
- [10] S.K.Joshi et al. "Oxidation of amino acid by manganese (III) in aqueous sulphuric acid", J.Chem.Pharm.Res.,3(1), 529-535, 2011.
- [11] V.Surender Rao, B.Sethuram, T.Navneeth Rao, "Kinetics of oxidation of some amino acids by KMnO₄ in a moderately concentrated H₂SO₄ medium in the presence and absence of Ag^{:**}, *International Journal of Chemical Kinetics*, Vol.XI, 165-173,1979.
- [12] B.Thimme Gowda, Mahesh Shetty, "Kinetics of oxidation of acidic amino acids and their monoamides by N-

chloroarylsulphonamides in aqueous acidic mecium", Journal of Physical Organic Chemistry, 17, 848-864, 2004.

- [13] Shanu Mathur, M.B.Yadav and Vijay Devra, "Oxidation of lysine by chromium (VI) in acid perchlorate medium: A kinetic study., *Int. J. Chem. Sci.* 13(20), 641-649, 2017.
- [14] Dhan Raj, Manju Bala Yadav &Vijay Devra, "Kinetic and mechanistic study of oxidation of serine by cerium (IV) in presence of manganese (III) as catalyst in aqueous acid medium", *International Journal of Current Research in Chemistry and Pharmaceutical Sciences*, 2(11),1-8, 2015.
- [15] S.Parimala Vaijayanthi & N.Mathiyalagan, "Kinetics of oxidation of amino acids by newly synthesized oxidant, Nchloropyrazinamide in aqueous acetic acid medium", *International Letters of Chemistry, Physics and Astronomy*, 6,1-8,2013.
- [16] T.Sumathi, P.Shanmugasundaram, G.Chandramohan, "A kinetic and mechanistic study on the oxidation of L-methionine and N-acetyl N-methionine by Cerium(IV) in sulphuric acid medium.", *Arabian Journal of Chemistry*, 9,S177-S184,2016.
- [17] K.Vivekanandan, R.Lakshminarayanan, "Oxidative decarboxylation and deamination of essential amino acids by nicotinium dichromate- A kinetic study", *International Letters* of Chemistry, Physics and Astronomy, 45, 66-72, 2015.
- [18] M.Sundar, D.Eswaramoorthy, S.KuttiRani, M.Palanichamy "Mechanistic investigation of the oxidation of lysine by oxone", J. Solution. Chem., 36, 1129-1137, 2007.

Study of Integral Transform involving Bessel Functions and Modified Bessel Functions

Vinita Agarwal Department of Engineering Scienses & Humanities Thakur College of Engineering and Technology Kandivali (East), Mumbai -400101, India vinita.gupta@thakureducation.org

Abstract - In this present paper, we investigated new and interesting form for an Integral Transform involving Bessel Functions and Modified Bessel Functions. This Integral Transform is evaluated in terms of the Humbert confluent hypergeometric function of two variables, which reduced to the generalized hypergeometric function and is interesting to derive some new results in special functions and polynomials. Being unified and general in nature, these integrals yield several known and new results as special cases.

Keywords- Integral Transform, Bessel Function, Generalized hypergeometric series.

I. INTRODUCTION

Special functions and integral transforms are widely used in physics, mathematics, and engineering. Several academics have researched the features of integral transforms and special functions because they are essential in many areas of applied mathematics and pure mathematics.

In this paper, we evaluate the values of some Laplace type Integrals involving the product of Bessel Functions and Modified Bessel Functions which are important & general in characteristic nature.

We recall here the following definitions required for the present study.

In this paper, we establish an integral transform involving the product of Bessel function $J_{\nu}(z)$ defined by [1]

& [2] and modified Bessel function $I_{\lambda}(z)$ defined by [4] as follows: $I = \int_{0}^{\infty} z^{2s} e^{-pz^{2}} J_{\nu}(az) I_{\lambda}(bz^{2}) dz \quad (1.1)$

Where s is an integer, $J_{\nu}(z)$ is the Bessel function of first kind of order v, $I_{\lambda}(z)$ is the modified Bessel function of the order $^{\lambda}$. For specific values of p, s, v and $^{\lambda}$, the above integral transform converts to some special functions and transforms like hypergeometric functions, modified Bessel function, Hermite function, Laguerre function, exponential function, trigonometric function.

The Bessel function, also referred to as the cylinder function, is any of a class of mathematical functions that was developed in 1817 while being researched by the German astronomer Friedrich Wilhelm Bessel while attempting to solve one of Kepler's planetary motion equations.

The Bessel function $J_{y}(z)$ of the first kind of order v is defined by defined by [1] & [2] the series,

$$J_{\nu}(az) = \left(\frac{a}{2}\right)^{\nu} \sum_{n=0}^{\infty} \frac{(-1)^{n} (z)^{\nu+2n}}{\Gamma(\nu+n+1) n!} \left(\frac{a}{2}\right)^{2n}$$
(1.2)

And well-known special functions are.

$$J_{-1/2}(z) = \sqrt{\frac{2}{\pi z}} \cos z \quad \text{and}$$
$$J_{1/2}(z) = \sqrt{\frac{2}{\pi z}} \sin z$$

The modified Bessel function $I_{\lambda}(z)$ of order λ is defined by [4] the series,

$$I_{\lambda}(bz^{2}) = (\frac{b}{2})^{\lambda} \frac{z^{2\lambda}}{\Gamma(\lambda+1)} e^{-bz^{2}} {}_{1}F_{1}(\lambda+1;2\lambda+1;2bz^{2}) \quad (1.3)$$

Where ${}_{1}F_{1}$ is the Gaussian hypergeometric function which is the special case of the generalized hypergeometric function [1969]

(p, q $\in N$; p $\leq q$) where the hypergeometric series converges and the Pochhammer symbol defined in terms of Gamma function as

$$(\eta)_{m} = \frac{\Gamma(\eta + m)}{\Gamma(\eta)} = \{ \begin{array}{l} \eta(\eta + 1)...(\eta + m - 1), \ m \in N\\ 1, \ m = 0 \end{array}$$
(1.4)

The Humbert confluent hypergeometric function of two variables is defined by [5] the series.

$$\psi_{1}(\alpha,\beta;\gamma,\eta;x,y) = \sum_{m=0}^{\infty} \sum_{n=0}^{\infty} \frac{(\alpha)_{m+n}(\beta)_{m}}{(\gamma)_{m}(\eta)_{n}} \frac{x^{m}}{m!} \frac{y^{n}}{n!}$$
(1.5)

$$\psi_{1}(\alpha,\beta;\gamma,\eta;x,y) = \sum_{m=0}^{\infty} \sum_{n=0}^{\infty} \frac{(\alpha)_{m+n}(\beta)_{m}}{(\gamma)_{m}(\eta)_{n}} \frac{x^{m}}{m!} \frac{y^{n}}{n!} = \sum_{m=0}^{\infty} \frac{(\alpha)_{n}}{(\eta)_{n}} \frac{y^{n}}{n!} {}_{2}F_{1}(\alpha+n,\beta;\gamma;x)$$
(1.6)

with

$$(\alpha)_{m+n} = (\alpha)_{m+n} = \frac{\Gamma(\alpha+m+n)}{\Gamma(\alpha+n)} * \frac{\Gamma(\alpha+n)}{\Gamma(\alpha)} = (\alpha+n)_m(\alpha)_n$$

Main result

In this section, we define the New Laplace type Integral Transform that is connected to the product of Bessel functions and Modified Bessel functions $L_{\nu,\lambda}^{s} = \int_{0}^{\infty} z^{2s} e^{-\xi z^{2}} J_{\nu}(az) I_{\lambda}(b z^{2}) dz$ (2.1)

The following transformation holds true:

$$L_{\nu,\lambda}^{s} = (\frac{1}{2})^{\lambda+1} (\frac{b}{\xi+b})^{\lambda} (\frac{a}{2})^{\nu} (\frac{1}{\xi+b})^{s+\frac{\nu+1}{2}} \frac{\Gamma(s+\lambda+\frac{\nu+1}{2})}{\Gamma(\nu+1)\Gamma(\lambda+1)} \times \psi_{1} [s+\lambda+\frac{\nu+1}{2},\lambda+\frac{1}{2};2\lambda+1;\nu+1;\frac{2b}{\xi+b},-\frac{a^{2}}{4(\xi+b)}] (2.2)$$

where
$$\operatorname{Re}(v) > -1, \operatorname{Re}(\lambda) > -1, \operatorname{Re}(s + \lambda + \frac{v - 1}{2}) > -1, \left|\frac{2b}{\xi + b}\right| < 1, \left|\frac{a^2}{4(\xi + b)}\right| < \infty$$

and ψ_1 is the Humbert confluent hypergeometric function of two variables defind by [5]

Proof: For convenience, let the left-hand side of the integral denoted by $L_{\nu,\lambda}^{s}$, applying (1.1) using (1.2), (1.3), (1.4) and change of order of integration, which is permissible under the conditions and integral is expressed as follows

$$L_{\nu,\lambda}^{s} = \int_{0}^{\infty} z^{2s} e^{-\xi z^{2}} J_{\nu}(az) I_{\lambda}(b z^{2}) dz \qquad (2.1)$$

$$L_{\nu,\lambda}^{s} = \int_{0}^{\infty} z^{2s} e^{-\xi z^{2}} \left(\frac{a}{2}\right)^{\nu} \sum_{n=0}^{\infty} \frac{(-1)^{n} (z)^{\nu+2n}}{\Gamma(\nu+n+1) n!} \left(\frac{a}{2}\right)^{2n} \left(\frac{b}{2}\right)^{\lambda} \frac{z^{2\lambda}}{\Gamma(\lambda+1)} e^{-bz^{2}} {}_{1}F_{1}(\lambda+\frac{1}{2};2\lambda+1;2bz^{2}) dz \quad (2.2)$$

$$= \left(\frac{a}{2}\right)^{\nu} \left(\frac{b}{2}\right)^{\lambda} \frac{1}{\Gamma(\lambda+1)} \sum_{n=0}^{\infty} \frac{\left(-\frac{a^{2}}{4}\right)^{n}}{n! * \Gamma(\nu+n+1)} \int_{0}^{\infty} z^{2(s+\lambda+\frac{\nu}{2}+n)} e^{-(\xi+b)z^{2}} {}_{1}F_{1}(\lambda+\frac{1}{2};2\lambda+1;2bz^{2}) dz \quad (2.3)$$

By using the Table of Integrals, Series, and Products' results, [3, page no. 815, eq. no. 7.522]

$$\int_{0}^{\infty} x^{\sigma-1} e^{-\mu x} {}_{m} F_{n}(\alpha_{1,\alpha_{2},\dots,\alpha_{m}};\beta_{1,\beta_{2},\dots,\beta_{n}};\lambda x) dx = \Gamma(\sigma) \mu^{-\sigma} {}_{m+1} F_{n}(\alpha_{1,\alpha_{2},\dots,\alpha_{m}},\sigma;\beta_{1,\beta_{2},\dots,\beta_{n}};\frac{\lambda}{\mu})$$
(2.4)
(with $m \le n$, $\operatorname{Re}(\sigma) > 0$, $\operatorname{Re}(\mu) > 0$ and if $m < n$; $\operatorname{Re}(\sigma) > \lambda$ if $m = n$)

Equation (2.3) becomes,

$$L_{\nu,\lambda}^{s} = \left(\frac{a}{2}\right)^{\nu} \left(\frac{b}{2}\right)^{\lambda} \frac{1}{\Gamma(\lambda+1)} \sum_{n=0}^{\infty} \frac{\left(-\frac{a^{2}}{4}\right)^{n}}{n! * \Gamma(\nu+n+1)} \Gamma(s+\lambda+\frac{\nu+1}{2}+n) \left(\xi+b\right)^{-\left(s+\lambda+\frac{\nu+1}{2}+n\right)} {}_{2}F_{1}\left(\lambda+\frac{1}{2},s+\lambda+\frac{\nu+1}{2}+n;2\lambda+1;\frac{2b}{\xi+b}\right)$$
(2.5)

after little simplification the right-hand side of equation (2.5) becomes

$$L_{\nu,\lambda}^{s} = (\frac{1}{2})^{\lambda+1} (\frac{b}{\xi+b})^{\lambda} (\frac{a}{2})^{\nu} (\frac{1}{\xi+b})^{s+\frac{\nu+1}{2}} \frac{\Gamma(s+\lambda+\frac{\nu+1}{2})}{\Gamma(\nu+1)\Gamma(\lambda+1)} \times \sum_{n=0}^{\infty} \sum_{\kappa=0}^{\infty} \frac{(-\frac{a^{2}}{4(\xi+b)})^{n} (\frac{2b}{\xi+b})^{\kappa}}{n!} \frac{(\lambda+\frac{1}{2})_{\kappa} (s+\lambda+\frac{\nu+1}{2}+n)_{\kappa}}{(2\lambda+1)_{\kappa} (\nu+1)_{n}}$$
(2.6)

The double series in equation (2.6) is Humbert confluent hypergeometric function of two variables defined by [5] & After simplification, the desired outcome is obtained.

$$L_{\nu,\lambda}^{s} = (\frac{1}{2})^{\lambda+1} (\frac{b}{\xi+b})^{\lambda} (\frac{a}{2})^{\nu} (\frac{1}{\xi+b})^{s+\frac{\nu+1}{2}} \frac{\Gamma(s+\lambda+\frac{\nu+1}{2})}{\Gamma(\nu+1)\Gamma(\lambda+1)} \times \psi_{1}(s+\lambda+\frac{\nu+1}{2},\lambda+\frac{1}{2};2\lambda+1;\nu+1;\frac{2b}{\xi+b},-\frac{a^{2}}{4(\xi+b)})$$
(2.7)

Where ψ_1 is given by (1.5) and (1.6). which is the required result.

SPECIAL CASE

In this paper, our integral transform is unified in nature and covers a wide spectrum of generality. We have derived several new special functions as their special cases by appropriately specializing the parameters of the product of Bessel Functions and Modified Bessel Functions in our main integral transform. We were successful in obtaining many important formulas for specific parameter values in both engineering and physics.

CONCLUSION

This paper establishes a unified integral transform involving Bessel functions and modified Bessel functions, which can be extended to produce other integrals and extend existing results. As a specific instance of our primary findings, several other integrals can be produced involving exponential function, Gamma function, hyperbolic function, Laguerre and Hermite polynomials [6,7]. Since the function and polynomial occurring in this integral are general in nature, these results can be extended further to provide interesting unifications and extensions of many new and known results.

- [1] Exton, H. (1982). Hypergeometric functions of three variables, J. Indian Acad. Math., 4, 113-119.
- [2] H.M. Srivastava and H.L. Manocha, A Treatise on generating functions, Halsted Press (Ellis Horwood Limited, Chichester), John Wiley and Sons, New York, 1984.
- [3] I.S. Gradshteyn and I.M. Rhyzik, Table of Integrals, Series and Products, 5th ed. Academic Press, New York 1994.
- [4] G.N. Watson, Treatise on the theory of Bessel function, 2nd ed. Cambridge University Press, Cambridge 1944.
- [5] A.P. Prudnikov et al, Integrals and Series, Vol.3, More special functions, Gorden and Breach Science Publishers, New York, 1990.
- [6] E.D. Rainville, Special Functions, The Macmillan Company, New York 1960.
- [7] G.N. Watson, Treatise on the theory of Bessel function, 2nd ed. Cambridge University Press, Cambridge 1944.

Access of Health and Education for Street Children in Mumbai: A Study Report

Ashwin Pathak Engineering Sciences & Humanities Thakur College of Engineering & Technology Mumbai, India ashwin.pathak@thakureducation.org

Abstract: Living on the street in harsh and garish conditions is challenging for adults and further it becomes extremely difficult for children to survive. Living in the metropolitan cites, working on the streets, they are unable to take the advantage of various opportunities. The paper discusses about the access of health and education of street children in Mumbai and examine their rights as human beings. Quantitative and qualitative research methods were used on approximately 100 children and their data was collected on individual basis by interview as well as observations. The result explains about the primary causes such as extreme poverty for collective number of street children, where lack of awareness and facilities related to opportunities in education and health keep away the children from school and health camps. The exposure of severe situations at such an early age creates loss of innocence, engaging in unfair and illegal means, which forces the children to take wrong path in life. Many Non-Profit Organisations (NGO) are working with the agenda to provide basic rights to the street children.

Keywords: health and education, street children, NGO

I. INTRODUCTION

Due to expansion of urbanisation at a faster rate, nation need to identify the solution of uncontrolled and unplanned population. A paradigm shift is observed in migration of people from rural area to urban areas for better financial prospects. This leads to increased population in Metropolitan cities like Mumbai as compared to available permanent housing shelter. Hence, there is no other option for this population to settle in temporary structures such as roadside trees, dwelling into pavements, railway station, etc. The group of street children population in urban areas is increasing so rapidly that it has become a serious concern for the society as it is resulting into increase in poverty rate, drug addiction rate, etc. Researcher [1] claims that compared to the poor people in urban area, these migrated population is more stern and helpless, hence there is a huge need of resources and welfare services to be arranged by the society so that they can be uplifted [2]. Being the most important asset of society, a huge number of children are far away from basic facilities, healthcare, etc. which is considered to be the serious issue faced by the Mumbai city. This paper deals with the Street children, who are the children working on the streets or living on the streets without having individual identity ageing between 5-15 years.

Ela Agarkar Engineering Sciences & Humanities Thakur College of Engineering & Technology Mumbai, India ela.agarkar@thakureducation.org

Every year, more than 47,000 children's are found to be on streets of Mumbai. Out of this number, approximately 1200 students are living in railway premises such as train and platforms. As per gender based survey, approximately 70% boys & 30% girls were found. These children experience physical and verbal torture and in many cases, sexual abuse also. Around 24% of children in the age-group of attending school, were found to be illiterate and engaged in earning for livelihood like selling flower, newspaper, rag picking, begging, etc. Remaining 66% of street children live with their parents at temporary structures.



Fig 1: Various aspects compelling street children to work

Few children who are not residing with families had reached streets due to the lack of opportunities at source, disturbed relationships, displacement by BMC, kidnapping, etc. 15% of such children are indulged in consumption of drugs, tobacco, etc. As these children are on their own, they have to look after themselves. 25% of these children admitted about not getting proper regular meal on all days. 80% of children were not aware about the help and assistance to be received from different organisation. For street children, more night shelters should be started with access to food and nutrition, drinking water, and sanitation facilities and link them with the education system as per mandatory provisions of the Right of Children to Free and Compulsory Education (RTE) Act 2009 [6].

II. METHODOLOGY

The paper discusses about the situation of availability of health and education for street children in densely populated city of India such as Mumbai. It also explains the intervention of non-profit organisation for ensuring the rights of helpless children in the following exploratory study. The study of accessibility of health and education in Mumbai is taken into consideration based on children living with or without parents [4]. During the interview with some social workers and NGOs, it was identified that denial in access of health and education leads to child labour, extreme poverty, lack of importance of health camps [3][5].



Fig 2: Reasons for working on Streets

III. OBJECTIVE

- Understanding the condition of family, economic, educational background of children on street of Mumbai.
- 2) Understanding the problem faced by street children, reason of living on streets, health problems and future aspiration of children on street of Mumbai

Statistics	12 Nos.
Gender	Boys & Girls
Data	Random interviews, questionnaire list, case
Collection	studies
Data Analysis	Descriptive report, category wise distribution

Table 1: Survey Details of Street Children

The data was collected and analysed parallel and list of questions was modified as per the comments of children. The recording of interview with children was not done as they were not comfortable with recording. The participation in interview was by consent and can be withdrawn any time as the reason for taking an interview was known to them (i.e. Research work).



The interview and notes prepared during interview is stored by individual volunteer without name of children and are tapped with labelled numbers. The interview was conducted specifically in their mother tongue language. The study was conducted at particular specific sites with a very small group of children. The total 8 interviews were conducted at different sites for a limited time and resources. Due to various reasons, some parents as well as respective children were not supportive for interview. Due to the limitations of manpower, the volunteers were unable to connect with issues other than health and education. The volunteers interviewed around 12 children's based on which case study report is prepared. The two case studies discussed are as follows-

Case Study 1:

Vinay was seen working with vegetable vendor at street of Malad west (Natraj Market). He is 12 years old living in Mumbai along with family where his father passed at early age. They are basically from small village Kaimur in Bihar. He earns his livelihood by distributing vegetables at different places nearby market in morning and in evening he stay on stall as helper for his owner. He was going to school earlier but as father is no more, family faces extreme financial crisis therefore he started working. His mother is also working at three slum house which adds as a support for family livelihood. Vinay earns about 1800Rs monthly and his mother earns about 1500Rs monthly from each house which is not enough for the family to fulfil the dreams. He wanted to go to school as many NGOs nearby offer free education but due to time constraints of working hours he is unable to attend. The health of Vinay was not bad as his owner provides lunch and dinner regularly but has a respiratory problem due to which he takes a holiday in a month at least 5 to 6 times. The health of his mother is not good as she is weak in her immunity and cold, cough, fever and body ache is common. They visit the doctor in slum but the prescribed medicine and said number of visit to doctor is not taken seriously due to which problem continues. They are not aware about nearby government hospital, where in minimal amount medication can be taken. Vinay knows the reason of his respiratory problem but he can't leave his job otherwise he will be unable to help financially, similarly his mother doesn't earn so much that they can have good healthy food resulting into good immunity. "Vinay and his mother love each other a lot and they both care for each other" said by their neighbours, peer and friends.

Case Study 2:

Geeta was seen picking a rag at Jogeshwari railway track in the mid-summer at 1.30pm afternoon. She at 10 years of her age is doing the work for her livelihood as she stays with her maternal uncle who works in restaurant & bar. Almost all his earning he spent in drinking alcohol due to which Geeta needs to do some work. Her mother met with a train accident, after a year approximately her father also committed suicide. Since then she is staying with her uncle. She says, "I like school because in school, children get new dresses, food and games". She was not aware about the free education facilities by NGOs and as it was informed she started crying and pleaded to provide the admission in such school. The health of Geeta was not well as she was having some skin diseases which volunteers got to know by seeing her. When it is asked by the volunteers about rashes on skin, she told "Machhar ne kat liya hai" She was unaware that she is affected by leprosy for which she needs to consult a doctor. The volunteer gave the information about her health and also conveyed to consult doctor for the skin related issue. At last she was very happy when volunteer said "Aapka interview hogaya". She started smiling and asked to come regularly so that she can talk to volunteers about her progress.

IV. RESULT & DISCUSSION

Children working on the street has different situations and constraints subject to their needs. These conditions need to be considered in positive manner by intervening locally and specifically for their upliftment based on the respective requirements [7]. The positive approach is to be followed rigorously for the healthcare betterment and educational rights of the deprived individuals. Lots of efforts will be necessary for rendering help in terms of medication and education. The nutritious low cost meals can be provided so that more children can be attracted towards the centre. More the children visiting, more will they understand the benefits of having good education and health.

V. CONCLUSION

The working street children need a specific and individual attention as they are not exposed to many schemes or ways for ease in access of health and education. The needs are different at different places and in different situations but it is essential to first identify the requirement in depth and then provide the solution with the help of health service providers as well as free education providers NGOs. Many outreach programmes to be conducted to understand the root cause of problem which can be tackled by addressing the symptoms of cause.

ACKNOWLEDGEMENT

The authors would like to thank Thakur College of Engineering and Technology for providing the opportunity. The statements made herein are solely the responsibility of the authors.

- Rubenson B. 2005. Working children's experiences and their right to health and well-being. Available Royal Tropical Institute Library, Amsterdam
- [2] Henry A. 2002. Street Children Their lives today, their hopes for tomorrow.
- [3] Berti R, Rolnitzky L, Zylbert S. 2001. Comparison of the health status of children using a school based health centre for comprehensive care. Journal of Paediatrics Healthcare, 15, 244-50
- [4] Dachner N, Tarasuk V. 2002. Homeless squeegee kids-food insecurity and daily survival. Social Science and Medicine, 54, 1036-1045.
- [5] Fassa A, Facchini L, Marinel M, Christiani D. 2000. Child Labour and Health: Problems and Perspectives. International Journal of Occupational and Environmental Health, 6:1; 56-62.
- [6] Indian Council of Child Welfare. 1997. ICCW: Working Children in Urban Delhi: A study of their life and work.
- [7] Mitra S. 1994. Factors in the socio cultural environment of child labourers: a study in a small scale leather goods industry in Calcutta. Occup. Environ Med. 1994 Dec;51(12):822-5.

Synthesis, Physiological and Biological Activity Studies of Oxadiazole Derivatives of Bicyclic Heterocyclic Compound

Jitendra Baliram Patil Department of Engineering Scienses & Humanities Thakur College of Engineering and Technology, Mumbai, India jitendra.patil@tcetmumbai.in

Abstract—In this study, Oxa-3,4-diazacyclopentadiene derivatives were synthesized by oxidative cyclization of hydrazides of benzoic acid. These hydrazides were prepared from the condensation of suitable aldehyde and mono-benzoyl hydrazide. Synthesized compounds identified on the basis chemical and physical analysis. Synthesized have been tested for their antibacterial activity and physiological studies.

Keywords—Oxa-3,4-diazacyclopentadiene derivatives, bicyclic heterocyclic compound, 3-phenyl-spirobenzopyrrole, antimicrobial activity, physiological studies, hydrazides of benzoic acid

I. INTRODUCTION

Benzopyran-2-ones derivatives, naturally occurring as well as synthetic compounds, show antibacterial activities. Coumarin-2-one derivatives of oxa-3,4diazacyclopentadiene and novel heterocyclic compund.³⁻⁴ 3substituted-5-phenyl-oxa-3,4-diazacyclopentadiene bicyclic heterocyclic compound synthesis in literature⁵⁻⁶, till any report on the synthesis of 4-substituted-5-phenyloxadiazolyl-coumarin-2-ones are mentioned. Also, 3phenyl-spirobenzopyrrole has been reported for its antifungal, antibacterial and anti-inflammatory.⁷⁻⁹

The oxidation methods used for the synthesis of 2,5substituted oxadiazole which employ the synthesis of intermediate to cyclization by its oxidative to form substituted oxadiazole compunds. Microwave mediated onepot synthesis oxa-3,4-diazacyclopentadiene by mono acyl hydrazide and benzoyl chloride has been reported,¹⁰⁻¹² but not single step synthesis methods using mono acyl hydrazide and aldehyde has been mention in the literature. The successfully isolated products were found to be colorless to faint yellow in colour and characterized based on their spectral analysis. This paper we report the synthesis, physiological and biological activity of coumarin-2-one and 3-phenyl-spirobenzopyrrole derivatives of oxadiazoles.¹³⁻¹⁵

II. BIOLOGICAL ACTIVITY

The synthesized molecules of oxadiazole derivatives of bicyclic heterocyclic compound were screened against E.coli and S. aureus using tube dilution technique.

III. RESULT AND DISCUSSION

4-formylcoumarin(1-4), was synthesized following the referenced method.15-16 For the preparation of the desired compounds, the cyclisation of 2H-1-benzo/

Rajesh S. Kenny Mahirndra Pharma ltd., rajeshkenny@yahoo.com

benzocoumarin-4-formyl (1-4) with monoaryl hydrazide (5-10) to form a hydrazides of benzoic acid. this hydrazides by oxidation using PbO4 yielded oxa-3,4-diazacyclopentadiene derivatives of bicyclic heterocyclic compound (11-21) as mention in Scheme I (Table I). The synthesized products were confirmed by chemical and physical analysis. we successfully synthesized oxadiazoles Similarly. derivatives of benzopyrrole following the above reactions . The derivatives mono substituted hydrazides (26-27) require for the synthesis were mentioned in Scheme II. 3-phenylbicyclo[3H-indoline]-2,4-(1H)diones(22-23).Synthesized compounds on reaction with mono chloroacetate in the presence of sodium hydride i to give esters compounds(24-25).. The syntheses of monohydrazide (26-27). The isolated hydrazides were finally condensed with derivatives of benzaldehydes (28-32) and changes into oxa-3,4diazacyclopentadiene derivatives of indole (33-41) follows the same method as used for 4-formylcoumarin.

IV. EXPERIMENTAL

IR spectra were carried out in FTIR-4200 spectrophotometer. NMR spectra were measured on a Varian Mercury 400 .

General Procedure A: Syntheses of 2,5-disubstituted-1,3,4-oxadiazole (11-21)

Coumarin-4-formyl (1-4) and hydrazides compounds 5-10 were heated with acetic acid, cooled to room temperature. and PbO_4 and acetic anhydride were mixed in the reaction mixture heated further for 2 hrs. Poured the cooled reaction mixture in ice water mixture. The solid thus filtered, dried and purified.

7-Methyl-4-oxadiaole-2-coumarin 11

IR -2925, 2832, 1715,1593, 1543, 1512, 1363, 1253, 1193, 830 and 732. NMR data: 2.59 (s, 3H), 6.93 (s, 1H), 7.21 (m, J = 7.5 Hz, 2H), 7.64-7.72 (m, 3H), 7.99 (m, J = 7.9 Hz, 2H), 9.22 (d, J = 7.7 Hz, 1H).

4-Chlorophenyl-4-diazacyclopentadienecoumarin 12 NMR data :3.62 (s, 3H), 7.25 (m, 1H), 7.23 (d, 2H), 7.59 (t, J = 7.5 Hz and J = 7.7Hz, 1H), 7.65(t, J = 7.6 Hz and J = 7.8 Hz, 1H), 7.72 (d, J = 7.8 Hz, 1H), 8.19(d, J = 7.8 Hz, 1H), 8.99 (d, J = 7.8Hz, 1H).

7-Methoxy-4-oxadiaole-2-coumarin 13

NMR data: 2.40 (s, 3H), 3.95 (s, 3H), 7.12-7.15 (d, 3H), 8.13 (d, J = 7.8 Hz, 2H), 9.23 (d, J = 7.8Hz, 3H), 9.29(m, J = 7.8Hz, 2H).

4-Chlorophenyl-4-diazacyclopentadienecoumarin 13

NMR data :3.62 (s, 3H), 7.25 (m, 1H), 7.23 (d, 2H), 7.59 (t,

J = 7.5 Hz ,1H), 7.69(t, J = 7.6 Hz,1H), 7.72 (d, J = 7.8 Hz, 1H), 8.19(d, J = 7.8 Hz, 1H), 8.99 (d, J = 7.8Hz, 1H).

6-Methylphenyl-4-(1-oxa-3,4-diazacyclopentadiene)-2coumarin 14

NMR data:2.53(s, 3H), 7.23 (m, 1H), 7.39 (m, J = 7.6 Hz, 1H), 7.47 (d, J =7.7 Hz, 1H), 7.55-7.63 (m, 3H), 8.48 (m, J = 7.9 Hz, 2H), 8.83 (m, 1H).

4-[5-(2-Methyl)-6-Methyl-phenyl-4-(1-oxa-3,4-

diazacyclopentadiene)-2-coumarin 15

NMR data: 2.43 (s, 3H), 5.57 (m, 3H), 6.26 (m, 1H), 7.59(d, J = 7.8 Hz, 1H), 7.69-7.71 (d, 4H), 7.83 (d, J = 7.6 Hz, 1H), 8.51(d, J = 7.8 Hz, 1H).

6-Methyl-4-[5-(3-nitro)-phenyl-6-Methyl -phenyl-4-(1-oxa-3,4-diazacyclopentadiene) -2-coumarin 16

NMR data: 2.69(s, 3H), 7.59 (d, 1H), 7.73(m, J = 7.8 Hz, 1H), 7.63(t, J = 7.8 Hz, 1H), 7.97 (m, J = 7.9 Hz and J = 7.9 Hz, 1H), 8.79(m, J = 7.9 Hz and J = 7.9Hz, 2H), 8.82 (d, 1H), 9.21 (d,1H).

5-Nitrophenyl-6-Methyl-phenyl-4-(1-oxa-3,4-

diazacyclopentadiene)-2-coumarin 17

NMR data: 2.69 (s, 3H), 7.36(s, 1H), 7.32(m, J = 7.9 Hz, 1H), 7.51(d, J= 7.9 Hz, 1H), 8.49 (t, J = 8.2Hz, 2H), 8.32(t, J = 8.3Hz, 2H), 8.76 (s, 1H).

4-[5-(2-nitro)-5-phenyl-4-(1-oxa-3,4-diazacyclopentadiene) -2-coumarin 18

NMR data: 7.31 (s, 1H), 7.69-7.78 (t, 5H), 7.88(m, J = 7.8 Hz, 1H), 7.91 (m, J= 7.9 Hz, 1H), 8.78 (m, J = 7.8 Hz, 1H), 9.42(t, J = 7.8 Hz, 1H).

2-Chlorophenyl-4-(1-oxa-3,4-diazacyclopentadiene) -2coumarin 19

NMR data: 7.36 (s, 1H), 7.16-7.19(d, 5H), 7.84 (t, J = 7.6Hz, 1H), 8.49 (t, J = 7.8 Hz, 1H), 8.91 (m, J = 7.8 Hz, 1H), 9.19 (m, J = 7.8 Hz, 1H).

4-[3-Nitrophenyl-4-(1-oxa-3,4-diazacyclopentadiene)]-2Hbenzocoumarin 20

NMR data:6.95 (s, 1H), 7.25 (d, J = 7.6 Hz, 1H), 7.59 (t, J = 7.6 Hz and J = 7.6 Hz, 1H), 7.89 (t, J = 7.8 Hz and J = 7.8 Hz, 1H), 7.63(d, J = 7.6Hz, 1H), 7.73(t, J = 7.6Hz and J = 7.6Hz, 1H), 7.94 (d, J = 7.5 Hz, 1H), 8.45 (d, J = 7.6 Hz, 1H), 8.59 (d, J = 7.6 Hz, 1H), 8.41 (d, J = 7.6 Hz, 1H), 8.99(s, 1H)

5-Phenyl-4-(3,4-diazacyclopentadiene))-2-benzocoumarin 21

NMR data:7.39 (m, J = 8.5 Hz, 1H), 7.43 (s, 1H), 7.59 (d, J = 7.8 Hz and J = 7.6 Hz, 1H), 7.55-7.66 (m, 5H), 8.12 (d, J = 8.4Hz, 1H), 8.29 (d, J = 8.4 Hz, 1H)

Procedure for 3-phenyl-bicyclo[3-indole-3,2-thiazolidine]-2,4-diones 33-41

5-Phenyl-3,4-diazacyclopentadiene methyl bicyclo [3H-indole-3,2-thiazolidine]-2,4(1H)-dione 33

NMR data:3.89 (m, J =14.0 Hz, 1H), 4.49(m, J = 14.6 Hz, 1H), 5.29 (d, J = 12.2Hz, 1H), 5.42 (d, J = 15.0 Hz, 1H), 6.91 (m, J = 7.6 Hz, 1H), 7.03-7.10(m, 6H), 7.35(s, 1H), 7.50-7.53 (m, 3H), 7.59 (d, J = 7.3 Hz, 1H).

5-(4-Methyl)phenyl- oxa-3,4-diazacyclopentadiene methyl-3phenyl-spiro[3H-indole-3,2-thiazolidine]-2,4(1H)-dione 34 NMR data: 2.53 (s, 3H), 3.93(t, J = 14.6 Hz, 1H), 4.59 (d, J = 15.6 Hz, 1H),5.34 (d, J = 15.1 Hz, 1H), 5.45 (t, J = 15.1 Hz, 1H), 7.03-7.15 (m, 6H), 7.20 (s, 1H), 7.48-7.56 (m, 3H), 7.67 (d, J = 7.2Hz, 1H), 7.97 (t, J = 7.2 Hz, 2H).

General Procedure for synthesis of substituted-3-phenylbicyclo [3H-indole-3,2-thiazolidine]- 2,4(1H)-diones 33-41 3-phenyl-spiro[3H-indole-3,2-thiazolidine]-2,4(1H)-diones 33-41 were synthesized by using the same procedure as mention for 2,5- disubstituted oxa-3,4diazacyclopentadiene.

5-(4-Methyl)phenyl-1-(3,4-diazacyclopentadiene) methyl-3-phenyl-spiro[3H-indole-3,2-thiazolidine]-2,4(1H)-dione 33 NMR data:2.43 (s, 3H), 3.90 (d, J = 15.7 Hz, 1H), 4.42 (d, J = 15.7 Hz, 1H), 5.34 (d, J = 16.2 Hz, 1H), 5.35 (d, J = 16.2 Hz, 1H), 6.83 (d, J = 16.1 Hz, 1H) 5-Phenyl-1,3,4-oxadiazolemethyl-

3-phenyl-spiro[3H- indole-3,2-thiazolidine]-2,4(1H)-dione 34 NMR data: 3.8(t, J = 15.3 Hz, 1H), 4.47 (d, J = 15.3 Hz, 1H), 5.05 (d, J = 16.2 Hz, 1H), 5.25 (t, J = 16.2 Hz, 1H), 6.92 (d, J = 7.8 Hz, 1H), 7.00-7.12 (m, 6H), 7.25 (s, 1H), 7.46-7.52 (m, 3H), 7.55 (d, J = 7.1 Hz, 1H), 7.96 (d, J = 7.1 Hz, 2H).

4-methoxyphenyl-spiro[3H-indole-3,2-thiazolidine]-2,4dione-1-yl-hydrazide 27

NMR data: 3.34 (s, 3H), 3.77 (d, J =15.9 Hz, 1H), 4.19 (d, J = 15.9 Hz, 1H), 4.26 (s, 2H), 4.45(d, J = 7.8 Hz, 1H), 7.02-7.12 (m, 7H), 7.30 (d, J = 7.8 Hz, 2H),7.47 (d, J = 7.3 Hz, 1H), 7.85 (d, J = 7.8 Hz, 2H).

4-Methoxyphenyl-1,3,4-(3,4-diazacyclopentadiene)methyl-3-phenyl-spiro[3H-indole-3,2-thiazolidine]-2,4(1H)-dione 35

NMR data:3.87 (s, 3H), 3.90 (d, J = 15.3 Hz, 1H), 4.40 (d, J = 15.3 Hz, 1H), 5.03 (d, J = 16.2 Hz, 1H), 5.22 (d, J = 16.2

Hz, 1H),6.93 (d, J = 8.3 Hz, 1H), 6.98-7.12 (m, 8H), 7.26 (s, 1H),7.46 (d, J = 7.3 Hz, 1H), 7.90 (d, J = 9.2 Hz, 2H).

5-(3-Nitro)phenyl-1,3,4- oxa-3,4-diazacyclopentadiene methyl-3-phenyl-spiro[3H-indole-3,2-thiazolidine]-2,4(1H)dione 36

NMR data: 3.90 (d, J = 15.4 Hz, 1H), 4.40 (d, J = 15.4 Hz, 1H), 5.05 (d,J = 16.1 Hz, 1H), 5.25 (d, J = 16.1 Hz, 1H), 6.90 (d, J = 7.9Hz, 1H), 7.02-7.16 (m, 6H), 7.30 (t, J = 7.7 Hz and J = 7.7 Hz, 1H), 7.50 (d, J = 7.4 Hz, 1H), 7.73 (t, J = 7.9 Hz and J = 7.4 Hz, 1H), 8.31 (d, J = 7.4 Hz, 1H), 8.41 (d, J = 8.3 Hz, 1H), 8.80 (s, 1H).

5-Phenyl-3,4-diazacyclopentadiene-3-(4-methoxy)-phenylspiro[3H-indole-3,2-thiazolidine]-2,4(1H)dione 37

NMR data:(CDCl3): 3.56 (s, 3H), 3.99 (d, J = 15.3 Hz, 1H), 4.38 (d, J = 15.3 Hz, 1H), 5.03 (m, J = 16.3 Hz, 1H), 5.29 (d, J = 16.3 Hz, 1H), 6.56 (d, J = 9.2Hz, 2H), 6.93 (d, J = 9.2 Hz, 3H), 7.12 (t, J = 7.5 Hz, 1H), 7.48-7.55 (m, 5H), 7.96 (t, J = 8.3 Hz, 2H).

4-Chlorophenyl-3,4-diazacyclopentadiene-3-(4-

methoxyl)phenyl-spiro[3H-indole-3,2-thiazolidine]2,4(1H)dione 38

INMR data: =3.49(s, 3H), 4.02 (d, J = 15.6 Hz, 1H), 4.17 (d, J = 15.6 Hz, 1H), 5.37 (d, J = 16.3 Hz, 1H), 5.35 (t, J = 16.8 Hz, 1H), 6.60 (t, J = 9.0 Hz, 2H), 6.85 (d, J = 9.0 Hz, 2H), 7.07-7.15(m, 2H), 7.34 (t, J = 7.4 Hz and J = 7.8 Hz, 1H), 7.64-7.68(m, 3H), 7.86 (d, J = 8.6 Hz, 2H).

Table 3:Absorption spectra of substituted oxadiazole (11-21) and derivatives of biccyclo[3H-indole-3,2-thiazolidine] (33-41)

Sr.	R,R2, R3 and R3	λma x	Sr.	R and R'	λma x
11	R2 = CH3	390	21	R =3NO2, R3- R3=C4H4	410
12	R = 4 O CH3, R2 = CH3	380	33	R' = R = H	390
13	R = 2 Cl, $R2 = CH3$	420	34	R' = H, R = 4- CH3	360
14	R3 = CH3	395	35	R' = H, R = 4-0 CH3	310
15	R = 2 CH3, R3 = CH3	380	36	R' = H, R = 3-NO2	370
16	R = 3 NO2, R3 = CH3	360	37	R' = 4-OCH3, R = H	380
17	R = 4 NO2, R3 = CH3	330	38	R' = 4-OCH3, R = 4-Cl	370
18	R1-R2 = C4H4	360	39	R' = 4-OCH3, R = 4- CH3	380
19	R = 2 Cl, R1-R2= C4H4	360	40	R' = 4- OCH3, R = 4- OCH3	380
20	R3-R4 = C4H4	360	41	R' = 4- OCH3, R = 3-NO2	380

Table 4 **Antibacterial Screening** substituted oxadiazole(11-21) and derivatives of spiro[3H-indole-3,2-thiazolidine](33-41)

	Minim	um		Minin	num	
	inihibi	tory		inihibitory		
	concentr	ation		concentration		
	(µg/n	nl)		(µg/r	nl)	
Sr.	S.auraeus	E.Coli	Sr.	S.auraeus	E.Coli	
11	400	300	28	400	400	
12	400	400	33	600	600	
13	500	400	34	600	700	
14	800	600	35	700	600	
15	800	700	36	600	600	
16	800	600	37	300	700	
17	500	600	38	400	600	
18	400	700	39	400	600	
19	400	600	40	600	700	
20	400 300					
21	500	400				

V. CONCLUSION

Synthesized Compounds were evaluated for their antibacterial activity by tube dilution method . The test organisms employed were S. aureus and E. coli. Some Synthesized compounds show moderate activity against S. aureus and E. coli. All synthesized were evaluated for their anti-microbial activity by using different concentration levels. The test organisms employed were S. aureus and E. coli show moderate antibacterial activity.

- [1] H.E.Mehta, Journal of Heterocyclic. 8, 114 (1998) https://doi.org/10.1007/BF02976765.
- M.E.Arch, Pharmaceutical review, 21, 723 (1998) https://doi.org/10.1007/BF02976765.
- [3] R. H. Mehta, J. Indian Chem. Soc. 74, 241 (1997).
- [4] S. V. Rusanova, Chem. Heterocyclic. Compd.35, ,167 (1999).
- [5] K. C.Krishna, Indian Jounal Chem. 29B, 766 (1990) https://www.springer.com/journal/10593
- [6] H M Doroshenk, K. M. Chem. Heterocyclic Compd., 37, 633 (2001).
- [7] F. D. Rajopadhye, Journal of Heterocyclic Chemistry 21, 289(1984),https://doi.org/10.1002/jhet.5570210203
- [8] V H Popp, F. D.; Rajopadhye, M. J. Heterocyclic Chem. 24, 1637 (1987)
- P. N. Reddy, Indian Journal of Chemistry 26B, 873 (1987),https://www.researchgate.net/journal/Indian-Journal-of-Chemistry-Section-B-0376-4699
- M.S. Gibson, Tetrahedron 19, 1377 (1962), https://www.sciencedirect.com/journal/tetrahedron/vol/18
- [11] E. Gavlakova, Chemical Communication, 59, 1892(1994), https://doi.org/10.1135/cccc19940457PHYSIOLOGICAL

Effect of Hard Chrome and its Alloy Coatings on Wear Resistance and other Characteristics of Base Material in Rolling Process- A Literature Review

Sajjan Kumar Lal ES&H Dept. Thakur College of Engg. & Tech. Mumbai (India) sajjanlal_930@gmail.com V.R. Gaval HOD Mechanical Engg. Dept. Institute of Chemical Technology Mumbai (India) vr.gaval@ictmumbai.edu.in Sanjay Rukhande Mechanical Engg. Dept. Fr. C. Rodrigues Institute of Technology Navi Mumbai (India) sanjay.rukhande@fcrit.ac.in

Abstract - This paper presents a review to the effect of alloy coatings on wear resistance and other characteristics of base materials.

To enhance the life of the deflector cold rolling mills it is coated, which increases the life of the roll to almost two times to six months. Chrome plating gives more hardness and wear resistance then the bases material of the deflector roll and thus it increases the life of the roll.

The following study deals with enhancing the life of the deflector roll even more, by studying the other material coating such as hard chrome etc.

Keywords: Coating, Thermal spray, Cobalt, Chromium, Hardness

I. INTRODUCTION

In modern steel plant automated line of production is used. If we use simple deflector roll without any coating then it has a life of 2-3 months approximately. Then it can be regrinded and reused but that decreases the dimension of the roll which cannot be feasible after a certain extent. Then roll has to be replaced which hampers the production line, increases the cost and maintenance. So, we need to enhance the life of the deflector roll

In cases of aesthetics, functional and industrial applications, different types of coatings/electroplating results in protection against wear and corrosion, high temperature oxidation, chemical resistance and good lubricity.

To avoid the failure resulting due to severe operating conditions, coating is done as a protective layer to enhance the capability of material against wear resistance, erosion, abrasion etc. the protective layer or hard coating is used in a wide range of wear resistant. Different types of coatings such as Nickel, Chromium, Tungsten, Cobalt, Phosphorus etc. are widely used for such purposes to obtain optimum surface conditions since they have high hardness.

II. LITERATURE REVIEW

2.1 "Analysis of Hard Chrome Plating Process to Reduce Rejections using PDCA Cycle", Mr. Saurabh Tatyaso Nikam [3] says:

By reducing the defects production can be enhanced. Tools like six sigma, QC, PDCA cycle had been used here. Piston rod has been coated with electroplating process. This process is expensive as well. It has been found here that maintenance rework cost can be minimized to a large extent and process efficiency can be improved the above tools are used at optimum level. Before implementing these tools there was a rejection of 10.47% which decreased to a large extent by using the tools.



Chart-1: Comparison of defects count in July versus August



Chart-2: Pareto Chart for defects after implementing remedies

2.2 "Research on Chrome Plating of the steel bars", Toian Elena Valentina, Bratu Vasile, Enescu Maria Cristiana [4] says

The life of steel rod decreases due to corrosion, high temperature application, wear as per its application. These can be overcome by applying a chromium layer which has high hardness. This hardness level goes on decreasing as penetrated below the surface layer i.e. as the depth of penetration of chrome layer goes on increasing. For C45E steel bar analysed it had a thickness of 55-58 µm and hardness of 977.77HV01. This type of chrome plated rod are used for indoor application which does not undergo any mechanical impact.



Fig 1. The variation hardness HV 01, hardened layer of depth measurement function $% \left({{{\rm{T}}_{{\rm{T}}}}_{{\rm{T}}}} \right)$



Fig. 2. Measurement of microhardness on the outside surface of C45E chrome bar Magnification (X200)

2.3 "The effect of hard chrome plating on iron fines formation", M.A. Mekicha , M.B. de Rooij , D.T.A. Matthews , C. Pelletier , L. Jacobs , D.J. Schipper [5] says :

In cold rolling process, to check the influence of hard chrome plating the rolls on iron fines generation, reciprocating and scratch sliding tests had been conducted. It has been found through scratch tests that comparing with uncoated pins, pins which were hard chrome plated displayed lesser material transfer, decreased value of friction and minimized amount of iron fines. These decreased values were due to tribochemistry of the chromium layer.

- Following more observations had been found out:
- (i) Tribofilm is formed due to chrome surfaces, verified through XPS result.
- (ii) The possible performance on strip cleanliness of other coatings can be detected by Scratch tests
- (iii) The mean roughness of the pins almost remained unchanged by chrome plating but grinding protrusions and sharp surface irregularities were smoothened up.
- (iv) Material transfer rate was low and lesser amount of scratches were observed when reciprocating sliding tests was carried out. By this it can be said that adhesive and abrasive wear resistance has good result due to chrome plating.
- (v) Strip surface cleanliness is enhanced



Fig. 3. (a) average friction coefficient of the scratch tests; friction coefficient vs sliding distance of the uncoated (b) and hard chrome plated pins (c) with a tip radius of $225 \,\mu$ m.

2.4"Amorphous alloy surface coatings for hard chromium replacement - Phase I", Integran Technologies USA, INC. [6] says:

Both for military and industrial applications, hard chromium coatings is widely used as it imparts better erosion and wear resistance to workpiece. This coating can have a thickness between 0.25 to 10 mil. This can be done through electroplating method. This coating will provide low coefficient of friction and high hardness, better thermal and corrosion properties etc. But the negative point is that Cr+6 electroplating bath is hazardous and toxic in nature

2.5 "Sliding wear performance of electroplated hard chromium and autocatalytic nickel-phosphorus coatings at elevated temperatures", Mats Eriksson [7] says: At room temperature wear properties were almost same for coating of hard chromium and electroless nickelphosphorus. On rough surface hard chromium displayed better result whereas on smooth surface electroless nickelphosphorus showed better result. Substrate bearing capacity have considerable effect on coating performance. Austenitic stainless coatings have poor wear properties than coating applied on cylinders made out of duplex stainless steel.

Chrome Plating Technique:

Chromium anhydride is filled in a container. Electrical charge is applied to this container. Workpiece and charged chromium solution acts as a cathode and anode. Due to electrical discharge from anode to cathode chromium layer is deposited on workpiece. Before carrying out this process workpiece has to be cleaned and degreased properly. After that electrical charge is applied to the container which starts the chemical reaction and chromium starts sticking on the workpiece. After plating is over, it may be followed by finishing and buffing process.



Fig. 4. Chrome plating by electrolysis method.

III. METHODOLOGY

- i. Selection of Coating Material: Coating Materials need to be selected based on their Physical, chemical properties and based on the literature review.
- Coating/Plating with Base Material: Methods and procedures of coating which are different for different types of material need to be decided. Coating has to be done as per standard size for which further testing could be done.
- Mechanical / Chemical Property Testing: Mechanical properties need to be tested such as Hardness, Tensile test, Impact test, Chemical composition etc.

- Tribological property testing : Tribological property such as Wear test (dry test/wet test), abrasive test, adhesive test can be done.
- v. Comparison and Analysis of different coating : Comparison and analysis should be done based on different tests using different statistical tools.
- vi. Result and Conclusion : Based on results obtained from various tests, comparison and analysis, conclusion can be derived as if which coating could give durable life compared to others.

IV. ANALYTICAL TECHNIQUES TO BE USED

- i. Tribological property testing -Wear test
- ii. Mechanical Property Testing Hardness etc.
- iii. SEM images

V. CONCLUSION

To increase the efficiency of rolling process the rolls which is the basic and most important tool of rolling process should have a very good life, but due to high load dynamic rolling application, wear and tear of rolls occurs frequently which decreases the productivity, efficiency of the process and thus there is a huge capital loss, too. From the literature review above it is seen that coated roll could give a better life then the uncoated one. Now, there are lots of alloying elements and various coating procedures for different alloying elements which can yield a better result. From the literature review it has been found that hard chrome or its alloy coating has given a good result in different applications. So, it can be concluded that if hard chrome is coated on rolling base material it gives interesting result over there as well, thus increasing the life and efficiency of rolling process. Hard chrome plating is a hard coating. It has a low friction. It has a good corrosion resistance and excellent wear resistance.

ACKNOWLEDGMENT

I would like to express my special gratitude towards my guide Dr. V.R. Gaval for his guidance and support in completing this research. I would also like to extend my gratitude towards our Principal, Thakur College of Engg. & Tech. Mumbai (India), Dr. B.K. Mishra and Head of the ES&H Dept Dr. Sunita Pachori for providing the required facilities to complete this research work. I would also like to thank all my colleagues for maintaining the required coordination and providing support in completing this research.

- Singh V P, Sil A, Jayaganthan R 2012 Tribological behaviour of nanostructured Al2O3 coatings Surface Engineering 28(4) 277-284.
- [2] Pawlowski L 2008 The Science and Engineering of Thermal Spray Coatings (Chichester: John Wiley & Sons Ltd) pp 67-89.
- [3] Mr. Saurabh Tatyaso Nikam "Analysis of Hard Chrome Plating Process to Reduce Rejections using PDCA Cycle", International Research Journal of Engineering and Technology (IRJET, Volume: 06 Issue: 09, Sep 2019, e-ISSN: 2395-0056, p-ISSN: 2395-0072
- [4] Toian Elena Valentina1, Bratu Vasile, Enescu Maria Cristiana "Research on chrome plating of the steel bars", Research Gate 2015
- [5] M.A. Mekicha, M.B. De Rooij, D.T.A. Matthews, C. Pelletier, I. Jacobs, D.J. Schipper "The effect of hard chrome plating on iron fines formation", https://http//www.elsevier.com/locate/triboin, Tribology International 142 (2020)106003
- [6] Integran Technologies USA, Inc. "Amorphous alloy surface coatings for hard chromium replacement - phase i", Project (Abstract), http://cfpub.epa.gov/si/si_public_comments.cf
- [7] Mats Eriksson "Sliding wear performance of electroplated hard chromium and autocatalytic nickel-phosphorus coatings at elevated temperatures", Thesis, Supervisor: Pavel Krakhmalev, The Faculty of Health, Science and Technology, Karlstads, University
- [8] A.R. Jones, Plating and Surface Finishing ŽApril 1989. 62.
- [9] J.R. Hwang, C.-P. Fung, Surf. Coat. Technol. 80 Ž1996. 271.
- [10] A. Stewart, P. H. Shipway, and D. G. McCartney, "Microstructural evolution in thermally sprayedWC-Co coatings: comparison between nanocomposite and conventional starting powders," Acta Materialia, vol. 48, no. 7, pp. 1593–1604, 2000.

Effect of Mass and Heat Transfer on MHD Free Convection Flow Past over Infinite Vertical Plate under Constant Heat Flux through a Porosity Medium

Satish Kumar Singh Department of Engineering Scienses & Humanities Thakur College of Engineering and Technology, Mumbai, India sks2010dr@rediffmail.com

Abstract - In this paper, we have considered the effect of mass and heat transfer on Magneto hydro dynamics free convection flow of a viscous incompressible electrically conducting fluid pass through porous medium over infinite vertical plate maintained temperature with constant heat flux. By using Perturbation technique, to obtained the analytical solutions of the governing partial differential equations for small amplitude of permeability for velocity, temperature and concentration fields. In the problem the effects of various parameters like magnetic field M, Grashof number G_r , Prandtl number Pr, Mass Grashof number G_m and time on velocity, temperature and concentration profile have discussed. The skin friction, rate of heat transfer in terms of Nusselt numbers and rate of mass transfer in terms of Sherwood number are obtained numerically and discussed their effects on various parameters into the paper through tabular form.

Keywords: Magnetic field, Skin friction, Nusselt number, Grashof number and Prandtl number and Porous medium

I. INTRODUCTION

The first investigation of free convective flow of a viscous incompressible electrically conducting fluid past over an infinite vertical plate has play a very important role in the field of core and their allied branches of engineering technology and in the field of applied sciences such as Magneto hydro magnetic accelerators and power generation systems, heating and cooling of nuclear reactors and astrological structure of stars and planets. S. Das et al. [1] have first investigated the unsteady Magneto hydro magnetic field flow and heat transfer of viscous incompressible electrically conducting fluid past over an infinite vertical heated porous plate. The new concept of development of energy field in the form of thermal radiation. The concept of Thermal radiation is the transfer of heat energy by the process of emission of electromagnetic waves which transfer energy away from the absorbing and emitting fluids. Sattar and Maleque [2] have been discussed the effect of unsteady Magneto hydro dynamics natural convection flow and mass transfer along an accelerated porous plate in a porous medium. Veera Krishna and Chamkha [3] have been investigated the effect of diffusion-thermos, radiation- absorption and Hall and ion slip effects on MHD free convective rotating flow of Nano-fluids past a semi-infinite permeable moving plate with constant heat source. Veera Krishna and Chamkha [4] discussed the MHD squeezing flow of a water-based Nano fluid through a saturated porous medium between two parallel disks, taking the Hall current into account. The heat generation/absorption and thermo-diffusion on an unsteady free convective MHD flow of radiating and chemically reactive second grade fluid near an infinite vertical plate through a porous medium and taking the Hall current into account have been studied by Veera Krishna and Chamkha [5]. we have considered the effect of free convection and mass transfer flow of a viscous incompressible electrically conducting fluid passes through porous medium on infinite vertical plate maintained with temperature constant heat flux.

II. MATHEMATICAL FORMULATION

In the present situation we consider the effect of mass and heat transfer on Magneto hydro dynamics free convection flow of an viscous incompressible electrically conducting fluid past over an infinite vertical plate under constant heat flux through porous medium including time dependent permeability $K(t) = k(1 + \varepsilon e^{i\omega t})$ and oscillatory velocity $v(t) = -v_0$ ($1 + \varepsilon e^{i\omega t}$). The y' –axis is considered along the plat and x' – axis is normal to it. Initially the plate is infinite in length so that all the physical parameters is a function of variable y' and t' only.

ICHSTE-2023

Thus, the flow is governed by the following partial differential equations in the form of usual Boussinesq approximation,



$$\frac{\partial v'}{\partial y'} = \mathbf{0} \tag{1}$$

$$\frac{\partial u'}{\partial t'} - v \frac{\partial u'}{\partial y'} = v \frac{\partial^2 u'}{\partial^2 y'} - \frac{\sigma \mu_\ell^2 H_0^2}{\rho} u' - \frac{v}{K(t)} u' + g\beta(T' - T'_{\infty}) - g\beta'(C' - C'_{\infty})$$
(2)

$$\frac{\partial T'}{\partial t'} - v \frac{\partial T'}{\partial y'} = \alpha \frac{\partial^2 T'}{\partial^2 y'} - S_1 (T' - T'_{\infty})$$
(3)

$$\frac{\partial C'}{\partial t'} - v \frac{\partial C'}{\partial y'} = D \frac{\partial^2 C'}{\partial^2 y'} - K_1 (C' - C'_{\infty})$$
(4)

With boundary condition are

$$u'(y',t') = -\frac{\partial T'((y',t')}{\partial y'} = C'(y',t') = 1 + \epsilon e^{i\omega't'} \quad \text{at } y' = 0$$
(5)

$$\boldsymbol{u}'(\boldsymbol{y}',\boldsymbol{t}') = \boldsymbol{T}'(\boldsymbol{y}',\boldsymbol{t}') = \boldsymbol{C}'(\boldsymbol{y}',\boldsymbol{t}') = \boldsymbol{0} \qquad \text{at } \boldsymbol{y}' \to \boldsymbol{\infty} \tag{6}$$

The above equations are non dimensionalised by using the following non dimensional suitable variables

$$\boldsymbol{u}' = \frac{\boldsymbol{u}}{\boldsymbol{v}_0} , \ \boldsymbol{y} = \frac{\boldsymbol{v}_0 \boldsymbol{y}'}{\boldsymbol{v}} , \ \boldsymbol{t}' = \frac{\boldsymbol{v}_0^2 \boldsymbol{t}}{\boldsymbol{v}}$$
$$\boldsymbol{\omega}' = \frac{\boldsymbol{v}\boldsymbol{\omega}}{\boldsymbol{v}_0^2} , \ \boldsymbol{\theta} = \frac{T' - T'_{\infty}}{T'_{w} - T'_{\infty}} , \ \boldsymbol{\varphi} = \frac{CT' - C'_{\infty}}{CT'_{w} - CT'_{\infty}}$$
(7)

And physical parameters

$$M^{2} = \frac{\sigma v H_{0}^{2}}{\rho v_{0}^{2}} , \qquad K = \frac{v^{2}}{k v_{0}^{2}} , \qquad P_{r} = \frac{v^{2}}{\alpha} , \qquad S_{c} = \frac{v}{D} , \qquad K_{c} = \frac{K_{1} v}{v_{0}^{2}} , \qquad S = \frac{S_{1} v}{v_{0}^{2}} , \qquad G_{r} = \frac{g \beta v (T' - T'_{\infty})}{v_{0}^{3}} , \qquad G_{m} = \frac{g v \beta' (C' - C'_{\infty})}{v_{0}^{3}}$$
(8)

The governing partial differential equations in the non-dimensional form are obtained as below $\frac{\partial u}{\partial t} - v_0 \left(1 + \epsilon e^{i\omega t}\right) \frac{\partial u}{\partial y} = \frac{\partial^2 u}{\partial^2 y} - \left(M^2 + \frac{1}{K(1 + \epsilon e^{i\omega t})}\right) u + G_r \theta - G_m \varphi$ (9)

$$P_r \ \frac{\partial \theta}{\partial t} - v_0 \ (1 + \epsilon e^{i\omega t}) \ P_r \ \frac{\partial \theta}{\partial y} = \frac{\partial^2 \theta}{\partial^2 y} - P_r \ S \ \theta$$
(10)

$$S_c \ \frac{\partial \phi}{\partial t} - v_0 \ (1 + \epsilon e^{i\omega t}) \quad S_c \ \frac{\partial \phi}{\partial y} = \frac{\partial^2 \phi}{\partial^2 y} - K_c \ S_c \ \phi$$
(11)

$$u = -\frac{\partial \theta}{\partial y} = \emptyset = \mathbf{1} + \epsilon e^{i\omega't'} \qquad \text{at } y = \mathbf{0}$$

$$u = \theta = \emptyset = \mathbf{0} \qquad \text{at } y \to \infty$$
(12)

III Mathematical Solution:

Solving equations (10) to (11) with boundary conditions (12) by using Perturbation method, where amplitude of permeability is very small

$$u(y,t) = u_0(y,t) + \in u_1(y)e^{i\omega t}$$
 (13)

$$\theta(y,t) = \theta_0(y,t) + \epsilon \theta_1(y) e^{i\omega t}$$
(14)

$$\varphi(y,t) = \varphi_0(y,t) + \epsilon \varphi_1(y) e^{i\omega t}$$
(15)

Zeroth order:

$$\frac{\partial^2 u_0}{\partial^2 y} + v_0 \quad \frac{\partial u_0}{\partial y} - \left(M^2 + \frac{1}{\kappa} \right) u_0 = G_r \theta_0 - G_m \varphi_0 \tag{16}$$

$$\frac{\partial^2 \theta_0}{\partial^2 y} + \boldsymbol{P}_r \boldsymbol{v}_0 \quad \frac{\partial \theta_0}{\partial y} - \boldsymbol{P}_r \, \boldsymbol{S} \, \boldsymbol{\theta}_0 = 0 \tag{17}$$

$$\frac{\partial^2 \phi_0}{\partial^2 y} + S_c v_0 \quad \frac{\partial \phi_0}{\partial y} - K_c S_c \ \varphi_0 = 0 \tag{18}$$

Corresponding boundary condition

$$u_0 = 1, \quad \frac{\partial \theta_0}{\partial y} = -1 \quad and \quad \phi_0 = 1 \qquad \text{at } y = 0 \tag{19}$$
$$u_0 = 0, \quad \theta_0 = 0 \quad , \quad \phi_0 = 0 \qquad \text{at } y \to \infty$$

The zeroth order analytical solution of velocity, temperature and concentration profiles are obtained **by using** equations (16) to (18) with help of appropriate boundary conditions (19)

$$u_{0} = A_{1} e^{-m_{5}y} - \frac{G_{r}}{A_{2}} e^{-m_{3}y} - \frac{G_{m}}{A_{3}} e^{-m_{1}y}$$
(20)
$$\theta_{0} = \frac{1}{m_{3}} e^{-m_{3}y}$$
(21)

$$\phi_0 = e^{-m_1 y}$$
(22)

Where
$$m_1 = \frac{S_c v_0 + \sqrt{S_c v_0^2 + 4K_c S_c}}{2}$$
, $m_3 = \frac{P_r v_0 + \sqrt{P_r v_0^2 + 4P_r S}}{2}$
 $m_5 = \frac{v_0 + \sqrt{v_0^2 + 4(M^2 + \frac{1}{K})}}{2}$, $A_2 = \frac{1}{m_3^2 + v_0 m_3 - (M^2 + \frac{1}{K})}$

$$m_{5} = \frac{1}{2} , \quad A_{2} = \frac{1}{m_{1}^{2} + v_{0} m_{1} - (M^{2} + \frac{1}{k})} , \quad A_{1} = 1 + \frac{G_{r}}{A_{2}} + \frac{G_{m}}{A_{3}}$$

First order:

$$\frac{\partial^2 u_1}{\partial^2 y} + v_0 \frac{\partial u_1}{\partial y} - \left(M^2 + \frac{1}{\kappa} + i\omega \right) u_1 = -v_0 \frac{\partial u_0}{\partial y} - G_r \theta_1 - G_m \varphi_1$$
(23)

$$\frac{\partial^2 \theta_1}{\partial^2 y} + P_r \nu_0 \quad \frac{\partial \theta_1}{\partial y} - P_r (S + i\omega) \quad \theta_1 = -P_r \nu_0 \quad \frac{\partial \theta_0}{\partial y}$$
(24)

ICHSTE-2023

$$\frac{\partial^2 \varphi_1}{\partial^2 y} + S_c \nu_0 \quad \frac{\partial \varphi_1}{\partial y} - K_c S_c \varphi_1 = -S_c \nu_0 \quad \frac{\partial \varphi_0}{\partial y}$$
(25)

Corresponding boundary condition

$$u_1 = 1, \quad \frac{\partial \theta_1}{\partial y} = -1 \quad and \quad \phi_1 = 1 \qquad \text{at } y = 0$$

$$u_1 = 0, \quad \theta_1 = 0 \quad , \quad \phi_1 = 0 \qquad \text{at } y \to \infty$$
(26)

The first order analytical solutions of velocity, temperature and concentration profile are obtained **by solv**ing equations (23) to (25) with boundary conditions (26)

$$u_{1} = A_{15} e^{-m_{10}y} + A_{8} e^{-m_{5}y} + A_{9} e^{-m_{3}y} + A_{10} e^{-m_{1}y}$$

$$- G_{r} (A_{11} e^{-m_{9}y} + A_{12} e^{-m_{3}y}) - G_{m} (A_{13} e^{-m_{7}y} + A_{14} e^{-m_{3}y})$$
(27)

$$\theta_{1} = \frac{1}{m_{9}} [A_{6} e^{-m_{9}y}] + A_{7} e^{-m_{3}y}$$
(28)

$$\emptyset_1 = A_4 e^{-m_7 y} + A_5 e^{-m_1 y}$$
(29)

Where
$$m_7 = \frac{S_c v_0 + \sqrt{(S_c v_0)^2 + 4(K_c + i\omega)}}{2}$$
, $m_9 = \frac{P_r v_0 + \sqrt{(P_r v_0)^2 + 4P_r(S + i\omega)}}{2}$
 $m_5 = \frac{v_0 + \sqrt{v_0^2 + 4(M^2 + \frac{1}{K})}}{2}$, $A_4 = 1 - \frac{S_c v_0 m_1}{m_1^2 + S_c v_0 m_1 - S_c(K_c + i\omega)}$
 $A_5 = \frac{S_c v_1 m_1}{m_1^2 + S_c v_0 m_1 - S_c(K_c + i\omega)}$, $A_6 = 1 - \frac{P_r v_0 m_3}{m_3^2 + P_r v_0 m_3 - P_c(S + i\omega)}$
 $A_7 = \frac{P_r v_0}{m_3^2 + P_r v_0 m_3 - P_c(S + i\omega)}$, $A_8 = \frac{v_0 A_1 m_5}{m_5^2 + m_5 - (M^2 + \frac{1}{K} + i\omega)}$
 $A_9 = \frac{G_r m_3}{(m_3^2 + m_3 - (M^2 + \frac{1}{K} + i\omega))A_2}$, $10 \frac{G_m m_1}{(m_1^2 + m_1 - (M^2 + \frac{1}{K} + i\omega))A_3}$

$$A_{11} = \frac{A_6}{(m_9^2 + v_0 m_9 - (M^2 + \frac{1}{K} + i\omega))m_9}, \qquad A_{12} = \frac{A_7}{(m_3^2 + v_0 m_3 - (M^2 + \frac{1}{K} + i\omega))m_3}$$
$$A_{13} = \frac{A_4}{(m_7^2 + v_0 m_7 - (M^2 + \frac{1}{K} + i\omega))}, \qquad A_{14} = \frac{A_5}{(m_3^2 + v_0 m_3 - (M^2 + \frac{1}{K} + i\omega))}$$

$$A_{15} = 1-(A_8 + A_9 + A_{10}) + G_r(A_{11} + A_{12}) + G_m(A_{13} + A_{14})$$

The skin friction at the plate is given by (∂u)

$$\tau = \left(\frac{\partial u}{\partial y}\right)_{0}$$
$$= \left(\frac{\partial u}{\partial y}\right)_{0} + \epsilon \left(\frac{\partial u}{\partial y}\right)_{0} e^{i\omega t}$$
$$= \left(-m_{5}A_{1} + \frac{G_{r}}{A_{2}}m_{3} + \frac{G_{m}}{A_{3}}m_{1}\right) + \epsilon \left(-m_{10}A_{15} - m_{5}A_{8} - A_{9}m_{3} - m_{1}A_{10}\right)$$

+ $G_r(A_{11} m_9 + A_{12} m_3) + G_m(A_{13} m_7 + A_{14} m_3) e^{i\omega t}$

Table-1 Numerical value of skin friction

М	K	Pr	Sc	Kc	S	Gr	Gm	v_0	ω	t	τ
0.5	2	0.71	0.22	1	1	5	10	0.2	$\pi / 6$	0.2	10.9116
1.0											3.4531
	2.5										0.9757
	3.0										8.895
		3									9.505
			.30								7.7150
				1.5							7.1357
						8					8.4043
							15				6.2194
2	3.5	7.0	0.6	2	2	10	20	0.4	π/4	0.4	19.3043
	4.0										6.8612
				3.5							8.6132
						8					10.4043
							15				13.6903
									π/3	0.6	14.8765
											15.8706
4.0							1		1		20.8302
			3.5								9.3117
					8		1		1		9.5091
						15	1		1		8.91118

The rate of heat in terms of Nusselt number at the plate is given by $N_u = \left(\frac{\partial \theta}{\partial y}\right)_0$

 $= \left(\frac{\partial \theta_0}{\partial y}\right)_0 + \epsilon \left(\frac{\partial \theta_1}{\partial y}\right)_0 e^{i\omega t}$ $= -1 - \epsilon \left(A_6 + m_3 A_7\right) e^{i\omega t}$

Table-2 Numerical value of Nusselt number

Pr	S	v_0	ω	t	Nu
0.71	1	0.2	π/6	0.2	0.0066
				0.4	1.0578
7				0.2	2.4367
	2			0.2	1.2473
	3			0.2	1.3210
		0.5		0.2	1.0381
		0.8		0.4	1.1317

		π/4	0.4	0.1670
		π/3	0.4	0.1673

The rate of mass transfer in terms of Sherwood number at the plate is given by $Sh = \left(\frac{\partial \varphi}{\partial y}\right)_{0}$

$$= \left(\frac{\partial \varphi_0}{\partial y}\right)_0 + \epsilon \left(\frac{\partial \varphi_1}{\partial y}\right)_0 e^{i\omega t}$$

 $= -m_1 + \epsilon \ (m_7 A_4 + m_1 A_5) e^{i\omega t}$ Table-3 Numerical value of Sherwood number

Sc	Kc	v_0	ω	t	Sh
0.22	1	0.2	π/6	0.2	0.91011
0.3				0.2	0.70602
0.6				0.4	0.36218
	1.5			0.4	0.26922
	2			0.4	0.65691
		0.5		0.4	0.527289
		0.8			0.565233
			π/4		0.491634
			π/3		0.491650

IV.CONCLUSION

In the present problem, we have observed that effects of various physical parameters like Hartman number, Grashof number, Prandtl number, Mass Grashof number, Schmidt number and independent variable time on velocity and temperature and concentration fields obtained for zero order and first order solution of governing partial differential equations by using appropriate method of Perturbation method. The numerical value of skin friction, Nusselt number and Sherwood number are calculated for various values of angle *of rotation* ω and other parameters at the plate. It is found that skin friction increases with increase of rotation angle. The velocity behavior depends upon the different values of Prandtl number, Grashof number and Hartman number. Flow behaviors of velocity, temperature and concentration field of physical parameter.

REFERENCE

 S. Das, S.K. Guchhait, R.N. Jana, Unsteady MHD flow and heat transfer past a porous plate in a rotating system, International Journal of Computer Applications, 33 (2011).

[2] M.A. Sattar and M.A. Maleque, Unsteady MHD Natural Convection Flow along an Accelerated Porous Plate with Hall Current and Mass Transfer in a Rotating Porous Medium, Journal of Energy, Heat and Mass Transfer, 22 (2000), 67-72.

- [3] Veera Krishna, M., Chamkha, A.J., Hall and ion slip effects on MHD rotating boundary layer flow of nano fluid past an infinite vertical plate embedded in a porous medium, Results in Physics, 15, 102652,
- [4] Veera Krishna.M., Chamkha, A.J., Hall effects on MHD Squeezing flow of a water based Nano fluid between twoparallel disks, Journal of Porous media, 22(2), pp. 209- 223, 2019.
- [5] Veera Krishna.M, A.J.Chamkha, Hall effects on unsteady MHD flow of second grade fluid through porous medium with ramped wall temperature and ramped surface concentration, Physics of Fluids **30**, 053101 (2018)

Strategies for Improving Interview Skills in Students

Shrikrishna R Sonawane Department of Engineering Science & Humanities, Thakur College of Engineering and Technology, kandivali (E), India. krishna.sonawane0@gmail.com.

Abstract - The interview is one of the important steps in the career selection process and admission process to higher education institutions. This research paper focuses the importance of interview skills by on proposing strategies for developing learners' skills. and seeks to draw attention to building confidence in interview skills. Students experience fear of interviews and thus do not properly prepare for interviews. Instead of thinking of the word "interview," we should be sure that this is nothing more than a personality test. Employers try to shock interviewees to understand how they think and react in unfamiliar situations. Being open-minded and relaxed can give you confidence in unfamiliar situations.

Keywords - interviewee, interviewer, techniques, skill, improvement.

I.INTRODUCTION

An interview is a social process involving two people interacting with each other. One is the interviewer and the other is the interviewee. This allows the interviewer to test the inner qualities of the interviewer. Interviews are mainly conducted face-to-face, but use the latest communication technologies such as the Internet, video conferencing, and telephone. According to the Chronicle of Higher Education and Marketplace (2020), 31% of employers believe college graduates are less job-ready for a variety of reasons.

Specifically, 67% of employers cited lack of interview skills as a major barrier to getting a job. Therefore, this study seeks to explain the current state of job interviews, highlight small mistakes that can be avoided, and discuss various strategies that can be taught to students to improve their chances of being recruited and employable.

II.OBJECTIVES OF THIS STUDY

This research paper aims to fulfill the following objectives. 1) To create the awareness about essential interview skills among students.

2) To evaluate critically the difficulties of the students about interview skills.

3) To recommend some of the tactics that can be applied to improve the grade of interview skills of the students.

III.RESEARCH METHODOLOGY

Bhumika Malhotra Department of Engineering Science & Humanities Thakur College of Engineering and Technology, kandivali (E), India bhumikamalhotra16@gmail.com

This study is based on secondary data and information collected from various sources, including reference books, published articles, and websites. A serious attempt was made to interpret and analyse the data against the backdrop of the current state of students' interviewing skills. This article is limited to some issues as well as strategies that will be applied in practice if needed to improve your interview skills.

IV. TYPES OF INTERVIEWS?

As per the nature of the industry, there are different kinds of interviews

Behavioral interview - This type of interview focuses on the candidate's experience and suitability for the position. Using this method, employers evaluate a candidate's past behaviour in a variety of situations in order to predict the candidate's future performance. It is easier to predict success based on the applicant's previous experience. Employers ask candidates open-ended questions about specific situations they have experienced in the past, then try to get more detailed and detailed answers.

Structured interview: These types of interviews are conducted in an appropriate setting and format. In this interview, the interviewer asks the same question to all applicants. There can be both open and closed questions. An open-ended question can have multiple answers to a single question. A closed question has only one answer. In this type of interview, the interviewer compares candidates based on their answers to these questions.

Unstructured interview: This interview is an open forum to obtain information about the candidate. Here, the interviewer changes the question based on the candidate's answers to the previous questions. There can be all types of interview questions that have no set format and are unpredictable. The interviewer may already have questions or may ask them as the interview progresses.

Stress interview: This type of interview is conducted to assess your ability to cope with stress.

This is inherently complicated. The interviewer wants to make sure your answers are constructive for the company. These types of interviews are common for highstress job profiles. *Walk-in-interview*: Interviews are held at job fairs. Unlike scheduled interviews, candidates are not required to register for formal meetings. A company usually conducts preliminary interviews when it plans to hire several people at the same time. Admissions interviews don't last as long as formal interviews, and applicants are only asked a few of the most important questions. Once a candidate is shortlisted, they are usually required to go through another detailed and formal interview.

V. SKILLS REQUIRED TO CLEAR THE INTERVIEW

Interviewees should know the skills required for an interview, namely:

Subject knowledge: To clear the interview subject knowledge is required. Because candidate have to apply effectively the subject knowledge in future.

Work skills: The candidate should have the work skills to complete the task efficiently.

Communication skills: Communication is the lifeline of the company. Candidate should belong the communication skills properly to avoid the confusion.

Listening Skills: Listening is a very important skill in the interview. Vital information can be missed when we forget to concentrate on the topic. The interviewee will want to make sure they are listening attentively to what question is being asked. Active listening helps the candidate in undivided attention and acknowledging the message that is being delivered.

Honesty- Honesty is one of the most important qualities employers look for in potential employees. If you're not honest from the start, the interviewer will eventually find out. Honesty shows you are comfortable with who you are and that you have nothing to hide.

Body language-Effective body language can help the interviewee send a positive message to the interviewer. Candidates can a strong first make impression with a handshake, eye contact and a smile. A straight, arms-free posture conveys a warm and friendly message, while sitting upright with your back against the seat back conveys confidence. Keeping a look of interest and trying to a maintain eye contact for two-thirds of the interview can show that you're interested and ready to do the job.

Dressing and grooming- Interview attire is a test in itself. Expectations vary by industry, job title, and personal preference.

VI. REASONS OF REJECTION IN THE INTERVIEW

The reasons of rejection are as follows- First, if candidate doesn't have a spark. Second, if candidate is looking too casual. Third, doesn't have an ability to listen or think. Fourth, if interviewee is too slow. Fifth, if the candidate is too confused and unclear. Sixth, if the candidate does not adapt to the situation. Seventh, if you have little authority. Eighth, if the candidate cannot express his/her opinion. Ninth, if the candidate is aggressive, he has poor looks and poor eye contact.

VII. TYPES OF QUESTIONS FOR THE INTERVIEW

Direct questions: The interviewee's answers should be clear and specific.

Indirect Questions: No specific information is required for this type of question.

For example, "Tell me about yourself?"

Behavioral or Descriptive Questions: These questions should first describe the situation, then the problem, the actions you took, and finally the results.

Situational Question: This question uses a problem-solving approach to test analytical and critical thinking skills.

Top questions: These questions encourage answers.

open-ended questions: These questions required a combination of knowledge and feeling.

Closed Question: This type of question requires only a yes or no answer.

VIII. STRATEGIES TO IMPROVE EFFECTIVE INTERVIEW SKILLS

Review your resume thoroughly: It is very important to have an up-to-date resume when you go to an interview. Don't overestimate your resume writing format or style. Instead, pay attention to the quality of your content.

Learn more about the organization: While you already know your skills and achievements, you should also be prepared to learn about the company. The interviewer will also check how much you know about the company, which reflects your passion for working for the company.

Prepare answers to sensitive questions about yourself: While you may share some personal information about yourself, it's also important to use common sense and be careful in your "Tell me about yourself" responses.

Have a mock interview with a friend or relatives: Conduct mock interviews with friends and family. Practicing and taking notes on a plan to share with the interviewer is a great way to better prepare during the interview and feel more relaxed and comfortable as a result. It is helpful to practice out loud with someone you trust.

Arrive before the scheduled time of your interview: Experts recommend arriving 10-15 minutes before the interview begins. It provides the perfect time to organize your notes, review your resume, and mentally prepare for the interview.

Be polite, respectful and sincere: Speaking politely and calmly demonstrates professional communication skills.

Answer each question concisely as per the expectation: It's important to provide a comprehensive answer, but not every question requires a detailed explanation. Short, concise answers give you confidence and allow the interviewer to direct the interview.

Use proper language and avoid slang: Clear communication and engagement from the interviewer will

help you position yourself as a confident professional and present your credentials authoritatively. Avoid using slang as it may sound unprofessional and reduce credibility.

Keep smiling face throughout the interview: Confidence will certainly help you stay ahead of others competing for the same spot. A smile is the best symbol of confidence. This will not only impress the interviewer, but will also make you happy during the interview.

IX. CONCLUSION

This article discusses the main and secondary aspects related to the development of interview skills along with a series of fit qualities. Employers want to ensure that interviewees have good interpersonal skills by testing their ability to work in a team. Nervous interviewees can be relieved by this article, which emphasizes effective interview preparation and confidence building through good practice in treating interviews like conversations.

- Campion, M.A., Campion, J.E., & Hudson, J.P., Jr. "Structured Interviewing: A Note on Incremental Validity and Alternative Question Types", Journal of Applied Psychology, 79, 998-1002, 1994
- [2] Dick, Bob. Convergent Interviewing. Sessions 8 of Areol-Action Research and Evaluation, Southern Cross University, 2002.
- [3] Foddy, William. Constructing Questions for Interviews, Cambridge University Press, 1993
- [4] General Accounting Office. Using Structured Interviewing Techniques. Program Evaluation and Methodology Division, Washington D.C., 1991
- [5] Groat, Linda & Wang, David. Architectural Research Methods, John Wiley & Sons, Inc
- [6] Hollowitz, J. & Wilson, C.E. "Structured Interviewing in Volunteer Selection". Journal of Applied Communication Research, 21, 41-52, 1993
- [7] Kvale, Steinar. Interviews an Introduction to Qualitative Research Interviewing, Sage Publications, 1996
- [8] McNamara, Carter, PhD. General Guidelines for Conducting Interviews, Minnesota, 1999.

Diversity in The Workplace for Sustainable Company Development

Ela Agarkar Engineering Sciences & Humanities Department Thakur college of Engineering & Technology Mumbai, India ela.agarkar@thakureducation.org

Ashwin Pathak Engineering Sciences & Humanities Department Thakur college of Engineering & Technology Mumbai, India ashwin.pathak@thakureducation.org

Abstract —"Workforce Diversity" is a key word for organizations and leaders of today's organizations & has become crucial concept in global workplaces. Workforce diversity is a multi-faceted concept that will continue to evolve as more corporate companies move towards a global marketplace. Since diversity remains a significant organizational challenge, employers and employees must learn the skills needed in a multicultural work environment. Diversity includes all groups of people at all levels in the company. India is one of the fastest growing developing nations in the world. It has the largest English-speaking population and the largest base of middle class. Organizations are initiating diversity management programs and policies to build a positive diversity climate. The Information Technology (IT) sector has become an important growth catalyst for the Indian economy. Information Technology (IT) industry has played a significant role in transforming India's image from a slow-moving bureaucratic economy to a land of innovative entrepreneurs. Business globalization, preference for teamwork and the changing workforce demographics have made workforce diversity management a necessity for companies. India has a markedly different societal context for diversity from Western countries as it is a highly culturally diverse country. While workplace diversity is unavoidable, managing diversity is a complex and unique HR issue. In the future, diversity in the workplace may be required for companies that want to be competitive, because diverse ideas help create new solutions to help overcome obstacles. Diversity management means creating a workplace where differences in heritage, background, style, tradition, and views are valued, respected and used to increase organizational capacity. The concept of diversity in the workplace has become increasingly important for companies around the world. This article analyses the data obtained through research work targeting the understanding of companies' orientation toward diversity. It assesses four themes: motivation, innovation and creativity, leadership, and social responsibility.

Keywords— Globalization, Diversity, Workforce Diversity, Diversity Management,Sustainable Development. Kiran Sanap Engineering Sciences & Humanities Department Thakur college of Engineering & Technology Mumbai, India kiran.sanap@thakureducation.org

Neha Mishra Engineering Sciences & Humanities Department Thakur college of Engineering & Technology Mumbai, India neha.mishra@thakureducation.org

I. INTRODUCTION

"Considerations regarding diversity have advanced from legal compliance to inclusion in the workplace. Title VII of the Civil Rights Act of 1964 prohibits discrimination in employment. McKinsey report found that organizations with more than 30% of their women in executive positions were more likely to outperform companies where this percentage was lower. Diversity management has become a challenge for more and more companies due to women's promotion to high positions in the public and private sectors. Governments seek to encourage diversity in the workplace in public services, primarily due to the existence of immigrants. No research has been conducted to provide an objective view of this field's rapiddevelopment.

As borders between nations and societies break, we are falling under the haste of globalization. Organizations must try to reflect such consumer diversity by creating diversity in the workplace. This management practice is known under various names, such as market reflection or workforce representation. It can be visible (based on attributes such as race, gender, or age) or invisible (education, jobs). Understanding the practical use of diversity management in organizations is necessary to design and implement a workplace diversity curriculum.

An analysis has been performed on the data obtained through research work targeting the understanding of companies' orientation toward diversity in the workplace. The study provides its contribution to the literature in the diversity management field through the perspective of human resources, creation, leadership, and social responsibility processes."

Diversity in The Workplace for Sustainable Company Development II. OBJECTIVE OF THE STUDY

- 1. To Review the workforce diversity and inclusion through literature and underpinning theories.
- 2. To understand the various dimensions of workforce diversity.
- 3. To identify the benefits of workforce diversity and inclusion to the organization.

III. LITERATURE REVIEW ON WORKFORCE DIVERSITY AND ORGANIZATION

- The research study by Kossek and Zonia (1993)49, in the domain of measuring diversity climate, analyses the links between group characteristics (racial/ethnicity, gender, and level), contextual organizational unit characteristics (gender and racial/ethnic heterogeneity, and level), and resource support for women) and how the workforce views diversity. According to this survey, women valued company initiatives to support diversity more than men did, and they also had more positive perceptions toward women's qualifications. The findings of this study show a substantial relationship between gender heterogeneity and accepting diversity.
- Cox (1993)50 in his elaborated work on diversity in organizations explains the importance of managing diversity in workplace. According to him diversity itself does not automatically have positive effects but must rather be managed effectively to improve organizational effectiveness. Cox uses the term "diversity climate" to define collectively the influence of individual, group and organizational factors that support diversity.
 - Research on demographic diversity and staff attitudes in the life insurance industry was done by Riordhan and Shore (1997) 53. In this study, the authors used 98 workgroups from the Life Insurance Company to explore the effects of an individual's similarity to the demographic composition of the workgroup on individual level attitudes. The findings show similarities in People's views toward their workgroup and perceptions of prospects for promotion are influenced by their race and ethnicity. Results for similarity in tenure and gender were insignificant. These results imply that the effects of demographic variables on employee attitudes toward diversity among work units of an organization may vary in complexity.

In his study "Diversity Management: Some Measurement Criteria," Thomas (1999)57 demonstrates the value of monitoring diversity programs. The research paper provides a detailed analysis of the significance of human resource managers, emphasising the need for them to be able to justify their diversity progress using both quantitative and qualitative criteria. The paper discusses the significance of diversity evaluation, both prior to implementing diversity to establish benchmarks and post- diversity investment to evaluate the organization's returns on such investments.

75 writers highlight the necessity of diversity initiatives like diversity training in organizations in Kulik et al(2008) .'s work. Furthermore, the surveybased study "Employee Receptivity to Diversity Management: Perceptions in a Federal Government Agency" by Soldan and Dickie (2008)76, which had the main goals of determining how much diversity management was received by employees in terms of gender and ethnic groups and of investigating the links between diversity management receptivity and its precursors.

The study by Bakr, et al. (2009)79 investigates workers' perceptions of workplace diversity in the banking industry in the United Arab Emirates (UAE). Results show that while the UAE is one of the more conservative nations in the world, the inclusion of diversity in the workforce does not significantly affect employee acceptance of diversity. This suggests that personnel in traditional, non-Western nations will have a different attitude toward welcoming diversity.

An extensive survey conducted by McKinsey & Company (2010)81, in Indian corporate on "Women matter: Gender diversity, a corporate performer", report reveals that there is male dominated environment in corporate world. The report identifies that most companies are practicing gender diversity only by initiating measures like flexible working conditions.

IV. HYPOTHESIS-1

In order to gain a competitive edge and improve performance, businesses operating in this changing business climate must support a creative workplace culture. According to a 2022 study, inclusion can effectively address the issues of workplace discrimination by fostering cooperation, engagement, cohesion, and equal chances in order to boost innovation. Another research from 2022 focused on the incomes of immigrants and public and private sector diversity strategies. The findings indicated that while working in mixed teams (as required by diversity policy) reduces salary disparities in the public sector, language programmes that require students to learn the national tongue of the country raise wage disparities in the private sector.



Figure 1. Reasons for Diversity

V. HYPOTHESIS-2

Consequently, diversity and inclusion are usually associated with each other as organizational priorities. However, the idea of initiatives to support workforce diversity sounds easier than putting it into practice. Contradictory approaches to managing diversity can lead to resistance or confusion among employees or stakeholders. However, there is little evidence of good practices in the field.

The authors of the study point out that it is necessary to achieve diversity beginning with the hiring process, such as attracting minorities to management positions [40], for instance, by using specific KPIs like the proportion of women hired for a position out of all candidates, the proportion of young or elderly candidates hired, or the proportion of applicants drawn to the position based on a candidate's religion, culture, or any other factor.



Figure 2. Women's representation in last 5 years

Leaders must understand that their success is based on the success of their talent, regardless of background, race, sex, orientation, or any other characteristic that defines individuals and makes them significant. Policies on diversity in the workplace are efficient if both the management and the employees support them.

VI. CONCLUSION

Some organizations have realized that initiatives to implement diversity policies and practices have a broader effect on them, their employees, partner organizations, and the community. In such companies, diversity is an organization-wide concern rather than a human resource department concern. The active involvement of top management and managers at all levels is vital for the successful implementation of diversity initiatives.

The Alpha Cronbach coefficient, relationships between items and scale, orthogonal rotation of the factorial matrix, variance, and elements related to the diversity of the workforce within the companies were all used by the authors to test the internal consistency of the set of items related to each analysed characteristic. A strong and positive culture, ethical conduct, equitable opportunities, fair employment, and opportunities for performing innovation teams, more points of view, and better creativity must all be fostered by HR managers. By incorporating each person and the manager in creating, putting into practise, and employing best practises and rules that are readily available to employees, performance can be boosted.

Companies are increasingly incorporating diversity in their management requirements as they understand the value of maintaining a positive business image and reputation. Participating in a variety of activities and initiatives helps people get a better knowledge of the beliefs and values they want to uphold as well as their exterior status in society.

Motivation, creativity, leadership, and social responsibility were examined. The empirical findings prompted a literature expansion that took a fresh look at how to achieve success through workplace diversity. Those in positions of leadership and management should begin by focusing on how to implement diversity in the workplace.

- Lockwood, N. Workplace Diversity: Leveraging the Power of Difference for Competitive Advantage; Society for Human Resource Management: Alexandria, VA, USA, 2005
- [2] Boukattaya, S.; Omri, A. Impact of Board Gender Diversity on Corporate Social Responsibility and Irresponsibility: Empirical Evidence from France. Sustainability 2021, 13, 4712. [CrossRef]
- [3] Joshi, A.; Liao, H.; Jackson, S.E. Cross-Level Effects of Workplace Diversity on Sales Performance and Pay. Acad. Manag. J. 2006, 49, 459–481. [CrossRef]
- [4] Barak, M.M. Managing Diversity: Toward a Globally Inclusive Workplace; SAGE: Thousand Oaks, CA, USA, 2013.
- [5] Management Association, Information Resources. Discrimination and Diversity: Concepts, Methodologies, Tools, and Applications: Concepts, Methodologies, Tools, and Applications; IGI Global: Hershey, PA, USA, 2017.
- [6] Hays-Thomas, R. Managing Workplace Diversity and Inclusion: A Psychological Perspective; Taylor & Francis; Routledge: London, UK, 2016.
Neurofilament Nanocomposite Proteins as Biomarkers to Track Neurological Disorders and the Success of Treatments

Neha Mishra, Department Engineering Science and Humanities Thakur College of Engineering and Technology, Mumbai, India neha.mishra@thakureducation.org Ela Agarkar Department Engineering Science and Humanities Thakur College of Engineering and Technology, Mumbai, India neha.mishra@thakureducation.org Kiran Sanap Department Engineering Science and Humanities Thakur College of Engineering and Technology, Mumbai, India neha.mishra@thakureducation.org

Abstract— Neuronal damage and degeneration biomarkers may enhance diagnosis, illness monitoring, prognosis, and therapy effectiveness. Because they are important neuron-specific components that preserve structural integrity and are sensitive to neurodegeneration and neuronal damage across a wide spectrum of neurological illnesses, neurofilament proteins (NFPs) are ideally suited as biomarkers in these situations. Neurological disorder is a disorder caused to the nervous system which mainly affects the brain as well as the nerves found throughout the human body and the spinal cord. The specific causes of neurological problems vary, but can include genetic disorders, congenital abnormalities A nanoparticle is a material with ultra-fine aspects of dimensions in the nanoscale. Its oneof-a-kind material makes it a significant player in the efficient working of the latest technologies. An attempt is made to integrate and use neurofilament protein and nanocomposite to develop a method to track neurological disorder by combining gene expression data from six different brain areas, to identify AD biomarkers in this work. The cornerstone of biomarker screening is the gap between genotype and phenotype, which may be bridged using materials from gene expression profiling data, which simultaneously creates a genome-wide assessment of RNA abundance.

Keywords—Neurology, Neurofilament, Biomarkers

I. INTRODUCTION

It is generally acknowledged that the pathophysiology underpinning many neurodegenerative diseases, including Alzheimer's disease (AD), begins many years before clinical symptoms appear. The most promising blood biomarkers of neuroaxonal integrity or damage have emerged in recent years, and these are Neurofilament proteins (NFPs). NFs are categorised as type IV neurons-only intermediate filaments (IFs). They are protein polymers with lengths of several micrometres and a diameter of 10 nm. The neuronal cytoskeleton is made up of microfilaments (7 nm) and microtubules (25 nm), together. Finding NFPs and neuronal degradation products in blood as substitute indicators of neuronal injury in neuropathic disorders has garnered a lot of attention recently in the area. Because they are not only sensitive to neuronal injury but also important components of aberrant intraneuronal aggregates in a variety of neurodegenerative illnesses, NFPs and fragments are justified as biomarkers of neuronal damage.

II. BACKGROUND OF RESEARCH

The brain, spinal cord, and nerves make up the nervous system. Together they control all the workings of the body. When something goes wrong with a part of your nervous system, you can have trouble moving, speaking, swallowing, breathing, or learning. You can also have problems with your memory, senses, or mood. There are more than 600 neurologic diseases. Neurological disorders are diseases of the central and peripheral nervous system. In other words, the brain, spinal cord, cranial nerves, peripheral nerves, nerve roots, autonomic nervous system, neuromuscular junction, and muscles. These disorders include epilepsy, Alzheimer disease and other dementias, cerebrovascular diseases including stroke, migraine and other headache disorders, multiple sclerosis, Parkinson's disease, neural infectious, brain tumours, traumatic disorders of the nervous system due to head trauma, and neurological disorders as a result of malnutrition. Hundreds of millions of people worldwide are affected by neurological disorders. More than 6 million people die because of stroke each year; over 80% of these deaths take place in low- and middle-income countries. More than 50 million people have epilepsy worldwide. It is estimated that there are globally 47.5 million people with dementia with 7.7 million new cases every year - Alzheimer's disease is the most common cause of dementia and may contribute to 60-70% of cases. The prevalence of migraine is more than 10% worldwide. There are certain techniques which are associated with the treatment of the neurological diseases. Some employ novel drugs, physical massage and medication. Contrast agents have been used to detect the neurological diseases. The techniques used for the detection of neurological disorders include MRI, CT scan, cryotomography. CeO₂(Cerium oxide) nanoparticles are used for the treatment as well as for disease detection. For accurate and better results, Fe₂O₃ (Ferric oxide) nanoparticles are used on a greater extent. More recently, a new generation of antineuronal antibodies against cell surface antigens, having a direct pathogenic role in causing the disease, has emerged to complement the existing repertoire. Neuronal antibodies are useful diagnostic markers of the brain disease and, in some cases, may reveal an underlying malignancy, thus facilitating faster diagnosis and earlier treatment with consequently better prognosis. [1]

III. PROBLEM STATEMENT

Several categories of possible biomarkers from the fields of clinical symptoms, neurophysiology, biochemical indicators in cerebrospinal fluid (CSF), serum, or specific tissues, neur oimaging techniques, and genetics are used in the present un derstanding of neurodegenerative disorders. In addition to traditional gene analysis, methods for detectin g the expression of genes (microRNA) are becoming more p revalent. More and more research is being done in other fiel ds of science, like proteomics and metabolomics, which anal yse functional molecules (proteins and neurotransmitter met abolites) that may have a role in neurodegenerative processe s. The major focus is on developing a distinctive profile, whi ch is a mix of biomarkers unique to a particular clinical unit or to a set of disorders with related characteristics.

Due to its close ties to the extracellular space of brain tissue, CSF is regarded as the best source of biomarkers. The CSF is thought to reflect every biochemical change occurring in t he brain. Since several years ago, there has been a steady im provement in the discovery of CSF neurodegenerative bio markers. Neurofilament proteins (NfPs) are well suited as biomarkers in these contexts because they are major neuronspecific components that maintain structural integrity and are sensitive to neurodegeneration and neuronal injury across a wide range of neurologic diseases. Low levels of NfPs are constantly released from neurons into the extracellular space and ultimately reach the cerebrospinal fluid (CSF) and blood under physiological conditions throughout normal brain development, maturation, and aging. NfP levels in CSF and blood rise above normal in response to neuronal injury and neurodegeneration independently of cause. [2]. Studies have linked NfP levels in blood to changes in white matter [3], gray matter, yielding a confusing picture of what variables dictate the highly variable levels found in different disorders [4]. Some likely determinants of blood/CSF levels, however, include the composition of the diseased or injured area (relative abundance of large caliber axons that have high Nfcontent) and size of the damaged region. Additional biomarkers are currently being worked with to st andardise analytic methodologies, while yet other biomarker s are likely to have their significance validated in future rese arch. Some biomarkers have been established and are utilise d in clinical practise, including in diagnostic criteria.

IV. RESEARCH OBJECTIVES

A Identification of the neurofilament protein and nanocomposite, as well as its characterisation to include both

of its components and usage as a possible biomarker for neurological disorders Multivariate regression, as the name suggests, is a method for estimating a single regression model with many outcome variables. A multivariate regression model is referred to as a multivariate multiple regression when it contains more than one predictor varia

V. RESEARCH METHODOLOGY

The steps listed below are some examples of methods.

1. The Discovery Framework for Biomarkers

Network interactions are often discovered by using computer methods to various forms of omics data, published literature, including those tagged in interaction databases, or both. The first group frequently includes genetic, protein-protein, protein-DNA, and metabolic interactions. The identification of gene interactions found in singlesource datasets, such as gene co-expression data, is the foundation of many network inference techniques used to uncover the biomarkers

2. Image Acquisition

Imaging has never had a better chance of directly influencing the choices we make for our patients. This intricacy necessitates further radiation oncologist training and opens the door for significant paradigm-shifting research projects that make use of the potential of image-based treatment and decision making. The influence of image-based staging, therapy targeting, and response evaluation are more crucial to our future success, even though clinical judgement is still essential.

3. Data Analysis in Six Brain Areas

The statistical community is becoming more and more interested in functional data analysis (FDA), which takes the continuity of the curves or functions into account. Time-series and spatial-series investigations frequently employ FDA. Recent advances in functional brain imaging technologies have made it feasible to track the evolution of the brain-mind interaction. As a result, a vast amount of functional data must be gathered and examined. Strong demand exists for functional approaches created for these data.

Result of multiple linear regression analysis investigating the associations of age, sex, education, $APOE\varepsilon4$ genotype, and clinical diagnosis with estimated progression score *s* at baseline

Independent Variable	Estimat e	SE	t- statistic	P value
Intercept	-3.71	0.545	-6.83	<0.001
Age	0.0269	0.006	14.1	< 0.001
Male sex	0.313	0.089	3.40	0.001
Education	-0.021 9	0.016	-3.98	<0.001
<i>APOE</i> ε4 hete rozygous	0.719	0.094	7.63	<0.001
APOEε4 hom ozygous	1.34	0.158	8.50	<0.001
MCI	2.45	0.103	23.9	< 0.001
AD dementia	5.13	0.132	38.8	< 0.001

Abbreviations: MCI, moderate cognitive impairment; APOE, apolipoprotein E; AD, Alzheimer's disease; SE, standard error.

NOTE: Due to lacking APOE data, five people were eliminated. In order to fit the model, 1364 data were employed. This resulted in an R2 of 0.635, an adjusted R2 of 0.633, an F-statistic of 336.7, and a Prob(F-statistic) of 0.0001.

VI. RESEARCH SIGNIFICANCE

Because scientists need to gauge how experimental medications affect volunteers during clinical trials,

biomarkers are crucial to drug development. And we do that by examining their impact on biomarkers. Therefore, it is crucial that we have access to a wide variety of biomarkers that can help us determine all we need to know about how the experimental medicine affects people. In general, biomarkers are crucial to medicine. We are all accustomed to seeing the doctor and receiving the results of all our tests, and even imaging tests like CAT scans and x-rays, which provide quantitative information about the health of the body, serving as biomarkers. As a prognostic marker, NfL may have potential as a predictor of disease activity in patients with AD, with potentially guiding clinicians in the choice of the best diagnosis and as a predictor of cognitive worsening in AD. [5]

- Karim, A. R., & Jacob, S. (2011). Immunological markers in neurological disorders. Annals of Clinical Biochemistry, 49(1), 29, doi:10.1258/acb.2011.011140
- [2] Yuan, A., Hassinger, L., Rao, M. V., Julien, J. P., Miller, C. C., and Nixon, R. A. (2015a). Dissociation of Axonal Neurofilament Content from Its Transport Rate. PLoS One 10:e0133848. doi: 10.1371/journal.pone.0133848
- [3] Sutter R, Hert L, De Marchis GM, et al. Serum neurofilament light chain levels in the intensive care unit: comparison between severely ill patients with and without coronavirus disease 2019. Ann Neurol. 2021;89(3):610-616.
- [4] Kurtzke JF. Rating neurologic impairment in multiple sclerosis: an Expanded Disability Status Scale (EDSS). Neurology. 1983;33(11):1444-1452.
- [5] Roxburgh RH, Seaman SR, Masterman T, et al. Multiple Sclerosis Severity Score: using disability and disease duration to rate disease severity. Neurology. 2005;64(7):1144-1151
- [6] Olsson B, Portelius E, Cullen NC, et al. Association of cerebrospinal fluid neurofilament light protein levels with cognition in patients with dementia, motor neuron disease, and movement disorders. JAMA Neurol 2018:1–8.
- [7] Mattsson N, Andreasson U, Zetterberg H, et al. Association of plasma neurofilament light with neurodegeneration in patients with Alzheimer disease. JAMA Neurol 2017;74:557–66
- [8] Steinacker P, Huss A, Mayer B, et al. Diagnostic and prognostic significance of neurofilament light chain NF-L, but not progranulin and S100b, in the course of amyotrophic lateral sclerosis: data from the German MND-net. Amyotroph Lateral Scler Frontotemporal Degener 2017;18:112–9
- [9] Zucchi, E., Lu, C. H., Cho, Y., Chang, R., Adiutori, R., Zubiri, I., et al. (2018). A motor neuron strategy to save time and energy in neurodegeneration: adaptive protein stoichiometry. J. Neurochem. 146, 631–641. doi: 10.1111/jnc.14542
- [10] Zhu, Y., Yang, B., Wang, F., Liu, B., Li, K., Yin, K., et al. (2021). Association between plasma neurofilament light chain levels and cognitive function in patients with Parkinson's disease. J. Neuroimmunol. 358:577662. doi: 10.1016/j.jneuroim.2021.577662

Disease Prediction: Various Symptoms Using Machine Learning

Meghna Singh Department of Engineering Science & Humanities Thakur College Of Engineering and Technology Mumbai, India singhmeghna2021@gmail.com Ashish Richhariya Department of Film Production and Communication KES Shroff College Mumbai, India ashishr@kessc.edu.in Brijesh Gupta Department of Engineering Science & Humanities Thakur College Of Engineering and Technology Mumbai, India brijesh.gupta@tcetmumbai.in

Abstract: In recent years, the use of machine learning algorithms has become popular in the healthcare industry for predicting diseases. In this paper, we propose a framework for disease prediction that utilizes three popular algorithms, Decision Tree, Random Forest Tree, and Naive Bayes. We have outlined disease prediction framework utilizing different MI Calculations. The dataset utilized had more than 230 maladies for processing. Based on the side effects, age, sexual orientation of an individual, the conclusion framework gives the yield as the disease that the person may well weighted be enduring from. The Decision Tree calculation gave the finest comes about as compared to the other calculations. The exactness of the weighted Decision Tree calculation for the forecast was 95.17%. Other algorithms i.e. Random Forest Tree and Naive Bayes also gave the exactness of 95%. If a recommendation system can be made for doctors and medicine while using review mining will save a lot of time. In this type of system, the user face problem in understanding the heterogeneous medical vocabulary as the users are laymen. User is confused because a large amount of medical information on different mediums are available. The idea behind this system is to adapt with the special requirements of the health domain related with users.

Keywords— Decision Tree, Random Forest Tree, Navie Bayes, Exactness

I. INTRODUCTION

The World Health Organization (WHO) records cardiovascular diseases as the driving cause of passing allinclusive with 17.9 million individuals dying each year. Disease prediction is a crucial task in the healthcare industry as it enables early detection of diseases and facilitates better treatment and management. Machine learning algorithms have shown great potential in predicting diseases, and various studies have been conducted in this field. In this paper, we propose a disease prediction framework that utilizes three popular algorithms, Decision Tree, Random Forest Tree, and Naive Bayes. The chance of heart infection to destructive behavior that leads to increment due overweight and weight, hypertension, hyper glycaemia, and cholesterol. Besides, the American Heart Association complements side effects with weight pick up (1-2 kg per day), sleep issues leg swelling, inveterate hack and tall heartrate. Diagnosis may be an issue for professionals due the symptoms' nature of being common to other conditions or confounded with signs of maturing. In later along time professional have expanded their utilization of computer advances to makes trades decision making back. Within-the health care industry, machine learning is getting to imperative arrangement to help the conclusion of patients. Machine learning is an analytical tool used when a task is large and difficult to program, such as transforming medical record into knowledge, pandemic predictions, and genomic data analysis [1]

There are too as many further municipalities which need restorative installations. Virtual specialists are boardcertified specialists who choose to hone online through videotape and phone movables, rather of in- person arrangements but this isn't conceivable within the case of extremity. Machines are always considered superior than people as, without any mortal mistake, they can perform errands more efficiently and with a steady position of fineness. A sickness predictor can be called a virtual specialist, which can prognosticate the illness of any patient without any mortal error also, in conditions like COVID-19 and EBOLA, an infection index can be a favoring because it can identify a human's sickness without any physical contact [2] [3]. Hence a system was needed that can prognosticate any complaint grounded on the symptoms with a good chance of delicacy at least ranging from 90-95 fineness. Then in this system we're going to use 3 machine learning algorithms Decision Tree, Random Forest Tree and Naive Bayes (Considering the result of the algorithms with loftiest number of fineness). Different studies have shown promising results while using machine learning algorithms [3].

II. LITERATURE REVIEW

The viability and security of zanamivir, managed 2x or 4x day by day over 5 days, was estimated in the treatment of flu conditions. An add up to of 1256 cases entered the consider; 57 of those randomized had laboratory- verified flu impurity. The essential conclusion point, "relief of major symptoms," was made to assess contrasts in clinical affect. In the overall crowd with or without flu impurity, zanamivir dropped the middle number of days to reach this conclusion point by 1 day. The drop was more prominent in cases treated inside 30 h of suggestion onset, febrile at suppose about section, and in characterized high- threat bunches. Zanamivir dropped gloamings of disturbed sleep, time to resumption of typical exercises, and use of suggestion relief drugs. It was well endured. These comes about propose that zanamivir can basically dwindle the length and overall characteristic impact of flu [1]. In this composition, sample datasets of 5145 cases, including,686 laboratory test results

were collected where a aggregate of 39 specific conditions grounded on the International Classification of conditions, 10th modification (ICD- 10) canons were delved. These datasets were used to construct light grade boosting machine(LightGBM) and extreme grade boosting (Boost) models and a DNN model using Tensor Flow. The optimized ensemble model achieved an F1- score of 81 and vaccination delicacy of 92 for the five most common conditions. The deep learning and ML models showed differences in prophetic power and complaint classification patterns [2].

The healthcare assiduity has set up that Machine learning (ML) is a useful and accurate decision- making fashion in the data collection produced in large amounts. The medical decision support systems developed were effective grounded on the software and the different algorithms proposed by numerous experimenters. Then a study is done grounded on the colorful ways using the different algorithms and their performance analysis. The prognosticating model was introduced with several combined features, and among the multiple styles and were other classification techniques. numerous being ways bandied, among which the delicacy position was set up as88.7 using the Hybrid Random Forest with a Linear Model (HRFLM) fashion

III.METHODOLOGY FLOW

The dataset we have considered comprises of 132 indications, the blend or stages of which leads to 41 illnesses. In light of the 4920 documents of various patient samples, mainly to point foster a forecast algorithm that considers in the side. The dataset we have considered comprises of 132 indications, the blend or stages of which leads to 41 illnesses. In light of the 4920 documents of various patient samples, mainly to point foster a forecast algorithm that considers in the side is the side of the 4920 documents of various patient samples, mainly to point foster a forecast algorithm that considers in the side effects of various client and forecasts the sickness that the person is bound to be affected.



Inputs (Patient Symptoms): When planning the algorithm, we have expected to be the client can have an unmistakable thought regarding the indications he is encountering. The Prediction created considers 95 manifestations in the midst of which the client can permit the indications his preparing as the input

	Disease	Count of Disease Occurrence	Symptom
0	UMLS:C0020538_hypertensive disease	3363.0	UMLS:C0008031_pain chest
1	UMLS:C0020538_hypertensive disease	3363.0	UMLS:C0392680_shortness of breath
2	UMLS:C0020538_hypertensive disease	3363.0	UMLS:C0012833_dizziness
3	UMLS:C0020538_hypertensive disease	3363.0	UMLS:C0004093_asthenia
4	UMLS:C0020538_hypertensive disease	3363.0	UMLS:C0085639_fail

	disease	Fig 2. Input data symptom	occurence_count
0	hypertensive disease	shortness of breath	3363.0
1	hypertensive disease	dizziness	3363.0
2	hypertensive disease	asthenia	3363.0
3	hypertensive disease	fall	3363.0
4	hypertensive disease	syncope	3363.0
		Fig 3 Preprocess	

B) Data pre-processing: The mining of the data's approaches that changes the crude information or then again encrypts the information to form a structure so that it can be

encrypts the information to form a structure so that it can be effectively deciphered with the help of calculation is known as information pre-processing. The information preprocessing strategies utilized in the introduced work which listed as follows:

1) Data Purification: Data is purified using certain measures like stuffing in lost worth, along these lines settling the irregularities in the information.

Data Reduction: The examination turns out to be hard when managing a gigantic information base. Thus, we kill those autonomous variables (symptoms) which may not affect the objective variables (diseases). So in the progress task, of around 95 of 132 side effects firmly identified with the illnesses are chosen

C) Models: The entire system is designed in such a way to predict the diseases by utilizing the three Algorithms i.e., Decision Tree model, Naive Bayes model and Random Forest classifier model, so that the predictive analysis study is proposed at the end of the study by exploring its speed, efficiency and performance of the various algorithms for the input dataset.

D) Output(diseases): While a framework is made with the preparation set utilizing the validated calculations standard datasets are shaped and whenever the client indications are provided as a contribution as input of the algorithm, and the side effects are composed agreeing as the standard dataset created, accordingly creating arrangements and foreseeing the high probable infection.

IV. WORKING

- A) The Disease forecast framework is executed utilizing the three information mining calculations for example Random Forest, Decision tree classifier and Naive Bayes. The portrayal and implementation of the calculations are provided.
- B) Decision Tree Model: The order of the algorithm worked as Decision tree look like the model of many branches in a tree. So, by analyzing the arrangement of unequivocal assuming at that point rules on highlight esteems (manifestations for our situation), it classifies down the dataset into more modest and more modest subsets that outcomes in anticipating an objective value (disease). A tree comprises of the mainly a decision Node and a Leaf Node. Decision Node: It has a minimum of 2 branches. In our analysis we introduced, every one of the manifestations are taken as decision node. Leaf Node: Constitutes the order which denotes that, the decision may of any of the branch. So that the diseases here represent to a leaf node

C Jupyler Ende Lastnesseer station percent	e
	 (Hale Lipstoire)
<pre># If ## ###############################</pre>	

Fig 4: Code Snapshot of Decision Tree

C) Random Forest Classifier: The Random Forest classifier is adaptable, and simple to utilize AI calculation that gives remarkable outcomes more often than not applied without any hyper tuning. So, as validated in the Decision tree model, the notable restriction of tree calculation is overfitting. So, it shows up as though the decision tree has remembered core of the information. This model forestalls this issue: That It's a form of troupe investigation. Troupe investigation alludes to utilizing different calculations or identical calculation on numerous occasions. Random Forest model is a group of many decision trees. Also, more noteworthy the quantity of these trees in this model is the fitter of the speculation. All the more decisively, the random Forest fills in as listed below:

- Fix the 'k' side effects from data (clinical data) the sum of m manifestations arbitrarily (here k << m). At that point, it assembles a Decision tree model with the help of side effects of 'k'.
- 2) Rehashes 'n' number of times with the goal that we have n number of tree model worked from various Random mixes of indications which is denoted as 'k' (or an alternate irregular example of information, known as bootstrap test).
- Consider every one of the various n-constructed trees and proceeds a variable which is random to foresee the illness. Here it Store the anticipated

illness, so that we can have a sum of 'n' illness anticipated from n number of the decision tree model.

4) Computes the decisions in favor of each anticipated illness and consider the mode (which is most continuous illness anticipated) as last expectation from the Random Forest model calculation.

10.11

	remembersette New oblasse seconde New Construction (Santa State 1944 - Santandare (Canada Stare)) 2044 - 2044 (Santa Stare)
	<pre># cancelstage between sectors according to the sectors according t</pre>
	httebooen - Chaldren Mattr Ander Mattr Thebaue Mattr Andree Mattr Thebaue Matri
1110	$\label{eq:2.1} \begin{array}{l} & f_{0} = 1, f_{0} = \exp(i f_{0}), f_{0} = (1213), f_{0} = 0, f_{0} $
	legenment - (11) presentes - 2000.generation()spacement; presentes - 2000.generation()spacement;
11111	In Sec The A Decemptor, (in (2)(meet))) (2)(performed - a)) The Sec Decemptor
1020	47 (New York) St. Communication (Communication) (Communicat
1.4.1	13. delete("1.0", 100) 13. State(100), "aut (anot")

Fig 5: Coding Snapshot of Random Forest Classifier

A) Naïve Bayes Classifier Algorithm: Naive Bayes classifiers are highly scalable, requiring a number of parameters linear in the number of variables (features/predictors) in a learning problem. Maximum-likelihood training can be done by evaluating a closed-form expression718 which takes linear time rather than by expensive iterative approximation as used for many other types of classifiers. In the statistics literature, naive Bayes models are known under variety of а names. including simple, Bayes and independent Bayes. All these names reference the use of Bayes' theorem in the classifier's decision rule, but naive Bayes is not (necessarily) a Bayesian method.

In [11]: 3	def	<pre>talveNayes(): from sklearn.naive_bayes import GaussiantB geb = GaussiantB() geb=mb.ft(x,n.n.iwv2(y))</pre>
5 7 8 10		<pre># citculating accuracy. from sklaarn.metrics import accuracy_score y_ened.pmb.predict(X_test) print(accuracy_score(y_test, y_pred)) print(accuracy_score(y_test, y_pred,mormalize=False))</pre>
12 12 10 14 15 16 17		<pre>psymptoms = [Symptom1.get(),Symptom2.get(),Symptom3.get(),Symptom3.get(),Symptom3.get()] for k in range(0,len(13)): for z in psymptoms: if(z=-11(k)):</pre>
10 10 10 11 10 10 10 10 10 10 10 10 10 1		<pre>inputtest = [12] predict = gob.predict(inputtest) predicted-predict(0) h='mp'</pre>
24 25 25 27 27 27 27 27 27 27 27 27 27 27 27 27		<pre>for a in range(0,ian(disnase))) if(predicted a):</pre>
2 11 12 12 13		If (N= Y05); 13.60fet(1.0", E00) t5.insert(R0, disease(s)) sisc: t3.60fet(1.0", E00) t3.insert(E00, "Not Found")

Fig 6: Coding Snapshot of Naïve Bayes Classifier

V. CONCLUSION Following is the accuracy score of all the 3 algorithm.

0.9512195121951219

39

0.9512195121951219

39

0.9512195121951219

39

Fig 7: Exactness of all three algorithm

In the above figure, 0.95121 represent the accuracy score and 39 represents the disease.



In [11]: / print("Accuracy(", metrics.accuracy_score(y_test,y_pred))

Accuracy: 0.9512195121951219

- Anna Karen Gárate-Escamila, Amir Hajjam El Hassani, Emmanuel Andrès, Classification models for heart disease prediction using feature selection and PCA, Informatics in Medicine Unlocked, 2020.
- [2] Keniya, Rinkal and Khakharia, Aman and Shah, Vruddhi and Gada, Vrushabh and Manjalkar, Ruchi and Thaker, Tirth and Warang, Mahesh and Mehendale, Ninad and Mehendale, Ninad, Disease Prediction From Various Symptoms Using Machine Learning (July 27, 2020)
- [3] Symptoms Based Multiple Disease Prediction Model using Machine Learning Approach Talasila Bhanuteja, Kilaru Venkata Narendra Kumar, Kolli Sai Poornachand, Chennupati Ashish, Poonati Anudeep. (IJITEE), Volume-10 Issue-9, July 2021
- [4] [A. S. Monto, D. M. Fleming, D. Henry, R. de Groot, M. Makela, T. Klein, M. Elliott, O. N. Keene, C. Y. ManThe Journal of Infectious Diseases, Volume 180, Published: 01 August 1999.
- [5] Park, D.J., Park, M.W., Lee, H. et al. Development of machine learning model for diagnostic disease prediction based on laboratory tests. Sci Rep 11, 7567 (2021). Published-07 April 2021
- [6] A comparative study on machine learning based heart disease prediction A. Kondababu, V. Siddhartha, BHK.

Advancement in Sensors for IoT using Arduino

Kshama Shukla Department of Engineering Sciences & Humanities Thakur College of Engineering & Technology Mumbai, India kshamavshukla@gmail.com

Abstract— Internet of things (IoT) is the future and it is going to be used by everyone everywhere. The applications are robotics, navigation, automation, remote sensing, underwater imaging, etc., it is becoming popular due to its advancement day by day. IoT is used for interconnecting physical devices with the internet using sensors. As the physical devices are connected with the internet, from anywhere in the world it can be accessed and controlled. For example, in healthcare system, patient can be operated from any part of the world or their status can be studied from anywhere, in smart home systems, household applications can be controlled from the offices, in agriculture system, plants can be watered automatically or in surveillance systems, IoT can be used. In this paper, various advancements in sensors would be studied and different sensors will be interfaced with Arduino board.

Keywords—Arduino, IoT, applications, sensors

I. INTRODUCTION

Arduino is an open source platform. Several sensors can be added to Arduino, and it can send data to output devices like led lights, motors, LCDs or 7-segmnt displays and other devices. The Processing-based integrated development environment (IDE) offered by the Arduino platform supports the C, C++, and Java programming languages. The core component of the Arduino platform is an Arduino Board termed a Hardware Board. The board can be interfaced to other external hardware, such as various sensors, different motors or led lights etc. The paper discusses about some of the IoT applications and different sensors available to interface with Arduino board. Arduino board have 6 analog pins and 14 digital pins. For automating any system, there is a need to use a microcontroller. In this paper, the prototype is using an Arduino microcontroller which is an open source microcontroller and can be easily programmed using the Arduino IDE according to our need. The most important advantage of Arduino is that the program can be written and changed n number of times. Also, the Arduino can be programmed using any programming language. ATMEGA328P microcontroller chip is used in the Arduino board. The board has 14 digital input/output pins out of which 6 can be used as PWM pins, 6 analog input pins, a USB connection, a power jack and a reset button. It has an operating voltage of 5V. For powering an Arduino, it can be connected to a computer with a USB cable or can be powered with a AC-DC adapter or battery to power the board. Also, after turning on, Arduino can power low voltage devices like LED, temperature sensor, motion Karuna Nikum Department of Engineering Sciences & Humanities Thakur College of Engineering & Technology Mumbai, India karuna.nikum@tcetmumbai.in

sensor etc. but it cannot power the devices which require higher voltages like motors, bulb etc. They need to use a separate battery or AC mains supply.



Fig 1: Arduino Uno Board[1]

II. ADVANTAGES OF ARDUINO

A. Active User Community

A group of individuals using a comparable product can communicate via posted messages, share experiences, and offer solutions to other users' difficulties [2].

B. Development of Arduino

Arduino was created with the goal of giving professionals, students, and amateurs an affordable and hassle-free approach to build devices that interact with their environment utilizing sensors and actuators. This makes it ideal for beginners to get going right away [2].

C. Affordable Hardware

Since Arduino is an open source platform, no software needs to be purchased; instead, just the board or its components must be purchased, making it a very affordable platform. The hardware designs are also freely accessible online from their manufacturer, making it relatively affordable. On its official website, the hardware designs are also freely accessible online [2].

D. Arduino Board as a Programmer

These boards have a USB cable that serves as both a power supply and a programmer, making Arduino boards easy to use and making them accessible everywhere [2].

E. Multi-platform Environment

The Arduino IDE can run on a variety of operating systems, including Microsoft, Linux, and Mac OS X, which expands the user base.

III. SENSORS

A sensor is often a tool that can spot changes in the surroundings. A physical phenomenon can be measured by a sensor and converted into an electric signal. It is crucial that the electronic version of the manuscript and any artwork match the hard copy perfectly for papers to be accepted for publication. Since the given electronic material is not replicated but rather transformed into the final published version, the content's quality and accuracy are essential.

A. TYPES OF SENSORS

1) Physical Sensors

Physical sensors often record data about the physical world, including length, weight, pressure, temperature, electricity, and sound. It can be described as a machine that emits an electrical signal that can be measured and corresponds to a physical attribute known as stimulus [3].

2) Chemical sensors

Chemical sensors are frequently employed in industrial settings. These sensors are mostly employed and applied by the chemical liquid changes industry. These sensors are crucial to the creation of industry-based smart cities. The conservation of the environment and the development of smart cities should also be taken into account. Chemical sensors' most significant and prominent applications are in industrial environmental monitoring and process control [3].

3) Temperature Sensor

One of the sensors that is frequently used to gauge the heat or temperature of a specific medium is the temperature sensor. These sensors employ a variety of techniques to identify and measure an object's temperature. Several types of temperature sensors may detect liquids or gases that release radiant radiation, such as heat spikes or temperature spikes, without needing to make direct physical touch with the object[4].

4) Proximity Sensor:

Sensors of proximity are the most effective at picking up any movement. They are commonly employed in applications involving safety or effectiveness. In order to avoid obstacles when going to a crowded location or along any complicated route, these sensors are used as the ideal sensors for map development.

5) Pressure Sensor

A pressure sensor helps detect pressure and translates that information into an electrical signal. Pressure sensor value and applied pressure are related. These sensors create Internet of Things (IoT) systems that keep an eye on brandnew pressure-driven systems and equipment[5].

6) Optical Sensor

Light and other electromagnetic energy are detected using optical sensing technology. It makes use of the photoelectric effect concept, which states that when a negatively charged plate made of a suitable light-sensitive material is struck by a photon beam, electrons will be expelled. The electrons can then start to flow from the plate feed as a current, acting as a signal[6].

7) Humidity Sensor

Water in the air is humidity, according to the humidity sensor. The amount of water vapour in the air can have an impact on human life, in addition to various manufacturing operations. Water vapour affects a variety of physical, chemical, and biological processes. Its measurement in industrial settings is problematic because it can have an impact on the cost and quality of the final product as well as the health and safety of the workforce. Thus, humidity sensing is crucial for controlling human life and industrial activities.

IV. SENSORS INTERFACE WITH ARDUINO

In this paper, some sensors are interfaced with the Arduino board, which can be used for some applications. First step is to sense physical value using analog or digital sensor.

A. Arduino with LDR

LDR is Light Dependent Resistor. They are used mostly in automatic lighting system, because they detect if light is present or not. It can also be used to measure the strength of light intensity.





Fig. 1. Arduino with LDR sensor

B. Arduino with PIR sensor



Fig. 2. Arduino with PIR motion sensor

ICHSTE - 2023

PIR sensors mean Passive Infrared Sensor, it allows to detect motion. It is mostly used in applications like automatic door lock system, car parking etc. They are mostly used because they are lightweight, low-power, simple to use and affordable.

C. Arduino with smoke sensor



Fig. 3. Arduino with smoke sensor

A smoke detector is a sensor that detects smoke. It can be used as a fire indicator. Smoke detectors typically comes enclosed in plastic material. In above image, it shows the green light glows when smoke is below a certain level and red led glows when smoke is above a certain level.

D. Arduino with Ultrasonic Sensor

Ultrasonic sensor is used to measure distance. It uses SONAR. There are ultrasonic transmitter and receiver modules in this sensor. Its accuracy is high and gives stable readings from 2cm-400cm.



Fig. 4. Arduino with ultrasonic sensor

V. ACTUATORS INTERFACE WITH ARDUINO

A. LED

1) Single LED

LED is the simplest output device which can be used for seeing the output. In the image, one led is connected with the Arduino board with the help of resistor.



Fig. 5. Arduino with single LED

2) Multiple LEds

Multiple LEDs can be used as a chaser application or traffic light controller etc. In the image, three LEDs are connected red, yellow and green. The program written is such that all the three LEDs turn on one after the other with 50ms delay. This can be further extended to make some toys, to give signal to output devices etc.

B. Servo Motor

Servo motor can be interfaced with Arduino board. The connection is very simple and the Arduino will control the motor depending upon the code. This can be further extended to control the motor based on some input. The input can be any physical quantity, which we want to control.



Fig. 6. Arduino with multiple LEDs



Fig. 7. Arduino with servo motor

VI. CONCLUSION

As IoT gains popularity, security concerns are receiving more attention in Io T devices and apps. We reviewed various IoT sensor types and their applications in this study. We provided a thorough review of sensors in our article on how existing sensor management systems can be adapted to the Internet of Things. IoT sensors are used in a plethora of industries, including mining, manufacturing, government, healthcare, and transportation. Inevitably, the usefulness of IoT devices is increased by the usage of sensors. Examples include recent attempts to use the sensors of IoT devices to compromise their security. Thus, security is crucial for IoTbased sensors. All of the sensors are combined and fused to provide a full platform that is extremely useful in many applications.

- Akshey Sharma, Amit Saxena, Govind Varshney, "ARDUINO A BRIEF REVIEW", International Journal of Scientific Research and Management Studies (IJSRMS) ISSN: 2349-3771 Volume 2 Issue 11, pg: 445-451
- [2] Leo Louis, "Working Principle of Arduino and Using it as a Tool for Study and Research," in (IJCACS), Vol.1, No.2, April 2016
- [3] Dr. J. Jegathesh Amalraj, S. Banumathi, J. Jereena John, "IOTSensors And Applications: A Survey," International Journal of Scientific & Technology Research Volume 8, Issue 08, August 2019.
- [4] Pranava Madan, Lakshay Dhama, Rajiv Dahiya, Ruchika Doda, "A Review Paper on Arduino Research Papers", JRASET Volume 7 Issue III, Mar 2019
- [5] Alisher Shakirovich Ismailov, Zafar Botirovich Jo'rayev, "Study of arduino microcontroller board," "Science and Education" Scientific Journal / ISSN 2181-0842 March 2022
- [6] Isaías González Pérez a, A. José Calderón Godoy b, Manuel Calderón Godoy cand J. Félix González González d, "Survey about the Utilization of Open Source Arduino for Control and Measurement Systems in Advanced Scenarios. Application to Smart Micro-Grid and Its Digital Replica", ICINCO 2019 - 16th International Conference on Informatics in Control, Automation and Robotics

Automation of Seating Arrangement for Exams Using Excel

Vikas Nagve Department of Engineering Sciences & Humanities Thakur College of Engineering and Technology vikasr008@gmail.com Soma Karmokar Department of Engineering Sciences & Humanities Thakur College of Engineering and Technology somaries88@gmail.com Karishma Bhandari Department of Engineering Sciences & Humanities Thakur College of Engineering and Technology Karishma.bhandari@thakureducation.org

Abstract--The purpose of this study is to automate the making of seating arrangement for exams. This study focuses on use of excel formulas to generate seating arrangement by inputting basic details. Making seating arrangement involves allocating a number of students from different class or classes to seat in a block for writing exam, this can be a tedious task if the students and classes are large in number. Generally making seating arrangement is a time-consuming task and may require hours of work based on number of students involved. Also, we have to do lot of mathematical calculations and need to input lot of data manually wherein chances of making error is high but, with the help of sequentially used excel formulas we can get the end result with just few clicks irrespective of number of students involved and also chances of making error are negligible

Keywords: excel, seating arrangement, automated seating arrangement

I. INTRODUCTION

We all know how complicated it is to work with a paper spread sheet.Being in an education sector means handling a wide range of data. The most crucial time is during the exam where the seating arrangement becomes a challenging task. First of all it is required to find out how many students will be giving the exam, secondly the number of rooms available to accommodate them. Also, we need to find out the seating capacity of the rooms available. After sorting out all this data we finally work on allocating each student to a designated room. Now doing this work manually would be an intricate mechanism. Here comes excel to our rescue as it has the ability to simplify these tasks. Microsoft Excel is equipped to handle, sort and segregate large data in an easier way. By using excel initially we can form a base structure of seating arrangement where we can give the input for a particular room number and a set of roll numbers allocated to that room. Likewise by filling the details of all the rooms a proper input structure for seating arrangement will be prepared. The same data will be reflected in individual block seating

arrangement where the block refers to the room where the exam will be conducted.

The process of making seating arrangement for exam begins with allocating different classes students in exam blocks. Here we have considered 40 or less students seating in a block, this automation won't work if number of students are going above 40, for that we need some tweaks in excel formulas. After allocating students we need to form seating arrangement structure where we can see all prepared blocks with class and roll number of students in it.

BLOCK No.	FLOOR	ROOM NO.	Perticulars(Group1)	TOTAL
1	5th	503(wing A)	Comp-A(10-20)=11 Comp-C(1-29)=29	40
2	5th	504(wing A)	CIVIL-(20-38)=19 IOT-(1-21)=21	40
3	5th	505(wing A)	CS&E-(44-64)=21 CIVIL-(1-19)=19	40
4	5th	506(wing B)	CS&E-(4-43)=40	40
5	5th	508(wing B)	AIDS-B(27-63)=37 CSE-(1-3)=3	40
6	5th	512(wing C)	AI&DS-A(50-63)=14 AI&DS-B(1-26)=26	40
7	5th	513(wing C)	AI&DS-A(10-49)=40	40
8	5th	516(wing C)	COMP-C(33-63)=31 AI&DS-A(1-9)=9	40
				-

Figure 1 Seating arrangement structure

Final step is to form block seating arrangement where we insert actual seating arrangement of the students inside the block. This is done for each block separately.

Comp-A(10-20)=11 Comp-C(1-29)=29

ROLL NO.	BENCH NO.	ROLL NO.	BENCH ND.	ROLL NO.	BENCH NO.	ROLL NO.	BENCH NO.
Comp-A10	1	Comp-A20	11	Comp-C10	21	Comp-C20	31
Comp-A11	2	Comp-C1	12	Comp-C11	22	Comp-C21	32
Comp-A12	3	Comp-C2	13	Comp-C12	23	Comp-C22	33
Comp-A13	4	Comp-C3	14	Comp-C13	24	Comp-C23	34
Comp-A14	5	Comp-C4	15	Comp-C14	25	Comp-C24	35
Comp-A15	6	Comp-CS	16	Comp-C15	26	Comp-C25	36
Comp-A16	7	Comp-C6	17	Comp-C16	27	Comp-C26	37
Comp-A17	8	Comp-C7	18	Comp-C17	28	Comp-C27	38
Comp-A18	9	Comp-C8	19	Comp-C18	29	Comp-C28	39
Comp-A19	10	Comp-C9	20	Comp-C19	30	Comp-C29	40

Figure 2 Block Seating Arrangement

II. PROBLEM STATEMENT

Exam time is the most crucial and critical phase in any academic institute. Smooth conduction of exams not only depends on paper setting and evaluation but also on the seating arrangement of the students. The work seems to be effortless but it becomes chaotic if the students are huge in number. Documenting all the data manually would be very tedious task and in addition to this it would be time consuming. Seating arrangement is one of the important part of exam which decides in which room and at which bench the students will be seating. Making block seating arrangement for large number of blocks may take hours to complete if done manually. The best solution for this situation is Excel which gives us the liberty to sort huge amount of data in a short period of time.

III. METHODOLOGY

The problem that arises due to manual documentation of any large scale data is very genuine. It requires lot of concentration and time dedication plus it becomes difficult to minimize the occurrences of error. This part will give us a detailed briefing about how Excel is useful to overcome the problem and its methodology.

'CONCATENATE' is one of the functions used to combine text from different cells into one cell. Also 'IF' which is one of the most popular functions in Excel, is used to make logical comparisons between a value and its outcome. These two functions are used to form a basic structure of the seating arrangement where only room number of the block and roll numbers of the students are to be given as input.

After this the seating arrangement structure of a block is to be defined which includes 40 students per block and 10 students in a column. Later on the base structure of the seating arrangement is linked with the seating arrangement in individual block.

The actual seating arrangement of each block is automatically generated by using VSTACK function. VSTACK combines all the arrays vertically into a single array. Each array is appended to the bottom of the previous array and thus a proper seating arrangement for 40 students in each block is prepared.



Figure 3- Flow chart

IV. RESULT AND DISCUSSION

The final outcome after using excel to make the seating arrangement will ease the job of exam in charge. The input data that needs to be updated in the excel sheet is very limited and in return we get fully organised output. By using this method, the seating arrangement can be made for 'n' number of blocks having a capacity of less than or equal to 40. The same work if done manually would take 4-5 hours of dedicated time but with the use of excel the work can be sorted within 15-20 minutes. This method is not only time saving but also it gives error free results because excel sheets are totally formulated. Unless someone feeds a wrong input there is very less chance of inaccuracy. To get seating arrangement of all blocks we just need to do entries like class, roll umber from, roll number to in input structure as shown.

CLASS G1	roll no. from	to
Comp-A	10	20
Comp-C	1	29
CIVIL-	20	38
IOT-	1	21
CS&E-	44	64
CIVIL-	1	19
-		1

Figure 4 Input structure of seating arrangement

After assigning all students in different blocks the formulated excel will generate 'basic structure of seating arrangement' as well as 'block seating arrangement' automatically.

V. FUTURE SCOPE

There is always a scope of future study in any research work. It gives an idea about the extent to which the findings can be explored more. In this current study we have limited the block capacity to 40 students as per the ergonomics and area of each block. This capacity can be increased up to any desired number as per the availability of space. The only trick would be to experiment more with the functions of the Excel.

ACKNOWLEDGEMENT

We would like to express our sincere gratitude to honorable Principal, **Dr. B.K Mishra** for giving us this platform to unveil our research work. We would also like to thank our ES&H department Incharge, **Dr.Sunita Pachori** for continuously encouraging and motivating us. Furthermore we would like to acknowledge with much appreciation the crucial role of our colleague and ex-faculty member of TCET, **Mr.VimalGosar** who gave us his guidance and necessary inputs throughout the course of our research work.

- [1] <u>https://www.educationworld.com/a_tech/techtorial/techtorialintro.sh</u> <u>tml</u>
- [2] <u>https://support.microsoft.com/en-us/office</u>

A Review on Energy Security in India

Karthik Sankararaman Engineering Sciences & Humanities Thakur College of Engineering and Technology, University of mumbai Mumbai, India karthik.sankararaman@tcetmumbai.in

Abstract— There have been recent efforts in India to improve the country's energy security, but given the complexity of the problem, it is critical to assess existing information and methods for measuring energy security. The following elements accessibility, cost, and environmental sustainability—must also be considered in order to comprehend India's energy security. This study will review on the current scenario of the Energy Security and emphasize on the need for using renewable energy resources instead of fossil fuels. Due to the advancement in living standards, India is now the world's third largest energy consumer. The rate of energy consumption has increased since the year 2000, along with coal, oil and solid biomass that is satisfying 80% of total demand. This current article emphasizes on India's energy resources and its requirements, focusing on oil and gas utilization.

Keywords: Energy Security, Supply, Oil, Gas, Sustainable

I. INTRODUCTION

In current scenario, Energy Security is one of the important parameter that has to be considered in a very high priority basis. Energy Security mainly depends upon the oil supply.

Studying the supply of natural resources used for energy consumption during a specific time period is crucial to comprehend the significance of energy security. Since the Indian economy currently only relies on fossil fuels (oil, coal, and natural gas), it may be concluded that only an adequate supply of fossil fuels will ensure future energy security. The only way to fix the existing situation is to transition to renewable energy, but all available information indicates that the Indian economy is solely dependent on fossil fuels. Fossil fuels will therefore undoubtedly continue to be needed for energy security in the future. The fossil fuels can only be replaced by renewable energy since it is gained from various domestic renewable energy resources, which will in turn lower the expenses incurred for import of fossil fuels from foreign countries. Therefore a conclusion can be made that more domestic energy resources must be developed instead of depending only on the import of fossil fuels.

To understand the Energy Security it is necessary to know about the term energy independence. The term energy security and energy independence are very closely related to each other. If energy security is improved then the energy independence will also be improved. Energy plays a superior role in the national security of any country, as without the availability of energy, there will be no improvement in the economy, in turn there will be no progress within the society.

All the existing oil exporter in the country are currently trying to find the solutions so as to increase the energy security by lowering the foreign oil import and stressing more on the renewable energy resource. Hence there Shivram Poojari Engineering Sciences & Humanities Thakur College of Engineering and Technology, University of mumbai Mumbai, India shivram.poojari@tcetmumbai.in

is a growth of domestic renewable energy resources thereby aiming to improve energy efficiency leading to the energy conservation. To achieve this, the concept of energy security is developed which acts as a means to safeguard the physical infrastructure and also various sources of energy. Energy Security aims to access the more volume of energy at very affordable prices.. Several economic sectors, including industrial, residential, and transportation, make up the energy demand sub-system, where final energy is utilized.

Many nations, notably India, one of the leading contributors of CO2 emissions, have a significant fuel component in their energy mix. Meeting a country's crucial challenge of a fast rising energy demand is India. India is the sixth-largest consumer of energy in the world. It must quicken the sector's growth in order to fulfil the desires of more than a billion people for increased prosperity. India now consumes a very little amount of energy per person compared to the rest of the globe. During the 2008–2009 period, the average global per capita energy consumption was close to 1800 kg (kilograms of oil equivalent). For many nations today, uninterrupted electricity supply is crucial, but for India specifically given its stage of development right now.

II. PRESENT CONDITION

The Global Energy Outlook projects a 40% increase in global primary energy consumption between 2007 and 2030, from just over 12,000 Mtoe (million tonnes of oil equivalent) to 16,800 Mtoe, an increase of 1.5% yearly. In Fig. I, the reference scenario based on current policies in 2008 and 2030, the global energy mix is shown. The International Energy Agency (IEA) predicts that under the reference scenario with present policies, the size of the global energy mix will increase from 11294.9 Mtoe in 2008 to 17014 Mtoe in 2030.Fossil fuels including coal, oil, and natural gas continue to be the predominant energy sources of choice globally, contributing to the 50% rise in energy consumption between 2008 and 2030.

Over the forecast period, the demand for coal will grow by the most in absolute terms, followed by the demand for gas and oil. Even while oil will still make up the majority of the primary fuel mix in 2030, its percentage will decrease from 34% to 30%. Figure II lists the energy mix of a few developed and emerging nations Iceland, Norway, Sweden, and Finland are four developed nations with renewable energy making up, respectively, 73, 60, 26, and 23% of their overall energy mix. France, Sweden, Switzerland, and Belgium, however, have 40, 37, 24, and 22% of nuclear power, respectively.



Figure I: Pie Chart of World Energy Mix

Country	Energy mix				
	Fossil (%)	Nuclear (%)	Renewables (%)	Other (%)	
Luxembourg	92	0	2	6	
United States	86	8	6	0	
Australia	97	0	3	0	
Canada	67	7	25	0	
Finland	59	16	23	2	
Belgium	75	22	2	1	
Ireland	97	0	2	1	
Netherlands	94	1	3	2	
Germany	84	12	4	0	
Denmark	85	0	14	1	
Japan	83	12	5	0	
Norway	37	0	60	0	
Austria	77	0	21	2	
United Kingdom	89	9	2	0	
Italy	90	0	7	3	
New Zealand	71	0	29	0	
Iceland	27	0	73	0	
France	52	40	6	2	
Bulgaria	71	22	5	2	
Portugal	83	0	15	2	
Sweden	37	37	26	0	
Switzerland	63	24	13	0	
Brazil	62.45	1.36		36.08 (hydro)	
China	92,6	0,77		6.61 (hydro)	
India	92,82	0.80		6.06 (hydro)	
Indonesia	97.80			2.16 (hydro)	
South Korea	85.32	14.22		0.37 (hydro)	
World Mean	87	6	6	1%	

Figure II: Comparative table of World Energy Mix

Another issue with the main energy sources is that sseveral developing and developed economies have taken notice of the energy security with uninterrupted supply of energy.

However, the major fuels needed to generate energy are not spread equally over the globe. In fact, the recent global price volatility, fiercely competitive global demand, and related geopolitical risks have effectively excluded some nations.

The competition between developing and developed economies for access to foreign energy resources has greatly increased in recent years as a result of major concerns about energy security.

III. ENERGY MIX IN INDIA

Figure III displays the energy mix in India in 2008. Coal accounts for over 54% of all commercial energy. Even though it only produces a little amount of coking coal, India is a sizable coal producer. As a result, South Africa, Australia, and Indonesia imported about 59.0 million tonnes (12%) of the world's total coking and high-grade thermal coal in 2007–2008. Moreover, oil and gas still play a key role in meeting the country's energy needs. The oil and gas industry would supply roughly 45% of the overall energy requirements .

India produces roughly 880,500 bbl of oil per day while importing about 2.159 million bbl, whereas the country generates about 31.7 billion cubic metres of natural gas per day while importing 10 billion cubic metres . Nigeria, Saudi Arabia, Kuwait, Iran, and Iraq are the main suppliers of oil for import. The consumption of natural gas has been rapidly increasing recently. In addition, compared to its current production of 100 standard cubic metres (MSCN) per day, its demand is anticipated to rise to 400 MSCN per day in 2024– 2025. India now imports natural gas from Australia, Malaysia, United Arab Emirates, Algeria, Egypt, Nigeria, Oman, Qatar, and the United Arab Emirates.

India's energy vulnerability has increased as a result of recent increases in its imports of oil and natural gas. India now consumes very little energy per person compared to the rest of the globe, yet despite this, the country's economy is expanding at a rate of 7–10% of GDP, which is driving up demand for energy. The expected growth in the size of the energy mix and the energy contribution from primary fuels are depicted in Fig. IV and V, respectively. The reference scenario predicts that the size of the energy mix will increase from 433.3 Mtoe in 2008 to 2123 Mtoe in 2031, with a modest 8% growth in GDP.

Figure III: India's Energy Mix in 2008

IV. ESTIMATION OF CO₂ EMISSION

According to the current scenario, India's total energy mix size in 2031 is expected to be 2123 Mtoe, with fossil fuels accounting for 2069 Mtoe (97% of the total size) (Figs. 6 and 7). In the current review, a straightforward technique is used to examine CO_2 emissions caused by the combustion of different fossil fuels in the energy mix. The changed energy mix reduced the 97% (or 2069 Mtoe) fossil fuel contribution from the reference scenario to 90, 80, and 70%. Figure VI displays the CO2 emission.

fæl	Food faels scenarii ere 2001	is oderaniz Ny mik is	Modified energy	gnit				
	Stille	0.001	98 Mbe	0.002	BTR Mitte	0.03	703 Mite	0.002
N	177	128	302.37	211	Q12	18	546.28	164
Col	115	45	186.13	4176	96528	371	网络彩	125
Natural Car	135	0307	126	628	112164-625	58	822	
Tal	208	7007	1999.5	657	1756	5.84	148	518

Figure VI: Estimated CO₂ Emission

V. RENEWABLE ENERGY MIX

Additionally, relying too heavily on non-renewable resources to produce electricity is also unsustainable in the long run. Therefore, it is crucial to address the global energy issue by making significant use of the wealth of renewable energy sources, including geothermal, solar, wind, and biomass energy. A lot of nations have set high goals for renewable energy. The "classic" renewables like hydropower and conventional biomass, which supply 6 and 9% of the world's primary energy consumption, respectively, continue to dominate the renewable energy market today. "New" renewable energy sources like wind, photovoltaics, and miniand micro- hydroelectricity only make up around 2% of the world's primary energy supply at the moment.

VI. OIL

Despite having scant natural gas and oil resources, India possesses significant coal deposits. Its oil reserves are estimated to be close to 11 billion barrels, which is 5.9 billion barrels more than 0.5% of the world's total reserves. These quantities are proven, reachable, and theoretically recoverable. The majority of India's oil deposits are situated in Assam and offshore regions close to Mumbai. Regrettably, domestic output can't even come close to meeting the rising demand. The country's annual demand for oil is expected to increase at an average rate of 2.9% during the next 25 years, while domestic supply is expected to remain stable.

Around 70% of its oil was imported in 2009, largely from Middle Eastern nations, as a result of stagnant domestic crude output, and this dependence is expanding quickly. India's reliance on oil imports is expected to increase to 91.6% by 2020, according to the International Energy Agency's World Energy Outlook .By 2025, India is anticipated to overtake the United States, China, and Japan as the world's fourth-largest net importer of oil, according to the Energy Information Administration (EIA).

VII. NATURAL GAS

Natural gas is quickly replacing other fuels as the preferred fuel of the future due to its attractiveness as a feedstock, environmental friendliness, and economic appeal. Further consideration is necessary for this promising sector. Natural gas has risen to become one of the most widely used fuels because of its superior efficiency, kindness to the environment, and low cost.

Around 1.5 Tcf (billion cubic feet) of natural gas was consumed in 2007, which is 100 Bcf (billion cubic feet) higher than in 2006. The discovery of the Godavari basin in the Andhra Pradesh region, which was made recently, not only raised the nation's potential gas production by 50%, but also enhanced the energy security of the nation.

Although India's natural gas output has steadily increased, the country has been a net importer of natural gas since 2004 because the demand has already outpaced the supply. India is mulling large-scale imports via pipelines and LNG terminals to help satisfy growing demand despite significant fresh natural gas discoveries in recent years. In 2007, it is estimated that India's net imports totaled 353 Bcf. Liquefied natural gas is used to import natural gas into India (LNG). In 2006, Algeria, Egypt, Nigeria, Oman, Qatar, the United Arab Emirates, Australia, and Malaysia supplied India with LNG. In 2025, India's natural gas consumption is anticipated to increase to 82 Bcf.

In conclusion, fossil fuels are essential for providing the heat, light, and mobility that a growing population needs today and is expected to need in the future. The difficulties of energy security with an unbroken supply of fuels, climate change, and health risks owing to environmental pollution must be addressed while meeting the requirement for energy using primary energy sources. The usage of fossil fuels and biomass combustion, which are notoriously ineffective at generating useful energy, is the issue. The utilisation of a "decarbonized" future energy mix, which includes renewable energy sources like wind, solar, and biofuels that release no carbon dioxide, offers a way to achieve the goals of energy security, combating climate change, and fostering sustainable industrial and economic growth.

VIII. CONCLUSION

The future of human prosperity is dependent on how well two major issues

- (i) securing a supply of affordable, reliable energy
- (ii) adopting a low-carbon, effective, and environmental friendly system of energy supply

Instead of focusing energy-saving efforts on the current energy portfolio, it is crucial to switch to energy sources that can significantly lower CO_2 emissions when compared to fossil fuels in order to solve these problems. Clean energies like renewable ones would be a significant alternative in this case. The majority of the technology required to switch from dirty, fossil fuel-based energy to clean, renewable energy already exists. The inclusion of a renewable energy portfolio into India's future energy mix will be as follows

- (i) Remove the combustion as a means of generating electricity for everyday usage as well as for automobiles,
- (ii) ensure energy security,
- (iii) improve quality of life.

The future energy mix is anticipated to be in order to achieve sustainable development without damaging the planet, consist of the following;

- (i) heavy use of nuclear fuel,
- (ii) natural gas, and
- (iii) third-party renewable energy sources.

- Ramchandra Pode, "Addressing India's Energy Security and options for decreasing energy dependency" Elseiver 14(2010) 3014-2022.
- [2]. Rue du Can S. de la, McNeil M, Sathaye J. India Energy Outlook: end use demand in India to 2020. Ernest Orlando Lawrence Berkeley National Laboratory. 2009.
- [3]. Pode R. India–Korea solar energy cooperation. Asia-Pacific Business and Technology Report 2009;1(2):38–9. Available at: http://www.biztechreport.-com/pdf/AP-July-2009.pdf.
- [4]. World Energy Outlook, Executive Summary. International Energy Agency (IEA), France; 2009. Available from: <u>http://www.worldenergyoutlook.org/</u>
- docs/weo2009/WEO2009_es_english.pdf.
- [5]. Narula K. Is sustainable energy security of India increasing or decreasing? Int J Sustain Energ 2014;33(6):1054–75.
- [6]. Daniel Yergin, "Energy Security", Foreign Affairs, 85, 2 (March/April 2006) 70–71. Also see, Girijesh Pant, Paper Presented in a Seminar on "India's Energy Security and The Gulf", at The School of International Studies, Jawaharlal Nehru University, New Delhi,19–20 March 2004.
- [7]. "Sakhalin-I starts oil, gas production", The Hindu, 2 October 2005.Ashok Parthasarthy, "Renewable Energy Sources: Situation and Prospects", World Affairs, 10, 1 (Spring 2006) 112–138.

Evaluation of Application of Roller Compacted Concrete as the Pavement Material: A Review

Yogita Sagare Department of Engineering Sciences & Humanities Thakur College of Engineering & Technology Mumbai, India yogita.Sagare@thakureducation.org

Abstract - Roller compacted concrete (RCC), a recently developed material for paving, is a viable option for many pavement applications because of its affordability and speed of construction. Because to its somewhat coarse surface, it has typically been utilized for pavements carrying large loads in low-speed locations. Nonetheless, its use on local streets and highways as well as in business areas has grown recently. At the opening to this study, the RCC's working principles are discussed, particularly in relation to the advantages of concrete pavement. It offers details on material qualities, mixture proportioning, structural design concerns, and manufacturing and construction factors. Also, an overview of the study on several aspects of rollercompacted concrete as a pavement material is presented.

Keywords- Roller compacted concrete, concrete pavement, Pavement materials, Zero slump, flexible pavement.

I. HISTORY: ROLLER COMPACTED CONCRETE PAVEMENT

When the Canadian logging industry transitioned to more environmentally friendly, land-based log-sorting techniques in the 1970s, RCC pavements were first built. For these huge sorting yards, the industry required a lowcost, durable pavement that could withstand heavy loads and specialized machinery (that can span 40 acres or more). RCC successfully overcame this obstacle and has now added other heavy-duty applications. Engineers, owners, and construction managers are still drawn to RCC because of its low cost. RCC's attractiveness today is mostly a result of performance. The building timetable can be accelerated by using RCC, which is strong enough to support large and specialised loads. RCC is adaptable enough to handle a wide range of paving applications and is resilient in a freeze-thaw environment.

WHAT IS ROLLER COMPACTED CONCRETE PAVEMENT?

The large vibrating steel drum and rubber-tired rollers that are used to compact concrete into its final shape are known as roller-compacted concrete (RCC). RCC is made of the same basic components as conventional concrete, including well-graded aggregates, cementitious materials, and water, but it has a different mixing composition. Prajakta Kamble Department of Engineering Sciences & Humanities Thakur College of Engineering & Technology Mumbai, India prajakta.kamble@thakureducation.org

The main difference between RCC combinations and ordinary concrete mixtures is that RCC has a higher proportion of fine particles, enabling consolidation and tight packing. Fresh RCC is more rigid than standard conventional concrete with zero slump. Its consistency is moist enough to allow for sufficient mixing and dispersion of paste without segregation while remaining stiff enough to maintain stability when subjected to vibratory rollers. RCC is normally laid out using an asphalt-type paver outfitted with a regular or highdensity screed, then compacted with a number of roller passes. Final compaction usually occurs an hour after mixing.

RCC pavements are built differently than traditional concrete pavements; it requires forms, dowels, and reinforcing steel. Joint. Although sawing is not necessary, transverse joints are placed farther apart than with standard concrete pavements when it is specified. RCC pavements are strong, dense, and long-lasting. RCC pavements are a great replacement for parking and storage areas, port, intermodal, and military facilities, highway shoulders, streets, and highways due to these qualities as well as the speed and economy of construction. RCC can also be utilised as the basis material in composite systems. RCC has steadily become more popular in both public and private applications in recent years, notably when building parking lots and low-traffic roadways [1].

The following are typical applications of RCC:

- Industrial plant access roads and parking lot
- Intermodal shipping yards, ports, and loading docks
- Truck/freight terminals, bulk commodity storage and distribution centers
- Low-volume urban and rural roads
- Aircraft parking areas
- Military long- or short-term loading zones, forward
 Or rearward bases of operation, and airfield
- Recreational vehicle pad storage
- Vehicle maintenance areas or compost areas
- Large commercial parking lots
- Roadways in public parks
- Roadways for timber and logging operations
- Highway shoulders

• Temporary travel lanes that must be constructed quickly to divert traffic

RCC can be utilised in pavement systems that serve higher traffic speeds, such as the bottom lift in a two-lift paving process or as a base for traditional concrete pavement surfaces. It can be used beneath overlays as well. Similar to the open texture of asphalt, the usual surface texture of RCC is more open than that of traditional concrete. Nevertheless, diamond grinding or the use of a thin overlay can produce a surface pattern that is denser and more closed [2].

II. DESIGN METHODS

The structural behaviour of typical asphaltic concrete pavements, which are intended to be flexible pavements, is very different from roller compacted concrete, which is a hard pavement. The rigid pavement can be designed using a variety of techniques, including empirical, semiempirical, mechanistic empirical, etc. The American Association of State Highway Traffic Organization (AASHTO), the Portland Cement Association (PCA), and the Indian Roads Congress are some organisations that have developed rigid pavement design techniques (IRC). All of these corresponding codes have undergone numerous adjustments to make them more applicable in the current situation [3].

III. MATERIAL AND CONSTRUCTION PRACTICES

Compared to standard concrete mixes, RCC mixtures typically contain less cementitious ingredients, coarse aggregates, and water and more fine aggregates, which fill the air gaps in the pavement system. Compared to traditional concrete, the fine particles in RCC are packed closer together. The initial load carrying capacity of the pavement is influenced by the high initial friction (aggregate interlock) provided by this tight packing.

a. Mix materials proportions:

In RCC, the volume of the mixtures is normally between 75 and 85 percent dense and well-graded coarse and fine particles. Because to their higher fines concentration and lower cement and water contents, RCC compositions are drier than conventional concrete.

b. Workability:

The combination resembles moist, densely graded granules in texture. The mixture used in the RCC is too stiff and relatively dry (less than zero slump) to be worked by conventional concrete paver machines.

c. Paving:

Normally, a heavy-duty, self-propelled asphalt paving machine is used to lay down the RCC mixture. A high-density single- or double-tamper bar screed is first used to consolidate the material into a slab of uniform thickness. These kinds of pavers are necessary for precise installation, particularly in applications involving thick pavement. The paperwork is not necessary. RCC is typically used in elevators between 15.2 and 20.3 cm.

d. Consolidation:

Consolidation's primary objective is to remove nonentrained air. This is done externally by compacting the concrete with rollers, usually within the first hour of mixing before the paste starts to set.

e. Finishing:

RCC pavement normally has an open texture (similar to asphalt) on top, however using smaller pebbles or more cement might result in a denser surface (closer to conventional concrete). Diamond grinding can be used to texture RCC.

f. Hydration:

For the pavement to last long time, the RCC mixture needs to be well hydrated. Curing the concrete is a crucial step since it helps with hydration.

g. Curing:

After roller compacting, complete curing is necessary as soon as possible. Controlling the evaporation of water from the concrete's surface makes it available for cement-water hydration, which creates a solid paste that binds the aggregate particles together.

h. Cracking, load transfer, and reinforcement:

When using RCC in industrial applications, the joints are typically not sawed. The random cracks, which are spaced 4.6 to 9.1 m apart, are typically tight when sawing is not required, allowing load transfer through aggregate interlock. Sawing is often used in applications where there is heavy vehicular and commercial vehicle traffic to control random cracks. In comparison to typical concrete pavements, RCC joints are sawed less often and are spaced 4.6 to 9.1 m apart transversely. Dowels or tie bars cannot be installed in RCC pavements because of how the RCC is consolidated.

IV. ENGINEERING PROPERTIES

The engineering qualities of RCC have been reported to be similar to those of traditional paving concrete, according to ACI 325.-95-10R [1] study. The amount of cementitious material, the calibre of the aggregate, and the level of compaction all affect how strong RCC pavements are. Although RCC has been used for paving for a while, the researchers have only conducted a small number of investigations to assess its engineering qualities. Because of this, the information regarding the engineering characteristics of RCC is mostly based on testing of specimens taken from actual paving projects or from a few full-scale test sections. The RCC's engineering characteristics are listed below.

a. High flexural strength

Based on beams and cores obtained from the test section, it was determined that the relationship between compressive

and flexural strengths of RCC was similar to that for conventional concrete, the relationship being of the form

where,

fr = flexural strength (third-point loading) (MPa)

 $f_r = C \sqrt{\mathbf{f}_c}$

fc = compressive strength (MPa)

C = a constant between 9 and 11 depending on actual RCC mix

More actual data is needed to define the range of C with sufficient confidence [1].

b. High compressive strength

RCC has a compressive strength that is comparable to ordinary concrete and normally ranges from 28 to 41 MPa. Several projects have achieved compressive strengths more than 48 MPa, however practical construction and financial considerations would probably call for increased thickness instead of such high strengths. RCC mixtures' usage of densely graded aggregates aids the concrete's development of high levels of compressive strength. The RCC combinations' low w/cm results in a cement matrix with reduced porosity, which also boosts the concrete's high compressive strength. Every mixing proportion has a sweet spot moisture level where it produces the highest dry density. The greatest strength is frequently offered by this density.

c. Split tensile strength:

The splitting tensile strength of cores taken from real RCC pavement projects ranges from about 2.8 to over 4.1 MPa at 28 days, depending on the cementitious concentration of the mix. Split tensile strength testing on cores are a more convenient and accurate way to determine RCC's tensile strength features than flexural strength tests on sawed beams. Data on typical splitting tensile strength from a few projects are shown in Table 1.

Project	Age days	sawed beam and core test results		
		Average flexural strength, MPa	Average splitting tensile strength, MPa	
Ft. Stewart	90	6.963705	-	
Ft. Hood	7 28	4.55743 5.72265	-	
Harvey Barracks	7 28	5.39859	2.33043 2.77169	
Ft. Campbell	7 28	4.46091	2.74411 -	
Aberdeen Proving Ground	7 28	3.8128 4.32301	2.61311 3.11643	

Table 1- Flexural and splitting tensile strength data of RCC projects (After ACI 325.-95-10R)

d. Modulus of elasticity

In samples from real RCC projects, the modulus of elasticity has rarely been tested. According to some of the restricted tests conducted on cores taken from a fullscale test section, the results of RCC's modulus of elasticity may be identical to or slightly greater than those for traditional concrete with comparable cement concentrations.

e. Bond strength

A major engineering characteristic of RCC lifts is bond strength at the contact. RCC pavement built in several lifts either behaves as a monolithic layer or as partially bonded or unbounded lifts depending on the bond strength. When compared to bonded lifts with an equivalent total thickness, the weight carrying capability of partially bonded or unbounded lifts is much lower. For untreated cold joints, there is little development of bond strength. According to best engineering practises, interface bond strength should be at least 50% as strong as the parent RCC material.

f. Shrinkage

Any significant change in the volume experienced with RCC pavements is due to drying shrinkage. However, the volume change associated with drying shrinkage is normally less than that in comparable conventional concrete mixtures due to the lower water content of RCC. Thus, lower volume of cement paste results in lower shrinkage and less cracking for RCC pavements. The research has also found that in a mixture with a constant cement amount, drying shrinkage decreases as the amount of coarse aggregate increases, due to high restraint [5]. Thermal expansion and contraction properties of RCC are believed to be similar to those of conventional concrete made with similar materials.

g. Permeability:

The permeability of RCC is nearly entirely regulated by the proportioning of the mixture, the manner of installation, and the level of compaction because it is highly dependent on the voids in the compacted RCC as well as the porosity of the mortar matrix. Hardened RCC's permeability is comparable to that of regular concrete.

h. Freeze- thaw durability

Internal cracking and surface scaling are the two main F-T cycle-related problems that RCC pavements in northern climes typically experience. These two types of harm can happen together, but they are separate and independent events. Internal cracking, which reduces the dynamic modulus of elasticity and causes expansion, can develop from F-T cycles if the RCC includes a considerable amount of moisture. Surface scaling also happens when the concrete is subjected to high moisture exposure during F-T cycles. In the presence of deicing salts, this process gets worse [19]. In order to resist both forms of attack brought on by F-T cycles, RCC mixtures must be developed.

i. Fatigue behavior

Evaluation of the fatigue behaviour of RCC has not received much attention. The RCC is vulnerable to fatigue effects, just like regular concrete and other building materials. The material rupturing as a result of repeated loads that result in strains below the material's strength is referred to as a fatigue failure. The outcomes of fatigue tests performed on beams made from a fullscale test section containing four different RCC mixtures show that the fatigue behaviour of RCC is comparable to that of conventional concrete [2].

V. LITERATURE REVIEW:

The review of various research works carried out on facets of RCC as a paving material is reported briefly in the following sections. For the purpose of clarity, the literature survey is presented in four broad categories, mentioned as under:

- Experimental Studies to Evaluate the Properties of RCC as a Paving Material
- Numerical Modeling and Analysis
- Analysis and Design
 Comparative Studies
 - Comparative Studies a. Experimental Studies

Afshin Famili [4] carried out the numerical analysis of Roller compacted concrete pavement, where a 3-D finite element (FE) model of RCC pavement was developed. Using finite element software ABAQUS software, the study investigated the effects of changes speed in vertical displacement.

Bily et al. [5] reported experimental study results in which all the experiments were strongly affected by the method used for the compaction of samples which was not optimal. Due to non-uniform compaction, the results showed relatively high standard deviations, the properties of samples with higher bulk density were systematically better then results measured on the specimens with lower bulk density. From this fact, it is possible to conclude that if the same concrete mix were compacted properly by heavy-weight drum vibratory roller, the mechanical properties of the material would be significantly better.

Pittman and Ragan [6] carried out laboratory investigations on the drying shrinkage of RCC for pavement application. The combined effect of the moisture content and aggregate grading on the drying shrinkage was statistically significant whereas the individual effects were not statistically significant

Kajorncheapunngam and Stewart [7] reported Rice husk ash (RHA) as cementitious Roller Compacted Concrete material due to high silica content. The use of RHA is not only to solve the problem of shortage of cement in the developing countries like ours but also to help to conserve energy, resources; and the environment. The use of RHA with 50% of replacement of cement in RCC can improve compressive strength of concrete.

Ghafoori and Cai [8] conducted experiments on laboratory made roller compacted concrete with various combinations of cement (Type I and Type V for surfaceresistant concrete), lignite dry bottom ash; and crushed limestone coarse to determine the suitability of use of bottom fly ash to manufacture long-term durability bottom ash roller compacted concretes.

Hamzah and Mohamed Baqer [9] studied experimental and analytical behavior of various mixes of RCC using different materials. They concluded that the magnitude of density of RCC decreases with the use of crushed aggregate and with admixtures, w/c reaches 0.83 in uncrushed aggregate mixes.

Krishna Rao *et al.* [10] evaluated the properties of RCCP with the help of soil compaction method. The results showed that RCCP mixes can be proportioned using soil compaction method and they further concluded that from the strength behavior of RCC, it is recommended for paving applications.

Hossain and Ozyildrim [11] investigated the properties of RCC for use in pavements. The special provision for use of RCC developed in this study was workable and was planned to be incorporated as a standard provision in VDOT's *Road and Bridge Specifications* with minor modifications. The study summarized the research that led to the development of VDOT's RCC specification.

b. Numerical Modeling and Analysis

Ouezdou and Loulizi [12] carried out numerical modeling of RCCP under vehicular loading. In the study, a 3-D numerical model was developed using F.E. software ABAQUS. This modeled pavement was analyzed under a single tier load of 60 KN with certain tire pressure. The results obtained were compared with the closed form solutions and Portland Cement Association procedure. The comparison showed that the FE model gives lower stresses and higher displacements. It was concluded that 3-D F.E. modeling is a reliable method for the calculation of stresses and displacement in RCCP.

Zidri *et al.* [13] studied a 3-D numerical model by introducing the computer code ABAQUS. Also, other methods of 2-D were applied for determination of stresses and strains. It was concluded that the 3-D modeling gives results slightly lower than those given by 2-D methods.

Rupnow *et al.*[14] studied the performance of thin roller compacted concrete under accelerated loading to determine the structural performance with failure mechanics and load carrying capacity also stating the applicability of RCC pavement with cement treated base

Vahidi *et al.* [15] carried out the modeling of mechanical properties of roller compacted concrete containing RHA using ANFIS. The test results and performed modeling showed that the optimal value for obtaining the maximum compressive strength and minimum permeability is offered by substituting 9% and 18% of the cement by RHA, respectively.

c. Analysis and Design

Schrader [16] presented the effect of compaction methods, water content, and other variables on density, pore pressure, practical construction problems in RCC construction. Muller (1990) reviewed the state of the art studies in RCCP. Further the study was extended to determine the performance of various types of pavements made and determines if a basis exists to build RCCP in Arizona, on an experimental basis, for both new roads and street connections.

Naik *et al.* [17] studied the state -of - the art information on strength and durability of roller compacted concrete for pavement design with and without supplementary cementitious materials with two case studies (using HVFA).

Kim [18] employed RCC for the interstate - 285 shoulder reconstructions in Atlanta, GA. Halsted (2009) studied the application, benefits, design, construction, testing, performance and sustainability of RCC pavement with successful example across North America.

Williams [19] RCCP was selected as a potential solution for failing pavements in the Arkansas area. RCC as a pavement a successful design in the two lanes constructed.

Krishna Rao *et al* [20] carried out the analysis and design of RCCP for low volume roads in India. Design curves for low volume were presented and the proposed RCCP was found suitable for sub grade having low modulus of reaction.

d. Comparative Studies

Mehdi Koohmishi [21] made a comparison between the properties of flexible pavement and RCCP by conducting experiments. The investigation showed that RCCP can be used instead of flexible pavements for warm weather conditions.

Zarrinkafsh and Shirazi [22] studied different aspects of RCCP such as mix design, flexural strength,

compressive strength and focus on the different part of RCCP in detail was investigated. It was concluded that for low speed, RCCP can be the best choice. It is also economical on freeways and highways.

Alikhani and Nejad [23] studied the properties of RCCP and its economic evaluation. It was concluded that RCCP can be used first in steep slopes and hot weather with a heavy and slow loading that in which asphalt pavements have problems and cannot be amenable.

VI. SUMMARY

Based on the critical appraisal of the literature reviewed related to the Roller Compacted concrete in the context of its being used as the probable material for application in pavement, following observations are summarized.

- A. Many studies pointed out the advantage of RCCP over the conventional flexible pavement. However, there are limited studies reporting the comprehensive investigations on the possible application of RCC as a paving material as a substitute for the conventional rigid pavements.
- B. Evaluation of the test data from RCC paving projects shows that the structural behavior of RCC is similar to that of conventional normal weight concrete. Thus, RCC can be treated much like conventional concrete when designing thickness of a pavement.
- C. It is clear that only a limited data base exists on engineering properties of RCC mixtures. No definite studies have been performed to determine influences of various parameters on the engineering properties of RCC.
- D. RCC, clearly, has many benefits from a cost and constructability standpoint that, in combination with appropriate design details and features, will make

it

a long-lasting and cost-effective pavement choice.

- E. However, their use is not that common in India as a highway pavement on large scale on large trafficked road although they are recommended for the low volume roads being constructed in the rural parts of the country under Rural Roads Development Programme and Pradhan Mantri Gram Sadak Yojana (PMGSY).
- F. Although there are few studies on modeling and analysis, limited studies are available wherein various aspects of the RCC pavements are linked by considering various aspects involved in the analysis, design, construction, modeling and assessment of the performance of the RCCP for different traffic conditions and weather conditions that would be prevalent in different parts of the country.
- G. It is an established fact that the RCC would be comparatively economical vis-a-vis conventional concrete when used in pavement. Moreover, it can

be an economical option in a part of the country like ours where the industrial waste material containing pozzolanic properties is available in abundance. Given the problem of safe disposal of such materials raising environmental concern, such material can be used advantageously in the RCC.

- ACI 325 10R-95, (2000) "State of the Art report on Roller Compacted Concrete Pavements", ACI manual of concrete practice, ACI, USA, 32PP.
- [2] David w. Pittman,(2009) "construction of Roller-Compacted Concrete Pavements" Transportation Research Record 1062
- [3] Naik, T. R., Kraus, R. N., Chun, Y.M., Rammer, B. R., and Singh, S.S.(1997) "Strength and Durability of Roller-Compacted HVFA Concrete Pavements", International conference on Durability of Concre.
- [4] Afshin Famili, Masoud Vafaei, "Numerical Analysis of Roller Compacted Concrete Pavement", Saudi Journal of Engineering and Technology, Vol-1, Iss-1(Jan-Mar, 2016):20-25.
- [5] Petr Bily, Josef Fladr, and Michael Haase (Sep 2015) "Experimental verification of properties of roller-compacted concrete for pavements".
- [6] David W. Pittman and Steven A. Ragan, (1998) "Drying Shrinkage of Roller-Compacted Concrete for Pavement Applications", ACI Material Journal, Title no. 95-M3
- [7] Kajorncheapunngam, S. And Stewart, D.F. (1992) "Rice Husk Ash in Roller Compacted Concrete", Concrete International; 14(4),38-44
- [8] Nader Ghafoori and Yuzheng Cai —Laboratory-Made Roller Compacted Concretes Containing Dry Bottom Ash: Part II— Long-Term Durabilityl, ACI Materials Journal, V. 95, No. 3, May-June 1998.pp 4-5
- [9] Hamzah,A.A and Al-Shadeedi,M.B.(2008) "Evaluation of Properties of Roller Compacted Concrete", The 1st Regional Conference of Eng. Sci, NUCEJ, 11(33),366-373
- [10] Krishna Rao, S.,Dr.Chandra Sekhara Rao, T.and Dr.Sravana,P.(2014) "Effect of manufactured sand on strength characteristics of Roller compacted Concrete", International Journal of Engineering Research and Technology; ISSN: 2278-0181, 2(2).
- [11] M. Shabbir Hossain, H.Celik Ozyildirim, (2016) "Investigation Of Roller-Compacted Concrete For Use In Pavements In Virginia"
- [12] Zdiri, M., Abriak, N., Ouezdou, M.B & Loulizi, A. And Neji, J. (2009) "Numerical Modeling of a Roller Compacted Concrete Pavement under vehicular loading", International Journal of Pavement Research and Technology ;2(5),188-195
- [13] Zdiri, M.Abriak, N.,Neji,J. ,and Ouezdou ,M.B.(2009) "Modeling of Stresses and Strains Distribution in an RCC Pavement using the Computer Code "ABAQUS"", Electronic Journal of Structural Engineering;9,37-44.
- [14] Zhoung,W.,Mahdi,M. and Rupnow,T.D (2016) "Accelerated pavement testing of thin RCC over soil cement pavements", International Journal of pavement Research and Technology,9, 159-168.
- [15] Vahidi, E.K., Malekabadi, M.M., Rezaei, A., Roshani, M.M and Roshani, G.H. (2017) "Modeling of mechanical properties of roller compacted concrete containing RHA using ANFIS", Computer and Concrete, 19(4), 435-442
- [16] Schrader, E.K(1987) "Compaction of Roller Compacted Concrete", Special Publication; ACI SP96-06, 96
- [17] Naik, T. R., Kraus, R. N., Chun, Y.M., Rammer, B. R., and Singh, S.S. (1997) "Strength and Durability of Roller-Compacted HVFA Concrete Pavements", International conference on Durability of Concrete.
- [18] Y. Stanley Kim (2006) "Roller-Compacted Concrete Shoulder Construction on an Interstate Highway in Georgia"

- [19] Stacy G. Williams Construction of "Roller-Compacted Concrete Pavement in the Fayetteville Shale Play Area", Arkansas (2014) Journal of transportation Research board
- [20] Krishna Rao, S.Dr.Chandra Sekhara Rao, T.and Dr.Sravana, P (2016) "Design & Construction of Roller Compacted Concrete Pavements for low volume roads in India", International Manager Journal of Civil Engineering Research ;5(2).
- [21] Mehdi Koohmishi, "Evaluation of Application of Roller Compacted Concrete versus Asphalt Concrete as Pavement Surface Layer for High Traffic Volume Routes", ISSN 2090-4304 Journal of Basic and Applied Scientific Research
- [22] Zarrinkafsh,O.and Shirazi,M.R.(2014) "Design of Roller Compacted Concrete Pavement", International Journal of Civil ,Environmental ,Structural ,constructional and Architectural Engineering ,9(6),785-788
- [23] Rasoul Zabihia, Jalal Ayoubi Nejad,(2017) "investigating the strength indices of roller compacted concrete containing propylene fibers for the pavement of roads"
- [24] Afrah A. Hamzah Dr .Mohammed Baqer Al-Shadeedi , "Evaluation of Properties of Roller Compacted Concrete", The 1st Regional Conference of Eng. Sci. NUCEJ Spatial ISSUE vol.11, No.3, 2008 pp 366-373
- [25] Ali Akbar Mashayekh "Numerical and Comparative Study on Pavement RCCP with Finite Element Method" Helix Vol. 8(5): 4104-4109.
- [26] Dolen, T. P.(1991) "Freezing and Thawing Durability of Roller-Compacted Concrete", Durability of Concrete, Second CANMET/ACI International Conference; SP-126, 101-114
- [27] Durga Prasad, K.Prudhvi, "Roller Compacted Concrete for M30", international journal and magazine of engineering, Technology, management and research.
- [28] IRC: 58-2002 "Guidelines for the design of plain jointed rigid pavements for highways". New Delhi.
- [29] IRC: 58-2015. Guidelines for the design of plain jointed rigid pavements for highways. New Delhi.
- [30] K Hemantha Raja, Satish Sajja, K Shyam Prakash "Experimental Investigation of Roller Compacted Concrete with Industrial Wastes", International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-7, Issue-6C2, April 2019
- [31] P.Vineela1, S.Krishna Rao2, B.Panduranga Rao3, V.Ramesh4 "2d analysis of stresses and displacements of roller compacted concrete pavements (rccp) for low volume roads under vehicular loading", IJRET: International Journal of Research in Engineering and Technology eissn: 2319-1163 | pissn: 2321-7308
- [32] P.E. Mueller, P.E. Center for Advanced Research in Transportation College of Engineering& Apllied Sciences, Arizona State UniversityTempe, Arizona 8528743.06 May 1990 report number: fhwa-az88-832 "roller compacted concrete pavement".
- [33] S.D.Bauchkar, Dr. H.S. Chore "Roller Compacted Concrete: A Literature Review", IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) ISSN: 2278-1684, PP: 28-32
- [34] Vineela,P. Krishna Rao,S. Panduranga Rao,B. And Ramesh,V. (2015):"2D Analysis of Stresses and Displacements of Roller Compacted Concrete Pavements (RCCP) for Low Volume Road under Vehicular Loading", International Journal of Research in Engineering

Social Issues among People Living With HIV in India

Manjiri Dorati Department of Engineering Sciences & Humanities Thakur college of Engineering and Technology Mumbai, India manjiriyadav1995@gmail.com

Abstract— HIV/AIDS is a type of disease that not only poses a threat to physical health, but also affects the emotional and mental health of patients due to negative attitudes and social stigma. The purpose of this study was to identify the psychological, social and familial problems of people living with HIV/AIDS in India. The Government of India estimates that around 2.4 million people live with HIV in India (1.93-304 only) adult prevalence 0.24% (2019). Children (under the age of 15) account for about 3.5% of all infections, with 83% in the 15-49 age group. 0.20% of all HIV-infected cases are women.

Keywords- physical health, mental health

I. INTRODUCTION

The most heterogeneous epidemics in India are concentrated in a few states, mainly in the industrialized south and west, and northeast. In South India, the four states with the highest prevalence (Andhra Pradesh 500,000, Maharashtra 420,000, Karnataka 250,000, Tamil Nadu 150,000) account for 55% of all HIV infections. It is estimated that more than 100,000 PLHIV live in West Bengal, Gujarat, Bihar and Uttar Pradesh, together accounting for another 22% of HIV infections in India.

II. INFORMATION

The Indian epidemic is concentrated among vulnerable populations at high risk for HIV. The concentrated epidemics are driven by unprotected sex between sex workers and their clients and by injecting drug use with contaminated injecting equipment. Several of the most at risk groups have high and still rising HIV prevalence rates. According to India's National AIDS Control Organization (NACO), the bulk of HIV infections in India occur during unprotected heterosexual intercourse. Consequently, and as the epidemic has matured, women account for a growing proportion of people living with HIV, especially in rural areas.

In the wider community, low simultaneous sexual relationships with multiple partners seem to have shielded most people so far. However, although overall prevalence remains low, large numbers of people are infected even with relatively modest increases in HIV infection rates in countries with populations of more than 1 billion.

Aafiya Siddiqui Department of Engineering Sciences & Humanities Thakur college of Engineering and Technology Mumbai, India Aafiya.siddiqui@tectmumbai.in

The HIV rate in Tamil Nadu decreased significantly from 0.58% in 2007 to 0.33% in 2009.

However, low prevalence states of Chandigarh, Orissa, Kerala, Jharkhand, Uttarakhand, Jammu & Kashmir, Arunachal Pradesh and Meghalaya show rising trends in adult HIV prevalence in the last four years.

AIDS is:

Acquired – must do something to contract

Immune – ability to fight off infectious agents

Deficiency – lack of

Syndrome – cluster of symptoms that are Characteristic for a disease

HIV is:

Human – isolated to the human species

Immuno-Deficiency – Lacking the ability to fight off infectious agents

Virus - a disease causing agent

III. CHANNELS OF DISTRIBUTION

Unprotected sexual intercourse with infected person (either heterosexual or homosexual)

· Transfusion of infected blood or blood products

• Infected mother to her baby during pregnancy, birth process and through breast – feeding

• Use of infected needles and instruments without sterilization or sharing of needles and syringes by HIV drug addicts

Unsafe Sex and Low Condom Use: In India, sexual transmission is responsible for 87.4 percent of reported HIV cases and HIV prevalence is high among sex workers (both male and female) and their clients. A large proportion of women with HIV appears to have acquired the virus from their regular partner who was infected during paid sex. Overall HIV prevention efforts targeted at sex workers are increasing in India.

However, the context of sex work is complex and enforcement of outdated laws often act as a barrier against effective HIV prevention and treatment efforts. Although recent data suggest an increase in condom use, in many places condom use is still limited, especially where commercial encounters take place in 'risky' locations with low police tolerance for this activity. Men Who Have Sex with Men (MSM): Relatively little is known about the role of sex between men in India's HIV epidemic, but the few studies that have examined this subject have found that a significant proportion of men in India do have sex with other men.

As per recent data of HSS 2010-11, Chattisgarh (15 %), Nagaland (13.58%) and Maharashtra (13%) have the highest HIV prevalence among MSM.

Poor knowledge about HIV was found in the MSM group. The scale and effectiveness of India's efforts to increase safer sex between MSM (and other sexual partners) will play a major role in determining the scale and development of the HIV epidemic in India.

Migration and Mobility: Occupational migration moves people away from their families and the social environment of society. This may increase the likelihood of risky behavior. Addressing the vulnerabilities of many migrants requires a concerted effort.

Furthermore, a high proportion of female sex workers in India are mobile. The mobility of sex workers is likely a major factor contributing to HIV transmission by connecting highrisk sexual networks.

Low Status of Women: Infection rates have been on the increase among women and their infants in some states as the epidemic spreads through bridging population groups. As in many other countries, unequal power relations and the low status of women, as expressed by limited access to human, financial, and economic assets, weakens the ability of women to protect themselves and negotiate safer sex both within and outside of marriage, thereby increasing their vulnerability.

IV. INTERCEPTION METHODS

Prevention is the only cure for HIV and AIDS.

It can be easily prevented by adopting simple measures such as:

Safe sex: The only safe sex is 'no sex'; all other practices like masturbation, cuddling, hugging, rubbing, sticking to one partner or using condom if one cannot avoid multiple partners are safer sex practices. Tips for condom usage:

• Never re-use condoms, always use a new one

• Check the pack expiry date

• Both can use protection male and female.

• Make sure the foil, fingernails or jewelry do not damage the rubber

• Make sure you squeeze any air out of the 'teat' at the top of the condom before putting it on

• Only use water based lubricants e.g. k-y jelly, not oil bases like Vaseline

• Dispose condoms carefully by wrapping them in a tissue and putting them in a bin Safe blood: Judicious use of blood and use only pretested HIV free blood or blood product. Avoid tatoos: As it may cause transmission of virus.

Avoid multiple partners: As there is high risk of transmission of HIV virus.

Safe needles: Insist your doctors and nurses to use sterile or disposable needles and instruments.

Safe Motherhood: Make sure you are HIV-free before taking important life steps like marriage or childbirth. ARV and

NVP protect babies from HIV-positive mothers during pregnancy, childbirth and breastfeeding.

Safety Razor and Blades: Do not share razor blades with others, and ask your barber to use a properly cleaned razor and new blades when shaving or cutting. Remember (although the risk of contracting it in a bar is minimal), AIDS does not distinguish between caste, creed, race, religion, education or social status. AIDS prevention is our shared responsibility.

Education and awareness are the only weapons in our hands. Let's challenge AIDS eradication. We must support and care for people living with HIV and AIDS with compassion and understanding.

HUMAN IMMUNODEFICIENCY VIRUS - HIV

 Number of the set of

V. PROBLEMS FACED BY THE PEOPLE

- Psycological problems: The most common issues raised in relation to psychological health problems of affected people, which were stated by all groups participating in interviews, include the followings: Family and society exclusion, depression and anxiety, a feeling of revenge, no fearing to infect others, frustration, social isolation, relationship problems, and fear and anxiety caused by stigma. Some groups insisted certain issues, and their views were somehow distinct from other views.
- Family problems: Marriage problems, family conflict, depression, lack of family support, rejecting patients by family members, economic problems inhibiting marriage, and the social rejection of the patient's family.
- Social problems: Unemployment and the need for jobs; the need for housing and shelter; basic needs and financial problems; homelessness; lack of active and impressive support communities; and the need for material and social support.

VI. CARE AND SUPPORT CENTRES (CSC):

The overall goal is of Care, Support and Treatment (CST) component under NACP IV is to provide universal access to extensive, equitable, fear-free, quality care, support and treatment services to all PLHIV using an integrated approach.

ICHSTE - 2023

Based on the recommendation and priorities of NACP IV working group on care and support, the strategy of implementation of the care and support is being completely revamped to ensure cost effectiveness and sustainability. All care and support component of NACP III CCC, DIC & DLNs are brought under one roof to provide community based care and support services.

Under NACP IV, Care & Support Centers (CSCs) are established and linked to ART centres with the goal to improve the quality & survival of life of PLHIV. The CSCs serve as a comprehensive unit for treatment support for retention, adherence, positive living, psychosocial support, referral, linkages to need-based services, and providing an enabling environment for PLHIV. This will be part of the national response to meet the needs of PLHIV, especially those from the high risk groups, and women and children infected and affected by HIV. CSCs are run by civil society

- [1] https://National library of medicine.
- [2] International journal of scientific and research publication
- [3] <u>https://cdc.gov</u>
- [4] <u>www.waynetownship.com</u>

Twenty-First Century Skills from the Perspective of NEP 2020

Jyoti Vanawe Engineering Sciences and Humanities Department Thakur College of Engineering and Technology jyoti.vanawe@tcetmumbai.in Sarika Awasthi Department of Sciences and Humanities Government Polytechnic College Nashik, Maharashtra sarikaawasthi825@gmail.com

Abstract - The current state of our country's education system demonstrates a gap between theory and practice. We felt the need to study the implementation level achieved so far and devise a solution to bridge the gap. The present system must implement NEP 2020 in such a way that all 21st-century skills required are developed concurrently. Our students are future professionals. Thus, NEP 2020, emphasizes vocational training at an earlier stage of academics while maintaining a multidisciplinary approach in the system, is a practical vision. Students today cannot work alone. They must work as a team and collaborate with all members well. These attributes could be gained through activity-based learning. Another aspect that would make the process more interesting and innovative is technology-based learning. Thus NEP 2020 is well aligned with the professional needs of the student community and can effectively bridge the gap between education and industry. However, the level of implementation is heavily dependent on collaboration, teamwork and values embedded in learners' education. A holistic approach in which a student's overall development becomes important requires a boost in academics. In this manner, NEP implementation will become feasible and effective.

Keywords— collaboration, communication skills, professional development, technology, holistic, practical learning.

I. NTRODUCTION

The only permanent thing in this world is change. In consideration of the existing scenario, change is a must and inevitable. Our education system cannot remain a stagnant pool of water but should strive and thrive in the ocean of knowledge and wisdom. Productivity and utility are the buzzwords we hear nowadays, and NEP 2020 has a lot of potential to attend this practical vision. NEP 2020 focuses on the all-around development of the personality of students who would be professional and responsible citizens in the near decade and certainly with its effective implementation policy will become reality making India a supreme power and a developed nation in the true sense of the terms.

NEP 2020 has promises and implementable guidelines for all, be it the student community, teacher community, parents and society at large. Thus, it is an integrated model of education. However, to attend it, 21st-century skills are necessary to master; mainly communication, collaboration, ICT skills, and human values are also an integral part of NEP like truth, patience, resilience, love and care with respect for all. These are core values to focus on and a scientific temper is a must, which will make our students future-ready global citizens. Thus, it clearly has scope for the holistic development of students in collaboration with academic and technical skill sets.

II. EXISTING SCENARIO

Past unfinished initiatives guide users to eliminate the loopholes within the system and revive policies. Feedback and takeaways from previous NEPs help to strengthen our willpower and the results of feedback and legalized structure of policy motivate us to implement educational policies and innovative reforms with zeal and enthusiasm. However, it is a phase-by-phase process and always requires planning and implementation level with its execution plan intact within the educator's mind. Lack of synergy at the state and national level, and centralization of power at one location give ways to conflict within the system. NEP 2020 has taken care of this problem by making clauses on synergy, coherence and coordination within state and nation and has proposed decentralization of power to specific departments and kept integration within the system. The need is to coordinate all the levels effectively for the effective implementation of the policy. The role of the holistic education system is undeniable and important. It needs to take threshold and thrive at a larger level and on a broad scale. Human values are universal in nature and always help human beings exercise responsibility. These values need to be strengthened, revived, and made into normal norms of existence. All of us can see its relevance after the pandemic that hit the world in the form of corona and these values, and their inculcation and preservation have become the panacea to become successful overcomers of present and future calamities. Educational institutions are the right place to develop these values with the help of holistic development of the student community in collaboration with society at large giving it international dimensions and standards.

III. CHALLENGES AND GAPS IN EXISTING EDUCATION SYSTEM

The main concern is all about, developing productive citizens at all levels be it physical emotional, social, professional, or vocational and all this is not possible without a strong support system and motivation mechanism with practical training in community projects. There is a wide gap between the academic and outside world which needs to get covered in a step-by-step manner through various activities and initiatives. The emotional intelligence level of students matters along with their intellectual quotients, and this is the main challenge i.e. to create all-around developed pupils and develop the left and right hemispheres of the brain working in unison and cohesion with one another. Stable balanced growth in all areas of arts, humanities, creative skills, soft skills, science, mathematics, vocational skills, and professional development is a challenging task and needs to get carried out well with effective leaders in the form of faculty members, parents, student coordinators, society at large so that no one should be left as a separate entity within the system. We need to implement the process hand in hand going some extra mile in our collaborative journey towards safe and quality education at all levels.

- Challenging Areas
- a. Academic and professional needs identification and its full-fledged fulfilment.
- b. Implementation level collaborative gaps at a synergistic level across institutions.
- c. Technology usage challenges regarding planning and implementation gaps. Regular monitoring and tracking process mechanism and feedback mechanism and its regulatory issues
- d. Conflict resolution and problem-solving challenges.

IV. PROPOSED SOLUTIONS

The system is not a one-man army but a team that collectively arises at the outcome. Values and life skill development programs help a team to take decisions regarding processes collectively, leaving less space for conflicts and problem-solving becomes easier.

Developing students' capacity and resilience power using the case study method becomes a necessary part of all curriculums at a higher level of education in our institutions. Students work together, plan together and in a way develop interpersonal skills as well as hard-core skills in unison and case study helps them realize their potential to solve problems.

All areas be its environmental education, value education, holistic education, or professional development can be made easy and feasible if students work collaboratively through activity-based learning and centers at the institute can support students who developed the skill set as per the requirements of the 21st-century world environment.

Awareness campaigns can be arranged for making students aware of real-world needs and even faculty development programs can be arranged where faculty members can collaborate with industry sectors and make themselves proficient educators upskilling time and again as per industrial and real-world demands.

In-service training programs provide chances of meeting like-minded and inspiring people and professionals across institutions and help cover the gap at the synergistic level.

Extensive use of ICT tools by faculty members and involving students as well as faculty in creation, editing work and use of gamification method using application software will innovate the process making it a joyful teaching and learning experience. Education will no longer remain a theoretical ground but a dynamic space where the interaction process will become a digital and integral part of the system. Organization leaders and their team members must always be ready to track the process through regular monitoring, feedback from students, and industry so that implementation will be smooth and continuous without any major flaw in the functioning of the policy within the system.

Decentralization of power to specific departments but at the same time coordination and synergy between departments is necessary. FDPs and student development programmes in interpersonal skill development can be arranged often to give a framework to tackle conflicts and problem-solving methods could be explored within such sessions with the use of case study methods and group activities.

Value education includes education of universal values i.e., truth, good behaviour, and nonviolence in speech and action, which can be developed gradually through awareness programs highlighting the pros and cons of good and bad ethical practices in human life. Institutional values, fundamental duties and rights and the most important democratic and impartial system should be the core of education and must be driven to its practical stage.

Science, technology, engineering and medicine courses and mathematics can be collaborated with courses under the humanities section to develop students into global citizens.

Assessment criteria can be laid down beforehand verbally to all stakeholders be it students, faculty, parents, and all concerned members who are part of education, directly or indirectly, so that our system will be on par with international standards at its implementation level. Knowledge of the plan and process to all in its full clarity will accelerate the policy to its desired positive results and successful outcome.

V. RESEARCH COMPONENTS AND METHODOLOGY

The data of this paper is collected through an in-depth literature review of existing literature. Observation method of existing practices and feedback is applied. The relevance of the case study method to improve the existing system collaboratively is considered in the research paper.

VI. EXPECTED OUTCOMES

- a. Increase in the awareness level of all stakeholders in the education process.
- b. Increase confidence in the plan and its implementation.
- c. Achieving enhanced motivation level to effectively implement the policy within the system.
- d. Clarity of purpose for all the members of the education process.
- e. Active involvement of the community in the educational scenario.

f. All-rounded development of personality of students and increase in the level of awareness regarding the relevance of holistic education and values in life.

VII. CONCLUSION

Thus NEP 2020, which is a practical vision can be implemented well with collaborative efforts and rewards and recognition methods in higher educational institutions. Rewards and recognition will motivate all the members to strive and thrive with the flow of 21st-century demands. These demands have wide scope ranging from personal, physical and emotional well-being to the creation of professional and safe learning and work environment aiming at a high-quality education system in India. The policy has an integrated model and its implementation also needs the same attitude and approach for its success. Certainly, able leadership roles played by various governing bodies will make it a feasible system of education in our country.

- [1] NEP 2020 policy document.
- [2] Innovative Teaching and Learning ITL Research project.
- [3] Goleman D. (1998b) What makes a leader? Harvard Business Review, November December.
- [4] http://www.eq.org/
- [5] https://www.europeanagency.org/sites/default/files/itlresearch 2011findings.pdf

Design and Development of Automated Spray Painting Process

Siddhesh Mane Assistant Professor, Department of Engineering Science & Humanities, Thakur College of Engineering and Technology Kandivali (E), India. siddhesh.mane@tcetmumbai.in

Abstract— As we are aware about the spray painting applied in many fields of manufacturing but robotics spray painting has come into existence and has also been developing rapidly. This technique of robotic spray painting will reduce the manual work of humans and will also provide accuracy. In last few years automatic and semi-automatic methods that realize optimal spray gun paths or trajectories, thus avoiding the manual self-leading programing procedures, have been developed. The basic aim of our project is to Design with Development of the Automated Spray Painting Process. It helps in reducing human interface and thus reduces operation time. Design of Programmed based smart control system helps to paint the parts smartly. The main objective of our project is it design and fabricate the automatic spray painting processes to increase the accuracy, to add flexibility in the process within the minimum cost so that it can be reliable to be used by any industry.

Keywords— Belt drive, Painting process, sensor, pneumatic cylinder

I. INTRODUCTION

In modern era robotics spray painting has come into existence and has also been developing rapidly. This technique of robotic spray painting will reduce the manual work of humans and will also provide accuracy. Utilizing robotic spray painting technology can be a highly effective method of automation and improving quality. In last few years automatic and semi-automatic methods that realize optimal spray gun paths or trajectories, thus avoiding the manual self-leading programing procedures, have been developed. Our project is aimed towards development of a usable, low-cost assistive automated path guided painting process for automatization in today's world. This automated path guided painting machine gives accuracy and reduces human errors. The design of this proposal is modern and futuristic. The cost saving is another privilege of this proposal. As we are aware about the spray painting applied in many fields of manufacturing but robotics spray painting has come into existence and has also been developing rapidly. This technique of robotic spray painting will reduce the manual work of humans and will also provide accuracy. In last few years automatic and semi-automatic methods that realize optimal spray gun paths or trajectories, thus avoiding the manual self-leading programing procedures, have been Suraj Singh Assistant Professor, Department of Engineering Science & Humanities, Thakur College of Engineering and Technology Kandivali (E), India. suraj.singh@tcetmumbai.in

developed. The basic aim of our project DESIGN AND DEVELOPMENT OF AUTOMATED SPRAY PAINTING PROCESS is to fully automate the painting process. II. LITERATURE REVIEW

The current state of industrial automation for spray painting is restricted to situations involving high quantities of parts and robot trajectories that are pre-programmed using offline programming or manual teach-in techniques. However, a novel strategy is introduced in this paper that leverages range image data to accurately determine the geometry of an unknown part and to automatically generate robot spray painting trajectories. To accomplish this, laser strip range sensors are positioned in front of the paint booth to acquire a range image of the part, which is then processed to produce precise robot trajectories for the painting operation. By using this innovative approach, significant improvements can be made in terms of both efficiency and quality in the field of industrial spray painting. The application of process knowledge plays a crucial role in the detection of geometric parameters from range data. By analyzing these parameters, a normal vector field can be generated, which facilitates the extraction of main faces. These faces are positioned across 30 spaces, and the process knowledge associated with each geometric primitive is utilized to obtain an optimized trajectory for the paint gun. To validate the effectiveness of this method, experiments are conducted involving the coloring of a car mirror and a steering column, with the results being presented in detail. It is evident from these experiments that the proposed approach can yield superior outcomes in terms of accuracy and efficiency Spray painting finds wide application in various industries, such as automobile and home appliance manufacturing. In recent times, robotic spray-painting technology has witnessed rapid development. With the maturation of off-line programming technology, the quality and effectiveness of spray painting can be significantly enhanced. Moreover, this technology eliminates the need for time-consuming and repetitive manual teaching processes, reduces paint waste and energy consumption, and improves labor productivity and production stability [1]. The paint deposition rate model is a crucial factor that determines the automatic programming process parameters for robotic air spray painting. Prior research has focused on establishing paint deposition rate

models by assuming the shape of the spray fog to be an oval cone, such as Gaussian distribution, Cauchy distribution, and so on [2-5]. However, in reality, the compressed air spouted from the shaping air orifices on both sides of the air spray gun pressurizes the circular fog cone to form an elliptic cone with a definite thickness, ultimately leading to the deposition of an oval-shaped painting film on the plane against the axial line of the spray gun.

III. PROPOSED SYSTEM

Fig.1. Block diagram of automated painting process

Above Fig.1. shows the block diagram of AUTOMATED SPRAY PAINTING PROCESS. It contains two important components such as Arduino mega and IR sensors. First the system scans the object and later give the signal to the Arduino. Then the Arduino checks if the object valid or not and starts processing.

Spray painting refers to a painting technique that involves a device spraying a coating, such as paint, ink, or varnish, through the air onto a surface. The most common types of spray painting utilize compressed gas, typically air, to atomize and direct the paint particles. Spray guns were developed by drawing inspiration from airbrushes, and they differ in terms of size and the size of spray pattern they produce. Airbrushes are handheld and are used for detailed work, such as photo retouching, painting, and fine art. On the other hand, air gun spraying employs equipment that is generally larger and is used to cover larger working areas with an even coating of liquid material. Spray guns can either be automated or handheld, and they have interchangeable heads that allow for different spray patterns to be created.

A. HARDWARE REQUIREMENTS

The project is designed with Arduino, IR sensor, pneumatic cylinders. The ATmega2560 microcontroller board serves as the foundation for the Arduino Mega 2560. This board comes equipped with 54 pins that can either function as digital inputs or outputs, with 14 of them having the ability to function as PWM outputs., The Arduino Mega 2560 is a microcontroller board that is based on the ATmega2560 microcontroller. It is equipped with essential features such as 4 UARTs, 16 analog inputs, a 16 MHz crystal oscillator,

a USB port, a power jack, an ICSP header, and a reset button. These features are necessary for supporting the microcontroller and allow it to perform various functions. To power the board, it can be connected to a computer via a USB cable or be powered by an AC-to-DC adapter or battery

Microcontroller	ATmega2560
Operating V	5V
Input V (recommended)	7 to 12V
Input Voltage (limits)	6 to 20V
Digital I/O Pins	54 (of which 14 provide PWM output)
Analog Input Pins	16 pins
Clock Speed	16 MHz

An IR sensor, also known as an infrared sensor, is a proximity sensor that is commonly used for object detection. The sensor module is composed of an IR emitter and IR receiver pair. The IR receiver is highly sensitive and can detect an IR signal from any source. The module contains a 358 comparator IC, and its output remains high only when the IR frequency is in close proximity to the sensor, otherwise it stays low. Additionally, the module includes an indicator that allows the user to check the sensor's status without the need for any additional hardware. The IR sensor module consumes low power and provides a digital output.

The DC Motor 30RPM Centre Shaft Economy Series is a superior quality motor that is designed to last long and have improved wear and tear properties due to the presence of steel gears and pinions. The gears are fixed on hardened steel spindles that are polished to a near mirror finish, and the output shaft rotates in a plastic bushing. The motor assembly is covered with a plastic ring for protection. The gearbox is sealed and lubricated with lithium grease, and the high-grade substances used in the gearbox ensure that it requires no maintenance. The motor is attached to the gearbox from the inside using screws. The motor can operate at 30 RPM at 12V, but it operates smoothly from 4V to 12V, providing a wide range of RPM and torque.

A pneumatic cylinder is a device that converts the energy of compressed air into linear motion. There are several types of pneumatic cylinders, including single acting, double acting, and multistage cylinders. The double acting cylinder is widely used in pneumatic systems. It is a type of cylinder in which the fluid or compressed air is used as an action force alternately on both sides of the piston. The double action cylinder has two ports, one for intake and one for exhaust, which allows the cylinder to move in both directions.

A double acting cylinder is an essential component of a pneumatic system. It operates by using air pressure to create a force that moves a piston, which results in stroke movement. The cylinder is equipped with two working ports - one on the piston side and the other on the rod side. To initiate the forward motion of the cylinder, compressed air is supplied to the piston side while the rod side is connected to the exhaust. Conversely, to facilitate the return motion, supply air is admitted to the rod side while the piston side is connected to the exhaust. Double acting cylinders are available in various diameters, ranging from a few millimeters to approximately 300 millimeters, with stroke

lengths varying from a few millimeters to 2 meters. These cylinders are built to withstand high-pressure air and can endure a wide range of industrial applications.

B. DESIGN IMPLEMENTATION

We designed the material handling flat belt drive which will bring the material from the loading station to the work station in desired direction towards the workstation in the desired speed. The belt drive has a motor arrangement for the motion of the belt which will guide the material at appropriate speed and deliver it to the work station in regular intervals for appropriate painting process without delaying the work.

The dimension of the belt drive is considered according to our requirements and hence it can be modified according to the customer demands. The flexibility of the belt drive is such that it does not allow the material to fell down and destroy the product. Hence, we choose this dimension of the belt drive. Wheel is the main part on which the component to be painted is kept and will rotate the component in desired angles to paint it from all the sides required. The wheel is fitted with the appropriate motor to rotate the wheel and helps in covering al direction around. The speed of the motor is controlled using raspberry pie hence it is more efficient for the controlling it. The appropriate dimension of the wheel is chosen such that it helps the component to stat stable while the painting is carried out and thus helps in material handling. The dimension can be changed of the wheel according the needs of the customers and thus the desired motor can be also selected as the component may become heavy to handle. The size of the main frame can be changed according to the required dimensions such that the component size can vary. We decided this dimension to meet the needs of small components and help to paint it flexibly.

1) FLOWCHART FOR MATERIAL HANDLING PROCESS

The above flowchart shows the process of painting: • sensor 1 detects the signal of the object in the range then it gives signal to Arduino to start the conveyor now if the object is reached to sensor 2 it will give output signal to the Arduino to start conveyor no.2

2) FLOWCHART FOR MATERIAL HANDLING AND PAINTING PROCESS

Fig.3. Flowchart for Material handling and painting process

This flowchart shows the Material handling and Painting process: Now if the material is reach to the material handling wheel the sensor 2 detect the object and spraying starts. After the painting is done the object is further passed to conveyor 2 towards dryer system.

IV. SOFTWARE

Arduino IDE• C/C++ languages are supported by Arduino IDE software.

V. CONCLUSION AND RESULTS

A. RESULTS

We designed the material handling flat belt drive which will bring the material from the loading station to the work station in desired direction towards the workstation in the desired speed. The belt drive has a motor arrangement for the motion of the belt which will guide the material at appropriate speed and deliver it to the work station in regular intervals for appropriate painting process without delaying the work.

Fig.4. Project setup

The Fig.5. shows the working model of our prototype. Its shows the stepwise procedure of our painting process.

Fig.5. Drying section

Fig.5. As shown in fig the painted object is dried in the system. And then transfer to dispatching.

B. CONCLUSION

This project is aimed towards developed a usable, low-cost assistive automated path guided painting process for automatization in today's world. This automated path guided painting machine gives accuracy. It is clear that the design of this proposal is modern and futuristic. The cost saving is another advantage of this design. Automation of process reduces human interventions, in result higher accuracy can be archived. Possible human error during painting process are eliminated and desired painting process is done. This Reduce down the operation time as the process is automatic and gives good quality work output. The Repeated pattern painting for complex design can be done frequently and number of times as it is very difficult for a worker to do it manually. The programed base plc will paint the object in the required patterns and thus we can change the program rather than the setup of the process.

- A. Gasparetto. "Automatic path and trajectory planning for robotic spray painting". 7th German Conference on Robotics, German, Munich,2012, pp. 211-216.
- [2] K. Shin and M. Mckay "A Dynamic Programming Approach to Trajectory Planning of Robotic Ma- insulators," IEEE Trans. on Automat. Contr., vol. AC-31, no. 6, pp. 491-500, June 1986.
- [3] P. Hartling, L. Hag, R. hen, I. W. Perram, and H. G. Petersen. Task curve planning for painting robots. i. process modeling and calibration. IEEE Tlanrocrions on Robotics and Automation. 12(2):324 -330, April 1996.
- [4] Wei, W.C.Hua, L.X.Ping. "Surface segmentation based intelligent trajectory planning and control modeling for spray painting". *Proceeding of the 2009 IEEE international conference on macaronis and automation*, China, Changchun, 2009, pp.4958-4963.
- [5] Y.S.Rui,C.L.Gang. "Modeling and prediction of paint film deposition rate for robotic spray painting". *Proceedings of the* 2011 IEEE international conference on macaronis and automation, China, Beijing, 2011, pp.1445-1450.
Emergence of Sustainability is Tool Model for Manufacturing Environment - A Review

Anup Chavan

Department of Engineering Sciences and Humanities, Thakur College of Engineering and Technology Mumbai, Maharashtra, India. anup.chavan@tcetmumbai.in

Abstract - Economical fabricating shows up to be a quickly creating field and it would be anticipated that there's a information developing body of in this zone. Beginning examination of the writing appears prove of work within the zones of item plan, supply chain, sustainable generation innovation and squander shirking exercises.In distribute measurements appearing critical enhance ments in natural execution at tall level but data on how these enhancements are accomplished is in adequate. There has been small earlier examination of distributed economical fabricating movement. In addition, the jumble between scholarly and specialist dialect leads to challenges in translation. This paper captures and examinations the sorts of feasible fabricating exercises through writing audit. In may help producers turn, this to get to cases of great hone and help scholastics recognize regions for future inquired.

Keyword- Economic Production, Sustainable manufacturing

I. INTRODUCTION

Feasible fabricating is the creation of made items through economically-sound forms that minimize negative natural impacts whereas moderating vitality and characteristic assets. It is a multiple concept. with organization, financial, natural, and social dimensions. Production is characterized as exercises and forms that change crude materials into items by implies of work, apparatus and data, in this way centering on forms that happen in generation offices and manufacturing plants, alluded to as "production systems". Fabricating forms are as of now experiencing a change actuated by the fourth mechanical transformation, which includes complexity but too openings for maintainable fabricating. In truth, generation frame works are transitioning to cyber-physical generation frame works (CPPS), where the virtual and physical universes meet (Monostori, 2014) and the esteem of information is tackled to realize craved goals.



Fig. 1. Process Chart

Feasible fabricating is the creation of made items through economically-sound forms that minimize negative natural impacts whereas preserving vitality and common assets. It's a multi-faceted concept, with regulation, financial, social & natural dimensions. Production is characterized as exercises and forms that change crude materials into items by implies of work, apparatus and data, hence centring on forms that happen in generation offices and manufacturing plants, alluded to as "production systems". Fabricating forms are as of now experiencing a change actuated by the fourth mechanical insurgency, which includes complexity but more over openings for economical fabricating. Generation frame works are transitioning to cyber-physical generation frame works (CPPS), where the virtual and physical universes meet (Monostori, 2014) and the esteem of information is tackled to attain craved goals.

II. EFFECTIVENESS IN SUSTAINABLE MANUFACTURING

Holistic consideration of temporal and spatial boundaries, socio-economic impacts, biophysical and environment indicators are required for evaluating effectiveness. Unforeseen rebound effects, in addition to conventional environmental, social, and economic challenges, must be considered at the design stage for effective sustainability.

Relative Assessment	Disconnected (Site-generic)	Absolute Assessment	Systems-based methods (Interconnected & Site-Specific)
Effic	tiency teen Cuchel	Effect	Veness Det cyter
Reactive	Reductionist.	Proactive	Holistic

Fig. 2. Effectiveness Cycle

III. OBJECTIVE

The objective of this study is to develop an effectivenessbased framework to guide design and manufacturing decisions.

- Design for repair, reuse, and recycle.
- Design for waste and hazards minimization.
- Design for product disassembly.
- Design for continuous improvements.
- Design for energy efficiency.
- Design for remanufacturing.
- Design for optimal materials use.
- Design for cost effectiveness.

The paper provides a basis to further effectiveness-based enquiry into manufacturing.

IV. SUSTAINABILITY CHARACTERIZATION

The sustainability characterization step includes recognizing cycle exercises, characterizing frame work item life boundaries, topographically following impacts based on neighbourhood and worldwide pertinence, selecting important affect categories and contamination limits related with each, and partners included. Encapsulated affect categories comprise of efficiency-based impacts of worldwide significance, e.g., climate alter and stratospheric ozone exhaustion. Dynamic affect categories incorporate indoor discuss contamination. nearfield human harmfulness. etc.Industry stakeholder's involvement is an essential part of the framework for continuous feedback and Fulfilling data requirements, e.g., material constituent data to estimate the chemical exposure in the use phase, could be easily sourced from the material safety data sheets at the manufacturing facility.

V. BACKGROUND REVIEW

The primary considers in SM were carried out beneath the natural approach, in this way starting the investigate field of Naturally Cognizant Manufacturing (ECM) [21]. A few of the most points of this approach are source diminishment, plan for fabricating and get together or cradleto-reincarnation concept. On its part, Sark is distinguished item, handle and innovation as the most three measurements to ECM techniques by proposing the well-known 'Rs' approach: lessening, remanufacturing, reusing and reuse. [13,14] the previously mentioned in past area, Natural Administration Framework (EMS) is becoming popular among producers as a apparatus for making strides their fabricating execution.

The most benefits of these systems are permitting an organization to evaluate and control its noteworthy impacts on the environment. decreasing the hazard of contamination episodes, guaranteeing compliance with pertinent natural enactment, and ceaselessly moving forward its forms and operations.[41-43] Other concepts related to SM are created amid the 1909s, such as 'industrial ecology'[46,47] 'ecological impression [48] and cradle-tocradle design.[49] And, within the early a long time of this century, the thought of amplifying the natural approach to all stages of the product's life cycle to address SM methodology leads to a modern line of investigate at life cycle appraisal (LCA) methodology.[50] As previously mentioned in past area, LCA gives a strategy for measuring natural impacts on the asset utilization (e.g.materials, water, vitality) and the squander created (strong squander, discuss emissions). 51 Additionally, LCA facilitates its evaluation all through the whole Item Life Cycle (PLC), from crude materials securing through generation 'cradle to gate', utilize, end-of-life recovery, [52,53] and transfer 'cradle to grave'.[54,55]

[Hossam A. Kishawy et.all] This paper had displayed in terms of concepts, usage procedures, and appraisal strategies. The interaction among the three feasible levels (i.e., handle, item, and framework) gives the specified maintainable target. The most desires of building a feasible fabricating framework are the taking after: to diminish the vitality utilization, minimize the squander, move forward the item solidness, diminish the natural and wellbeing concerns, improve the quality of the item, and create renewable vitality assets. To achieve these targets, a few needs (e.g., approach, strategies, information, inquire about, and integration) are required. Moreover, the execution of the maintainable fabricating approach requires utilizing afew plan viewpoints. These perspectives are as takes after: plan for natural affect, plan for asset utilization and economy, plan for manufacture ability, plan for usefulness, and plan for social affect.

Moreover, five primary stages are required to effectively accomplish a compelling maintainable frame work. These stages incorporate the taking after: creating work hone and support, handle optimization, crude fabric substitution, utilizing unused advances, and creating unused item designs. [01]

One of the foremost broad definitions of sustainability is that found within the 1096 UN Brundtl and Commission report: 'Development which meets the wants of current eras without compromising the capacity of future eras to meet their possess needs'.

This definition was along these lines utilized in different UN initiatives, such as the 2015 SDGs. Be that as it may, despite its acknowledgment, this definition isn't operational for the fabricating range. A proposition with more prominent application to the field of fabricating is made by Mihelcic et al.:79 'design of human and mechanical frame works that guarantee the utilize of characteristic assets and cycles by humankind without reducing the quality of life due to misfortunes in future. Manish Kumar [01]-

This paper displayed a preparatory systems-based system for successful supportability appraisal in fabricating. Steps to get it and recognize viability markers have been examined. A case think about of photovoltaic fabricating industry has been talked about within the setting of the framework. This area presents a brief audit of the prior work on adequacy in fabricating SA. The Biological Shortage strategy is one of the prior thinks about to propose a distance-to-target technique for affect evaluation [26].

The strategy proposed "Eco-factors" for Switzerland to benchmark the impacts against the country's (political) emanation targets. The concept of planetary boundaries (PB) was to begin with presented by Rock Strom et al. [27]. Tooth et al. [28] displayed an outright appraisal system to coordinated natural foot printing techniques with the PB, utilizing diverse affect categories at global/planetary, national, territorial, and nearby scales. Industry-specific strategies have been created to gage mechanical exercises against the PB [13][14][31].

From a chemicals viewpoint, understanding the complex intelligent between chemical and item life cycles, crosscontamination issues, and the trade-offs between item reuse (and expanded introduction length) and decreased fabric extraction are unaddressed challenges for moving towards outright evaluations [15]. For a viable approach, the accentuation of the circularity choices must be on the "clean cycles" [16]. Conserving assets has been proposed as a potential arrangement for maintainable fabricating [17].

Integrating material criticality assessments with life cycle assessment is crucial to ensuring material supply [18]. CE principles could potentially reduce the criticality of materials if various risks (environmental, socio-economic, and technical) associated with CE strategies are well-thoughtout at the design stage [19]. Recent work has analyzed sustainable production from a CE perspective to proactively assess impacts associated with CE scenarios [20].

Sala et al. [21] differentiated between integrated assessment and sustainability assessments and proposed a systems-based SA framework for effectiveness. The framework distinguishes SA from the integrated assessments based on the principles viz. science-based targets, the broad participation of stakeholders (at policy, community, and practice levels), and a solution-oriented trans-disciplinary holistic approach for proactive assessment. A very few studies have conducted life cycle/manufacturing SA using systems approach [39][40][41].

For effectiveness in sustainable manufacturing, it's crucial to i) ensure resource availability for manufacturing by operational CE, and ii) geographically trace and regulate impacts throughout the product life cycle to preserve the vitality of the local and global living environments (both human and natural) and the entities.

VI. MAIN DEFINITIONS OBSERVED IN THE LITERATURE

Environmental management system the natural measurement is progressively taken under consideration by organizations. Appropriately, the foremost widely used strategy to improve a firm's natural comes about within the brief and medium term is the EMS.

It can be characterized as a plan that empowers any company to efficiently screen its primary natural impacts and to decrease the potential contamination dangers according to the enactment and a objective of nonstop advancement. Here, ISO14001 is the foremost generalized worldwide standard characterizing the prerequisites for creating, executing and ke eping up an EMS. The standard is organizationally situated and does not set up a set of quantitative targets for outflow levels or strategies of measuring those emissions.

A. LIFE CYCLE ASSESSMENT

LCA could be a strategy for natural affect appraisal, standardized due to the broad utilize of ISO natural benchmarks (particularly ISO 14040). An acknowledged definition of LCA is as takes after: '[Life cycle appraisal is] an natural book keeping and administration approach that considersall viewpoints of asset utilize and natural discharges related with an mechanical framework from support to grave'. LCA can be utilized to efficiently compare the environmental impacts of diverse SM choices and to assist recognize benefits and trade-offs among options. In this sense, to extend the scope of PLC markers, the LCA concept has advanced into Life Cycle Supportability Appraisal (LCSA), consolidating social and financial perspectives in expansion to natural angles when examining the supportability of PLCs (Kloepffer 2008). The definition of Zhang and Haapala,77 for occasion, consolidates the concept of LCSA in expansion to the measurements of TBL: 'sustainable fabricating can be characterized as the make of items in a way that minimizes natural impacts the social obligation for workers, considers and the community and buyers all through the PLC of a item, whereas accomplishing financial profit'.

B. PLC

The maintainability of made items must be considered not as it were within the generation or the utilize stage, since in numerous cases it is more basic to oversee the product once it is now not utilized, that's , 'end of life' administration. In this way, the thought of supportability from a lifetime point of view leads us to the broad concept of PLC. The most steps of the PLC are preparing plan, generation arranging, fabricating, get together, shopper utilization, extreme reuse, recycling and remanufacturing.

As Zarte et al.03 state, SM is as it were conceivable when organizations consider the full PLC. Additionally, the ensuing post-uses of the item, much appreciated to the final steps of the PLC, lead to the concept of numerous life cycles.

The 6R concept (Diminish, Reuse, Reuse, Recoup, Update and Re-manufacture) may be a key component in guaranteeing that the different life cycles lead us to the closed-loop flow.57 In later a long time, SM has regularly been related with the closed-loop and the circular economy (CE) concepts. Closed-loop generation frameworks look for effectiveness within the streams of materials, components, vitality and water all through the progressive life cycles of the item amid numerous stages of utilize by empowering reuse or, if not conceivable, remanufacturing. 20

C.TRIPLE BOTTOM LINE

Another broad term in this field is the TBL set up by Elkington. 04 The TBL broadens the measurements (moreover known as columns) with which supportability must be considered: social, natural, and financial.

The TBL approach includes extending the organization's duties, which in numerous cases are constrained to the financial questions of fabricating and getting benefits by regarding legitimateness and complying with measures. In any case, the TBL approach includes those natural and social duties through extra execution pointers which complement the financial perspective.05

The financial measurement is the best to get it since it is the one customarily considered. To the absolutely financial viewpoint that mulls over the change of crude materials, work and other assets into items and administrations at an satisfactory taken a toll and time, the trade administration includes an organizational view point that investigations the arrangement of exercises that increment the item esteem or benefit. In this way, within the SM field, it is more common to as it were receiving the financial perspective.03

The social measurement appears to be more troublesome to acclimatize and get it, as measuring impacts and social obligations could be a more challenging assignment for organizations, particularly for SMEs. The concept of Corporate Social Obligation (CSR) includes exercises related to the social measurement but can take on different meanings on setting and elucidation. The depending foremost acknowledged definition is that of Carroll26 which postures four sorts of social duties of companies, seen as a pyramid: 'Corporate social obligation includes the financial, lawful, moral, and charitable desires that society has of organizations at a given point in time'.



Fig.3. Sequence of SM process within 6R and TBL dimensions

D.FRAMEWORKS AND METRICS

In arrange to legitimately oversee companies, it is basic to survey the execution and confirm the compliance with targets in arrange to create fitting strategic and operational choices. Fabricating could be a develop commerce work, so companies' degree financial execution methodically by bookkeeping the costs of the assets expended and the esteem included along the fabricating prepare. In expansion, this bookkeeping can be amplified to the whole supply chain. In any case, the degree of natural and social performance could be a complex assignment that includes surveying the effect of beneficial action on maintainability, taking under consideration the materials, components, vitality and other supplies expended within the fabricating forms. Besides, squander and outflows can too be inputs for other mechanical or normal reusing frame works that include natural, social and financial affect that must be evaluated.14

To legitimately oversee generation frame works or indeed the whole supply chain from a supportability view point, the execution must be assessed with both subjective and quantitative metrics84 that encourage the distinguishing proof of associations and intelligent between the three measurements of sustainability. 60 These measurements for SM make it less demanding to create choices when optimizing items, forms and frameworks plans.

There's common agreement on the ought to utilize a few pointers for each of the viewpoints of the SM.85 The markers will frame portion of the company's announcing for inner purposes, among others: administration control and decision -making, as well as to educate partners.

The choice of supportability markers and their down to earth application in decision-making are a challenge for

the managers of the organizations.03 Additionally, whereas the evaluation of financial indicators is apparent, the measurement of natural and social pointers, as previously mentioned, could be a challenge for managers.86 On the opposite, the relative significance of markers can shift significantly depending on the sort of fabricating or the stage of the PLC beneath thought, and so this weighting must be carefully built up and a affectability examination must be utlized to decide how the comes about of supportability reports change agreeing to weightings.77

The feasible execution assessment can be carried out at item, prepare, manufacturing plant or company level. Fiksel et al.06 investigated current hones of driving companies, and after that proposed an item maintainability execution estimation system that encapsulates three standards partition of asset and esteem measures, unequivocal represent ation of the TBL and thought of the LCA. Lu and Jawahir07 proposed metrics and a calculation strategy to assess the method supportability. Huang and Badurdeen 09 created a system to assess the maintainable execution at the company level coordination past works on item and prepare economical execution files.

A system of operational maintainability pointers for industry covering the three measurements of TBL was proposed by Labus chagne et al.09 which has been connected for maintainability evaluation in a assortment of industries.10

The work of Joung et al.11 distinguished 11 worldwide systems of markers for economical advancement, a few of which incorporate pointers that can be utilized to degree SM execution and are summarized underneath. The one made by the Joined together Countries Division for Maintainable Advancement (UN-CSD) categorizes the measurements by the three measurements of TBL and 14 topics with a add up to of 96 markers, of which a huge portion are not arranged to manufacturing.

The Worldwide Detailing Activity (GRI) 12 may be an intentional detailing activity for organizations and mechanical companies. The GRI G4 announcing rules comprise of 10-degree pointers which cover the three fundamental measurements of supportability.

The GRI announcing framework makes it conceivable to examine and screen the organization's maintainability execution. A few creators like Tiwari and Khan94 propose SM or Industry 4.0 system mapped with the fitting TBL theme beneath the GRI.

Components influencing the economical fabricating of electric vehicles were recognized.

The 67 factors distinguished were categorized into 7 components. The pertinence of these components was analyzed by the ostensible gathering strategy. The 3-member gather comprised of an academician, an industrialist, and a policy Smaker from the Government of India. Based on the input from the gather, the criteria weights of the variables were calculated utilizing the Shannon Entropy strategy.

Comes about appeared that the foremost critical among the 7 variables was the innovative calculate. It was advance gathered that extend, control, seating and baggage capacity, and battery swapping innovation were the foremost important criteria inside the mechanical space. Mechanical figure was taken after by the natural calculate, inside which, nursery gas outflows, commotion, and worldwide warming were the fore most basic criteria to be considered.

Fuel cost and buy taken a toll of the financial figure were moreover found to have comparatively higher significance than other components. Geographic and social variables were the slightest pertinent variables influencing economical fabricating of electric vehicles in India, and thus does not require prompt consideration.

VII. SUMMARY AND FUTURE WORK

Existing Sustainable Manufacturing systems in fabricating take after an efficiency-oriented approach. Current COVID-19 and biodiversity dangers have drawn the consideration of investigate community towards the significance of biological system wellbeing. Businesses must get it their commitment to different impacts past fabricating boundaries and centre on successful hones. A preparatory effectiveness-based SA system joining dynamic impacts has been presented in this paper. Originators and producer can pick up knowledge from such evaluations and maintain a strategic distance from unexpected dynamic impacts.

Parallel industry activities such as mechanical advantageous interaction, product-service frameworks, and block chains would upgrade traceability, specialized possibility, and data sharing within the item life cycles, and this framework's appropriateness.

We get it that the instruments included within the system are time, asset, and data intensive. Some steps to recognize topography and industry-specific information have been displayed within the paper. Future steps include executing this system at a fabricating industry to get it commonsense challenges, e.g., time and abilities required to carry out the evaluation.

REFERENCES

- [1] Design for Sustainable Manufacturing: Approach, Implementation, and Assessment Hossam A. Kishawy 1, Hussien Hegab 2,* and Elsadig Saad.
- [2] Manish Kumar^o, Monto Man "Towards an interdisciplinary framework for effective sustainability assessment in manufacturing" Procedia CIRP 98 (2021) 79–84.
- [3] Zarte, M, Pechmann, A, Nunes, IL. Decision support systems for sustainable manufacturing surrounding the product and production life cycle – a literature review. J Clean Prod 2019; 219: 166–179.

- [4] Elkington, J. Partnerships from cannibals with forks: the triple bottom line of 21st-century business. Environ Qual Manag 1998; 8(1): 20–51.
- [5] Gao, SS, Zhang, JJ. Stakeholder engagement, social auditing and corporate sustainability. Bus Process Manag J 2006; 12(6): 722–740.
- [6] Fiksel, J, McDaniel, J, Spitzley, D. Measuring product sustainability. J Sustain Prod Des 1998;
- [7] Lu, T, Jawahir, IS. Metrics-based sustainability evaluation of cryogenic machining. Proced CIRP 2015;
- [8] Huang, A, Badurdeen, F. Sustainable manufacturing performance evaluation: integrating product and process metrics for systems level assessment. Procedia Manuf 2017; 8: 563–570.
- [9] Labuschagne, C, Brent, AC, Van Erck, RPG. Assessing the sustainability performances of industries. J Clean Prod 2005; 13: 203– 215.
- [10] Brent, AC, Pretorius, MW. Sustainable development: a conceptual framework for the technology management field and departures for further research. South African J Ind Eng May 2008; 19(1): 31–52.
- [11] Joung, CB, Carrell, J, Sarkar, P, et al. Categorization of indicators for sustainable manufacturing. Ecol Indic 2013; 24: 148–157.
- [12] Global Reporting Initiative. GRI standards , 2018, https://www.globalreporting.org /standards/gri-standards-downloadcenter/?g=267fbc31-1051-4752-ba63-746f458b1894 (accessed 22 October 2019).
- [13] S. Kara, M. Hauschild, and C. Herrmann, "Target-driven Life Cycle Engineering: Staying within the Planetary Boundaries," Procedia CIRP, vol. 69, pp. 3–10, Jan. 2018.
- [14] S. Moshrefi, S. Kara, and M. Hauschild, "A framework for estimating regional footprint of companies towards absolute sustainability," Procedia CIRP, vol. 80, pp. 446–451, 2019. [31] M. W. Ryberg et al., "How to bring absolute sustainability into decision-making: An industry case study using a Planetary Boundary-based methodology," Sci. Total Environ., vol. 617, pp. 1406–1416, Sep. 2018.
- [15] P. Fantke and N. Illner, "Goods that are good enough: Introducing an absolute sustainability perspective for managing chemicals in consumer products," Curr. Opin. Green Sustain. Chem., vol. 15, pp. 91–97, 2019.
- [16] U. Kral, K. Kellner, and P. H. Brunner, "Sustainable resource use requires 'clean cycles' and safe 'final sinks," Sci. Total Environ., vol. 461–462, pp. 819–822, 2013.
- [17] A. Rashid, F. M. A. Asif, P. Krajnik, and C. M. Nicolescu, "Resource Conservative Manufacturing: an essential change in business and technology paradigm for sustainable manufacturing," J. Clean. Prod., vol. 57, pp. 166–177, 2013.
- [18] G. Sonnemann, E. D. Gemechu, N. Adibi, V. De Bruille, and C. Bulle, "From a critical review to a conceptual framework for integrating the criticality of resources into Life Cycle Sustainability Assessment," J. Clean. Prod., vol. 94, pp. 20–34, 2015.
- [19] L. Tercero Espinoza et al., "Greater circularity leads to lower criticality, and other links between criticality and the circular economy," Resour. Conserv. Recycl., vol. 159, p. 104718, 2020.
- [20] G. Zapelloni, A. García Rellán, and P. M. Bello Bugallo, "Sustainable production of marine equipment in a circular economy: deepening in material and energy flows, best available techniques and toxicological impacts," Sci. Total Environ., vol. 687, pp. 991–1010, Oct. 2019.
- [21] S. Sala, B. Ciuffo, and P. Nijkamp, "A systemic framework for sustainability assessment," Ecol. Econ., vol. 119, pp. 314–325, 2015.

Selective Harmonic Elimination using ANN Controller

Minal Bhoir Department of Engineering Sciences & Humanities Thakur College of Engineering & Technology, Mumbai minal.bhoir@tcetmumbai.in

Abstract - In this paper, a direct supervisory training system is used to eliminate odd lower order dominant harmonic in a single-phase inverter output voltage. The results of MATLAB show considerable improvement in voltage spectrum if trigger pulses are generated at the ANN positions as harmonic contents are reduced with significant improvement in fundamental voltage resulting in reduction in device ratings. The conventional techniques SVMT, SPWM and SHE-NR method not provide the accurate reading of firing angle. Artificial Neural Network implement for minimize for the odd dominant harmonic and show the comparative difference between conventional technique. The quantitative analysis is given in list relative to fundamental. This shows better more reliable and easy design of a SHE-ANN controller better than the SHE-NR.

Keywords- SVMT, ANN, SHE-ANN, SHE-NR, SPWM.

I. INTRODUCTION

The selective harmonic elimination using SPWM, VPWM, and SHE-NR these various methods provide the good output voltage. These are reduced odd harmonic such like 3rd, 5th and 7th. The SHE-NR has the skill to eliminate the low order harmonics, up to the specified order and to control the magnitude of fundamental RMS voltage at the output of voltage source inverter. The execution of SHE- NR needs solving a set of nonlinear equations, contain trigonometric terms and are transcendental in nature. Consequently, multiple solutions are possible. These equations should be solved by numerical methods, first by applying Newton Raphson's method to obtain a linearized set of equations and the solution of these equations is achieved by Gauss elimination method [1]. The numerical methods have inherent difficulties such as Number of iterations, divergence of response, convergence to wrong results, time consuming and requiring large memory size. The convergence problems are highly arising especially when the numbers of equations are increased. ANN controller is eliminating all the problem of conventional technique which are used in SHE.

The artificial neural network widely used in engineering and pharmaceutical field. In this technique we are using sample data which is collect from the SHE-NR method. These dada train by using neutral network tool. ANN tool segregates the data of error and correct output. A supervisory data control used in neural network with back propagation trainingalgorithm is used to produced pulsed width modulation. A feed forward ANN basically implements nonlinear input-output mapping [2]. The computational delay of this mapping becomes negligible if parallel architecture of the network is implemented. For any chosen objective function, the optimal switching pattern depends on the desired modulation index. In the existing practice, the switching patterns are pre-computed for all the requiredvalues of this index, and stored in look-up tables of a microprocessor-based modulator. This requires a large memory and computation of the switching angles in real time is, as yet, impossible. To overcome this, an ANN is trained in off-line to obtain the notching angles required to generate an output voltage without using the real time solution of nonlinear harmonic elimination equation. The complete set of solutions to the nonlinear equations is found using the back propagation of the errors between the desired harmonic elimination and the nonlinear equation systems using the switching angle given by the ANN. The ANN having the following advantages over the SPWM and SHE-NR techniques. In this technique, it is not necessary to establish specific input- output relationships but they are formulated through a learning and training process. Complex iterations involved in solving the nonlinear equations using any of the numerical methods are eliminated. Though training takes a long timeit is not a disadvantage since the training is carried offline. The conventional lookup table method involves larger memory which is not required in case of neural net. After the weights of the neural net are determined the net can be implemented online or offline. Parallel neuron units enable parallel processing reducing the computation time significantly in real time [10]. In this technique generated PWM signals for various values of N and modulation index using direct supervisory method and feed forward neural network. Artificial neural network gives the output of firing angle and these outputs provide to single phase inverter.

II. She-NR CONVENTIONAL TECHNIQUE

This SHE-NR method Mathematical analyses play important role for process of iterations. In power electronic circuits, one of the main problems is the formulation of the pulse for switching of the power electronic devices. When the gate pulse is a pulse of constant duty cycle, the problem becomes simpler. But in the case of a PWM waveform, there is a great deal of calculations and they vary according to the PWM generation method used. Mathematical analysis is to solve the non-linear simultaneous harmonic equations [1]. The non-linear equations are the transcendental equations of the switching instants of thePWM waveform. Some non-linear iterative methods are used to generate the angles by finding the solutions of the given set of equations [8]. The whole procedure is finally implemented in MATLAB programs.

A. simulation model



Fig 1: Simulation model of a single-phase VSI

B. Table 1:	simulation	parameter
-------------	------------	-----------

Input voltage	100V
Resistive load	100 ohms
Inductive load	1Mh
Simulation time	0.7 sec

C. simulation output SHE-NR

Samplin		Annual Control	-	1e-06 s	
Samples	per	cycle	=	20000	
DC comp	oner	1t	=	0	
Fundamer	ntal	L	=	0.8999 peak (0	.6363 rms)
THD			=	49.45%	
0	Hz	(DC) :		0.00%	0.0*
50	Hz	(Fnd) :		100.00%	-0.0°
100	Hz	(h2):		0.00%	0.0*
150	Hz	(h3):		0.05%	19.9°
200	Hz	(h4):		0.00%	0.0*
250	Hz	(h5):		0.02%	39.7°
300	Hz	(h6):		0.00%	0.0*
350	Hz	(h7):		0.04%	205.0°
400	Hz	(h8):		0.00%	0.0*
450	Hz	(h9):		0.02%	-44.0°
500	Hz	(h10):		0.00%	0.0*
550	Hz	(h11):		39.12%	180.0°
600	Hz	(h12):		0.00%	0.0°
650	Hz	(h13):		2.91%	179.7°
700	Hz	(h14):		0.00%	0.0*
750	Hz	(h15):		26.74%	-0.0*
800	Hz	(h16):		0.00%	0.0*
850	Hz	(h17):		10.69%	-0.1°

Fig 2: FFT Analysis of SHE-NR [MI=0.9]

III. SHE-ANN PROPOSED TECHNIQUE

An ANN is an interconnection of a number of artificial neurons that simulates a biological brain system. It has the ability to approximate an arbitrary function mapping and can achieve a higher degree of fault tolerance [5]. NNshave been successfully introduced into power electronics circuits. For the harmonic elimination of PWM inverters, NN replaced a large and memory-demanding look-up table to generate the switching angles of a PWM inverter for a given modulation index. When an NN is used in system control, the NN can be trained either on-line or off-line. In on-line training, since the weights and biases of the NN are adaptively modified during the control process, it has better adaptability to a nonlinear operating condition [2]. The most popular training algorithm for a feed forward NN is back propagation. It is effective because it is reliable, easy to implement, and accurate. However, the back propagation algorithm involves a great deal of multiplication and derivation. If implemented in software, it needs a very fast digital processor.

IV. FEED FORWARD NEURAL NETWORK

This feed forward neural network are has input, hidden and output layer of neuron respectively to eliminate odd lower dominant harmonics. The input received an input data and distributes it to all neurons in the middle layer. The input layer is passive and does not alter the input data. The neurons in the middle layer act as feature detectors. They encode in their weights a representation of the features presents in the input patterns. The output layer accepts a stimulus pattern from the middle layer and passes a result to a transfer function block which usually applies a nonlinear function and constructs the output response pattern of the network [1]. The number of hidden layers and the number of neurons in each hidden layer depend upon the network design consideration and there is no general rule for optimum number of hiddenlayers



Fig. 3 : Basic Structure of Feed Forward Neural Network

V. SUPERVISED TRAINING FOR SHE

In the Artificial neural network training method having two types direct supervised training and indirect supervisory training. The direct supervisory training to find the firing angles, corresponding to different modulation indexes are obtained from the Cauchy's relation. Thus, with the available targets, the net can be trained offline. As per the figure 4th comparing the output data and correct data using back propagation training algorithm. Once when the net is trained to the desired level such that the error obtained is minimum, the weights are updated. Using these updated weights, the required notching angles can be found. Back propagation training algorithm is most commonly used in feed forward ANN. When a set of input values are presented to the ANN, step by step calculations are made in the forward direction to drive the output pattern [10]. Squared difference between the net output and the desired net output for the set of input patterns is generated and this is minimized by gradient descent method altering the weights one at a time starting from the output layer. This is used as the training data and the net is directly trained.



Fig 4: Direct Supervised Training of ANN for SHE

VI TRAINING PROCESS OF THE ANN

- 1) The first stage decides matrix pattern, then the various module index is there so need to decide the modulation index pattern.
- 2) The firing angle set as a target by solving the newton Raphson method.
- Then the initial weights for both input and hidden layers including the bias are assumed.
- 4) With the available training pattern, targets and the initial weights, the network is trained by the back propagation algorithm and set layer of network used for the training process.
- 5) The error will be less than the tolerance value, then stop the all-training process and find the final firing angle.
- 6) Thus, the neuron updated weight i.e., all training process find the firing angle using modulation index.

VII SIMULATION OF SHE-ANN

A. Training of ANN to generate switching angles In training process take a various sample of the modulation indices and various nothing angle are obtain for the neural network training process.

MI	0.1	0.3	0.5	0.7	0.9	1
α1	28.23	26.22	24.90	23.08	21.01	19.33

α2	29.73	31.06	32.13	33.74	31.32	29.13
α3	57.68	54.93	51.96	42.63	44.45	40.51
α4	60.41	62.74	65.03	66.93	6.011	60.52
α5	87.50	84.46	81.27	77.68	72.34	63.42

Α.	Table	2: 7	Fraining	Parameter
----	-------	------	----------	-----------

	8
Network Type	Feed Forward backprop
Training Function	TRAINLM
Adaptive Learning	LEARNGD
Function	
Performance Function	MSE
Number of Layers	1
Number of neurons	20
Transfer Function	TANSIG

B. In this paper single layer feed-forward network, and the system used are the back propagation network. Parameter of the training process is following

- 1) Input data: mi, provide the specific input of the neural network .
- 2) Target dada: angles, select the target data related to the output of the neural network.
- Training function: TRAINLM, trainlm is a network training function that updates weight and bias values according to Levenberg-Marquardt optimization.
- Number of layer: one, single layer network used in the training process.
- 5) Number of Neurons: 20

6) Performance function : MSE, the mean squared error or mean squared deviation of an estimator measures the average of the squares of the errors or deviations that is, the difference between the estimator and what is estimated.MSE is a risk function, corresponding to the expected valueof the squared error loss or quadratic loss. The difference occurs because of randomness or because the estimator doesn't account for information that could produce a more accurate estimate. The MSE is a measure of the quality of an estimator it is always non-negative, and values closer to zero are better.



Fig. 5: Performance plot for NN

The design of the Artificial Neural Network Control technique is working platform of MATLAB. The technique is satisfied in such a way `that it can eliminate the odd lower order harmonics, so it can reduced THD level as shown in figure 6.

Samplin		ime =	5e-05 s	
Samples	per	r cycle =	400	
DC comp	oner	nt =	1.102e-07	
Fundame	ntal	1 =	107.3 peak (75.)	86 rms)
THD		=	34.98%	
0	Hz	(DC) :	0.00%	90.0°
50	Hz	(Fnd) :	100.00%	-0.8°
100	Hz	(h2):	0.00%	268.5°
150	Hz	(h3):	1.40%	-1.8°
200	Hz	(h4):	0.00%	267.2°
250	Hz	(h5):	4.09%	175.8°
300	Hz	(h6):	0.00%	267.6°
350	Hz	(h7):	4.01%	-5.9°
400	Hz	(h8) :	0.00%	263.9*
450	Hz	(h9):	3.96%	172.9°
500	Hz	(h10):	0.00%	262.2*
550	Hz	(h11):	18.76%	171.1"
600	Hz	(h12):	0.00%	79.5°
650	Hz	(h13):	15.37%	169.5°
700	Hz	(h14):	0.00%	78.5°
750	Hz	(h15):	6.32%	-12.4°
800	Hz	(h16):	0.00%	77.1*
850	Hz	(h17):	20.35%	-13.9°

Fig. 6: Matlab Analysis result [MI 1]

C. Comparison between SHE-NR and SHE-ANN

As per the result of the MATLAB SHE-NR and SHE-ANN, Artificial neural network technique is very effective as compare to the SHE-NR. In this method, it eliminates dominant odd lower order harmonic also eliminates even harmonics. Comparison between two methods THD is reduced from 50% to 34.98%

VII. CONCLUSION

We are using SHE-ANN method to reduce the THD level and improve the firing angle. The harmonics are reduced to the extent of elimination with simultaneous increase in fundamentalvoltage component. Increase in output voltage results in reduction in ratings of the devices consequently reducing the cost. It is observed that the trigger pulsepositions given by SHE-ANN controller produces good quality of voltage at the Inverter output as is seen from MATLAB simulation as compared to that obtained by the conventional numerical technique of Newton-Raphson method. The SHE-ANN controller can handle the complicated non-linear equation set in a better manner producing the optimum firing pulse-positions. This result show that selective harmonic elimination using artificial neural network technique are eliminates the lower order odd dominant harmonics.

REFERENCES

- Kaelbling, L. P., et al. "Intel's neuromorphic computing systems: a survey of applications." Science Robotics, 4(26), January 2019.
- [2] Vidushi Sharma, "A comprehensive study of artificial neural network," IJARCSSE, Vol. 2, issue 10, Ooctober2012.
- [3] M. Balasubramonian, "Design and Real Time Implementation of SHE PWM in Single Phase Inverter using Generalized Hopfield Neural Network", IEEE Transaction on Industrial

Electronics, DOI 10.1109/TIE 2014.

- [4] Muhammad Aamir, "Selective harmonic elimination in inverters using bio-inspired intelligent algorithms for renewable energy conversion applications," gate research February 2018
- [5] imarazene khoukha, "Application of ANN to the Control by Elimination Harmonics of a Seven Level Voltage Inverter", 2006
- [6] Y. Sahali, "Selective Harmonic Eliminated Pulse- Width Modulation Technique (SHE PWM) applied to Three-level Inverter / Converter," in Conf. IEEE 2003.
- [7] "Quantum computing for artificial intelligence" by Maria Schuld, Ilya Sinayskiy, and Francesco Petruccione, in Physical Review Research (2020).
- [8] Madhuri A. Chaudhari" Artificial Neural Network Controller For Performance Optimization Of Single Phase Inverter" IJAIA, Vol.3, No.1, January 2012.
- [9] M. Suresh Kumar K. Ramani "Comparative Review of Modulation Techniques for Harmonic Minimization in Multilevel Inverter" International Journal of Electrical, Computer, Energetic, Electronic and Communication Engineering Vol:8, No:12, 2014.
- [10] B. Maind, Ms. Priyanka Wankar, "Research Paper on Basic of Artificial Neural Network," International Journal on Recent and Innovation Trends in Computing and Communication, vol. 3, issue 1, January2014.

Study of NEP 2020 & It's Effects on Student's Life

Radha R. Sonavadekar Department of Engineering Sciences & Humanities Thakur College of Engineering & Technology, Mumbai India Radha.sonavadekar@tcetmumbai.in

Abstract —National Education Policy (NEP) 2020 is approved by Prime Minister Narendra Modi on 29th July, 2020. This was proposed by Dr. K. Kasturirangan (Chairman of ISRO) committee. This gives us the updated 5+3+3+4 criteria of Indian Education. To study NEP 2020 is very important for a teacher to make the students aware of new education policy. Some people are agreeing and some are disagreeing with this NEP 2020. It is always wrong to conclude anything about any topic without doing proper study on that particulartopic. According to the survey, this policy is positively effective from the student perspective. There also can be some negative effects. All these points along with online & offline mode of education are studied and mentioned in this research paper. This paper will help the reader to understand NEP 2020 and its effect on education (offline Vs online).

Keywords — National education Policy (NEP), Benefits & Drawbacks, Challenges, Higher Education.

I. INTRODUCTION

Children are the pioneers of any country. Hence, it is obvious that every country should give the best education to the children. Hence, Education is considered as the foundation stone of country. India is the well developing country in the world. Therefore, it isrequire to implement the best education system in our country. Our 34 years old education system is based on10+2 level. But, now, it will be changed as per the new National Education Policy (NEP) which will be implemented from the Academic Year 2023-24. NEP 2020 was proposed by Ministry of Education with the help of committee panel which was led by Dr. K. Kasturirangan who is the Chairman of Indian Space Research Organization (ISRO) on 31/05/2019. We will be discussing some pros and cons of NET 2020 through it's study.

II. NATIONAL EDUCATION POLICY 2020

NEP is developed to transform our Indian Education System as per the need of 21st century. It will bring drastically positive change towards critical thinking rather than curriculum. It will be starting from vocational skill development to higher education. The pictorial representation of primary education is give below:



Fig.1. NEP Flow

A)Primary Education:

The main goal is to increase the enrollment of all the children in the country to 100%. So that, no one will remain as uneducated in India. The primary education criteria will be changed from 10+2 to 5+3+3+4 curricular structure. First 5 years stage is called as Foundational stage. These 5 years are divided into two parts again:

• Pre-Primary / Anganwadi / Balvatika: The children of age 3 years to 6 years will be including in this category. These children will be taught with activity-based learning method. They will learn through the play.

• Class 1 & 2: Then after the child will be enrolled in 1^{st} and 2^{nd} class at the age of 6 years o 8 years.

The next stage is from 3rd standard to 5th standard (Age:8-11). This is 3 years learning stage called as Preparatory Stage which includes playing, discovering new ideas, activity based learning and interactive classroom learning to develop child's brain. Next 3 years stage will be from 6th standard to 8th standard (Age 11-14). This stage will include experimental learning in Sciences, Mathematics, Arts, Social Science and Humanities. This is called Middle stage. The last

stage in primary education is called Secondary Stage that will include multidisciplinary study, greater critical thinking, and flexibility in study by student's choice of subjects. This is 4 years stage from 9th standard to 12th standard (Age: 14-18).

The National Curricular and Pedagogical Framework for Early Childhood Care and Education (NCPFECCE) will be established by NCERT for the children up to age of 8. The primary education is designed so that student can give equal importance to Extra-Curricular, vocational and study in the school. This is holistic and

360 dimensional approach. The students will be evaluated on the basis of rules which will be given by PARAKH (Performance Assessment, Review and Analysis of Knowledge for Holistic Development). Also, National Curriculum Framework for teacher education (NCFTE) will be established to educate the teachers. CAP – Cognitive Affective Psycho motor method will be used for assessment of the students. No rigid separation between Arts, Science and Commerce.In this way every child will adept in at least one skill.

B) Higher Education:

The Education Ministry of India aims to increase the Gross Enrolment Ratio of children in Higher education to 50%. In accordance to which 3.5 crore new seats will be available in Higher Education Institutes This new policy will give multiple entry and exit points to each of every student with certificate at every stage. The curriculum will be as follows:

The 12th pass out student can enroll for 4 years Graduation Course of any stream of his / her choice. In which 1 year successful completion will provide certificate in respective subjects. After that If student wants to continue with 2nd year with same subject, then after its successful completion, he / she will get Diploma certificate in respective stream. Otherwise, the students can change the stream / subjects according to their choice in 2nd year. Then students will be considered as Graduate after successful completion of 3rd year. This will also give them certificate of Graduation. Also, students will be considered as eligible candidates to appear for any competitive examor they can apply for jobs on the basis of 3 years completion of Graduate degree. After that, if student wants to pursue Masters Degree then he / she can take admission for 4th year of Graduation. Then, student canget certificate of Masters Degree by completing next 1 year of Post Graduation Course after 4 years of

Graduation. M.Phil degree will be canceled from 2023-24 academic year. The minimum time span to pursue PhD is 4 years.

The Higher Education Commission of India (HECI) will take a control on entire higher education system excluding legal and medical education. It aims to convert all the affiliated colleges into Graded Autonomy. Also, National Educational Technology Forum (NETF) will be established to share innovative ideas in free of cost. The Indian Economy aims to invest 6% of total GDP of India as early as possible. Now, it is 3.1% of GDP.

This policy is the need of 21st century. This will reduce illiteracy in the country. The successful implementation of NEP 2020 will increase the enrollment ratio of children as this directly hits the mentality of backward minded population in this country who don't send their children to the school. I think the most important output from NEP 2020 is that students will be skilled in the area of their interests. They may become all-rounder. Another good part I liked is that students will be taught in their mother tongue. The language of communication in primary education will be their mother tongue language. So that, the students can easily connect with teachers as well as with each other. This will helps to keep them connected to the soil of our country. Also, the flexibility in choosing the stream / subjects in highereducation will give freedom to the students. This will helps to reduce the unemployment in India. Also, students will contribute to the best of our country.

III. CHALLENGES IN FRONT OF INDIAN GOVERNMENT

A) Infrastructure & Funding

The new economy survey was conducted in 2020-21. In which it is found that India spends only 2.9 % of its GDP on education sector. NEP 2020 targets of spending 6% total GDP of country. To implement NEP 2020, a big infrastructure is required. For that Education Ministry needs large amount of funds. This is the big challenge. As per the survey, India is reducing the expenditure in Education Sector year by year. We can see by using the graph given below:



Such a large funding is not available in Indian Economy. Along with this, most of the posts of teachers are vacant as state governments do not have fund to hire permanent teachers. The question arises that how will the government implement the new education policy 2020? It requires a heavy investment for upcoming years which includes targets like achieving 6% GDP in education, digitalliteracy, trained teachers which is out of India's budget.

B. Medium Of Instruction

This will increase the gap those who can communicate in English and those who cannot. Also, new learning material in various mother tongues is yet to standardize. Along with this some concepts are hard to convert into regional language. This is another level challenge that will impact directly on student's mentality.

Choosing a mother tongue / local language is confusing. For example, a single class may contain students with different local language. In other way, suppose one child who speak Marathi get enrolled in the school in Assam due to the transferable job of his

/ her parents. Then, it will be difficult for such childto catch up and to understand anything. This results into the loss of that particular child. Apart from this, when that child enrolls to Higher Education institutes, and then he / she will find it difficult to communicate with other students due to language barrier. Also, child will get difficulties in understanding of concepts because the medium of instruction is not mother tongue in Higher Education institutes. Eventually, this will become big challenge for teachers. Language is used as a vehicle to maintain the culture of a particular region. But we should not forget that the Global Language of communication and empowerment in the world is English. Hence, I think Education Ministry need to find some appropriate solution for this problem such that people stay connected with their pioneers roots as well as they can able to communicate with the outside world more confidently.

C. Skills & Vocational Training

Vocational courses will be made compulsory from 6th standard. The skills like local crafts, carpentry, cooking, gardening, etc will be taught to each student. Hence, schools may face the issues due to lack of proper resources. The set up and trained persons need to hire into the schools to deliver course content. So, high investment is needed. If we want to save the money then one solution can be possible is that schools can make a partnership with local craftsmen and take all the students to their working factories / craft places. But again the risk factor will arise related to all small children regarding their safety. Apart from this, transportation cost will require and the time will be wasted in travelling from schools to their craftsmen places. This will lead to a burden on parents in terms of fees and child's safety.But we know that gardening, pottery, etc do not need special setup. These can be done at school campus only. The courses like carpentry need a good setup. The major issue regarding this topic is mentality of people living in unprivileged sections of India. It is possible that these peopleget adverse effect due to these vocational courses. They might use this for their malpractices. Thich will lead to distractions. Another chance is that poor parents put their children to the low skills jobs to get money. This will increase dropout rate from the schools.

D. The Trained Teaches

A large number of trained teachers will require for implementing this dynamical process. Most of the qualified teachers in India are facing the problems like uninspiring job profile, exploitation, and disincentivized service conditions. Even if they get opportunity to teach the students, they are paid lesser than the norms of UGC, Government of India. They get unenthusiastic and unmotivated. This will affect their way of teaching. Apart from this it is found that according to Justice JS Verma Committee Report, 2012, on an average 85% of teachers are not qualified for the Central Teacher Eligibility Test (C-TET). Some candidates are occupying teacher's posts who are not even qualified and some qualified candidates are unemployed. A large number of teachers are trapped in administrative work. So, they can't give justice to their actual responsibility of teaching. So, the question arises here is that how will they give sufficient time to learn all these new things that are important to implement NEP 2020. All the teachers need to learn new skills. But it will be tedious task to give training to such large number of teachers.

E. Digital Approach Towards Education

It is good approach of education department as they are thinking to give importance to digital education. But it should need to keep n mind that there is huge gap between rural areas and city areas. First thing there is lack of electronic gadgets / web in rural or village areas. As we observed in COVID-19 that many students from village areas were not able to attend online classes due to internet issues. Due to this reason, some students were travelling far away from home to attend classes. Poor students are no able to access all such electronic gadgets. Also, online things will affect directly to children's health.

It might possible that many students will get mental disorders due to excessive use of digital things.

IV.CONCLUSION

NEP 2020 is best in itself. It will give us tremendouslydesire output if implement properly. It will take huge efforts from all government, schools, teachers, parents and students. But if the implementation will not be proper then that will lead to a biggest loss of India. So, all things are depends upon its implementation. For that Education Sector needs a large amount of funds from government. Many such things are discussed in this review paper. Still many factors are disclosed in this policy. NEP 2020 seems to be very easy on paper but itis hard to implement in Real-World situation.

ACKNOWLEDGMENT

I would like to convey my heartfelt gratitude to Dr. Sunita Pachori Ma'am (HOD) and whole ES & H Department for their support in the completion of my review paper. I would also like to thank TCET, Mumbai & our Principal, Dr. B. K. Mishra Sir, for providing mewith this wonderful opportunity to work on this review paper with the topic NEP 2020. I express my deep thanks to Dr. Karuna Nikam Ma'am for her assistance. The completion of the project would not have been possible without their help and insights.

REFERENCES

- [1] NEP_Final_English.pdf (education.gov.in).
- [2] Rachna Soni, Challenges and Issues in National EducationPolicy 2020.
- [3] https://www.drishtiias.com/printpdf/national-education- policynep-2020.
- [4] What does NEP 2020 Mean For Schools & Universities? -Univariety Blog.
- [5] https://www.insightsonindia.com/2022/01/28/214606/
- [6] https://youtu.be/pQJOFFObp54.

Imperative Aspects Influencing Transformation of Wind Energy

Achala Khandelwal Assistant Professor, Engineering Sciences & Humanities Thakur College of Engineering & Technology, Mumbai achala.khandelwal@tcetmumbai.in

Abstract – It took very long for wind energy to become a feasible source of energy, as uncertainty of availability associated with such sources of energy made it difficult. Wind Energy bares huge load like domestic, commercial etc., and these loads are far away from the grid. For the purpose of local electrification mono generators are required. This paper discusses choice of generators, different technologies for grid connected generators. Paper also deals with recent development for translation of wind energy to electrical energy and classification of generators.

Keywords — energy transformation, interconnection, aeroturbine (AT), sustainable energy, power-quality

I. INTRODUCTION

Wind is fundamentally produced by the temperature variation of atmosphere which is the outcome of solar heat. Wind comprises of huge amount of energy. Formerly, power of wind was served to many countries and was called wind mills, later wind power evolved for electric power on large scale. Today around 41GW of electricity is produced using wind power plant. Wind as supply of energy is extremely striking as it is abundant, limitless, sustainable, and non-poisoning [1]. In huge part of the globe, wind flows for more than 300 days in a year which gives them an advantage over sunlight in direct conversion programs. Moreover, it does not levy excess heat problem on the nature [2]. Key elements of any wind energy transformation scheme comprise of an Aero turbine (wind turbine), generator, controller and interconnection system. Aero turbine is classified as two types: (1) "Horizontal Axis Aero Turbine (HAAT)" and (2) "Vertical Axis Aero Turbine (VAAT)" [3]. In modern AT employ a horizontal axis pattern with 2 or 3 blades functioning either down/up wind. AT can be structured for either variable or constant speed of operation. AT of variable speed can generate 8-15% more o/p in comparison to the constant speed, though they require power electronics controllers for static voltage & frequency power to the load [4]. Many makers have option for diminution gears b/w the lower speed turbine rotor & the high speed 3 phase alternators. Direct Drive pattern, in which an alternator is attached directly with the rotor of AT, offering great consistency, minimum maintenance & lower cost. So many turbine

makers choose the direct drive pattern in modern turbine structures [5]. In recent scenario and in up- coming years induction generator with squired cage type & wound rotor, permanent magnet synchronous generator (PMSG), synchronous generator will be used doe aero turbine. For small to medium power wind turbines, permanent magnet generators and squirrel cage induction generators are often used because of their reliability and cost advantages.

II. SITE SELECTION FOR WIND POWER

It is necessary to measure wind speed in the region where possibility of wind power [6]. This measurement is done for an annum then after draw a graph wind speed versus time. This graph manifests that for considerable period in a year wind power is available. Wind duration curve is drawn by this curve and it represents the available power is not constant. The graph of Wind speed Vs time is shown in figure 1 below.



Fig.1. Wind Speed Kmph Vs Time in hours

Abbreviations:

Vc: - Cut In speed where wind electrical generator starts to generate power

Vf: - Furling speed or Cut Out speed where electrical generator disconnects from the system.

Vm: - Mean wind speed. Vr: - Rated wind speed. Vp: - Peak wind speed.

III. PERFORMANCE CO-EFFICIENT OF AERO TURBINE

It is the proportion of useful shaft power output to wind input power.

Cp = Useful shaft power output/Wind power input

Practical value of Cp is 30% but theoretical value of Cp is 59.3%. Ideally, the max efficiency by applying theory of Froud momentum is 59% but an overall efficiency of only 30% could be achieved due to aerodynamic and other mechanical losses. This gives a power of about 0.3 Kw/m2 for a wind velocity of 10 m/s.

Capacity factor: "The proportion of real productivity in a year to the maximum theoretical is known as *capacity factor*. As the speed of wind is not persistent therefore the annual production of energy is at no time equal to the summation of the nameplate ratings of generator in multiplication of the total hours in a year. Typically, the range of capacity factor is between 20- 40%, with values at the higher end in predominantly favorable sites. Contrasting to fuel generating plant, the capacity factor is restricted by the intrinsic properties of wind [7].

IV. CATEGORIZATION OF WIND ENERGY TRANSFORMATION SYSTEM (WETS)

Categorization of WETS is done in several ways. Illustration of foremost types are given below

(A) According to size of machine or size of Electrical *Power Output*: it is categorized in three sizes of WETS shown below.

i)*Small scale machine:* - The generating capacity of this size is up to 2 kW and it is used for remote locations or at places requiring low power.

ii) *Medium scale machine:* - The generating capacity of this size is up to 2 to 100 kW and this type of turbine is used to supply less than 100 kW rated capacity, to several residence load or local use.

iii) *Large scale machine:* - The generating capacity of this size is up to 100 kW and above and it is used to generate power for distribution in central power grids.

(B) According to type of Electrical power output:

It is categorized in mainly three types of generators.

i) D. C. Generators: -

Due high expense and requirement of frequent maintenance this generator is relatively unusual in wind turbine applications. In recent trends a.c. generators are used instead of d.c. generators and generate a.c. to be converted into d.c. by using controlled rectifiers [8].

ii) Induction Generators (IGs): -

Th generators provide various benefits in comparison to traditional synchronous generators as a foundation of secluded power source. Due to its decreased price, roughness, brush less, lower size, inexistence of distinct DC supply and ease of retainment, self-preservation in case of major overload and short circuit, are the main rewards. Further synchronous generator is thoroughly coupled and device and are employ in WT that is related to instability and needs added damping devices. Whereas IG is lightly coupled device, i.e., IGs are profoundly damped and hence has the capability to adjust minor variation in speed of rotor so as to drive transients to little amount a n d so can be absorb. Induction generators have some major disadvantages like reactive power consumption and poor regulation of voltage in case of speed variation, but the advancement of solid-stateconverters have facilitated the regulation of IG in respect to frequency and output voltage.

i) Synchronous Generators (SGs): -

The main positive side of SG is the controllability of reactive power so that machines could be utilized to provide reactive power to other components of power system, requiring the power. It's usual for any WETS to possess a SG when fitted to a WT to be regulated cautiously to avoid the acceleration in speed of rotor from synchronous speed particularly amid storming wind [9]. It needs elastic connection in the drive train, or to build up the gear box assembly on dampers or springs to captivate storming. SGs are costlier in comparison to IGs mostly when small in size.

(C) According to rotational speed of Aero turbine: -

Various types of generator topologies are being developed. In the paper a short bird's view of several generator technologies is represented.

i) Constant speed system:

This system is the naivest and utmost utilized globally. They operate at steady or almost steady speed. It is also known as "constant speed constant frequency (CSCF)" approach for operation. Figure 2 shows the general arrangement for CSGS. This system implies that regardless of turbine speed, the angular speed of the rotor is secured and regulated by grid frequency and gear ratio. The system has plain and consistent erection of the electric assembly but mechanical fragments are experienced to excess stress along with requirement of safety factors to be integrated in plan. In this system as a electrical machine "induction generator (IG)" or "wound rotor type synchronous generator (WRSG)" is used, but the squirrel cage induction generator has been the customary choice. The reason to choose

induction generator customary are mainly due to its simple construction, higher efficiency, and least maintenance necessities. To counteract against reactive power consumption of IG, a capacitor bank is introduced in shunt to the IG so as to acquire about upf. Additionally, to diminish the mechanical strain and to lessen the interference between grid supply and turbine throughout association and startup of the turbine, a lenient starter is utilized. The foremost benefit of such system is that it's easy and trustworthy arrangement. Although, capacitor is needed to regularly cut in or cutoff to maintain pf. This arbitrary swapping provides escalation to unwanted transients in line current and voltage. The variations in rotor speed are transformed to torque oscillations, that causes mechanical strain, which results in failure of gear box and drive train. The power produced through such arrangement is sensitive to variations in speed of prime mover. To sidestep it pitch management of rotor blade is essential.



Fig. 2 General arrangement of Constant Speed Generationsystem (CSGS)

(ii) Fully Variable Speed System: -

The inherent problems of the constant speed systems increase with the increase in size of turbine especially in areas with relatively weak grids. To prevent these troubles, recent trend in modern generator technology prefers variable speed system. A variable-speed system as shown in figure 3, keeps the generator torque constant and it is the generator speed which changes. Variations in the incoming power are absorbed by rotor speed changes.



Fig. 3. General arrangement of the fully variable speed system

The variable-speed system therefore incorporates a generator control system that can operate with variable speed. In this arrangement the variable-voltage variable frequency (VVVF) power generated by the machine is converter to fixed-frequency fixed voltage power by the use of back-to-back power converters. The arrangement can have either induction generator or synchronous generator as the electric machine. The machine side converter supplies the lagging excitation to the machine while the line side convertermaintains unity power factor at grid interface and also regulates the dc link voltage constant [10].

(iii) Limited Variable Speed System: -

With this system power can be extracted from or fed to rotor circuit and the generator can be magnetized from either thestator circuit or the rotor circuit. Mainly two methods of speed control can be employed to the induction generator, namely rotor resistance control and back-to-back convertor control [11]. Back-to-back converter control is very effective and it is used in doubly- fed pattern. This is shown below in figure 4



Fig. 4 General arrangement of limited variable-speed systemwith Doubly – fed pattern.

(B) According to applications of aero turbine: - i) Battery

storage: - Here battery gets charged byproduced energy and it is stored.

ii) *Direct connection:* - in this system local load isdirectly connected to aero turbine system.

iii) Grid connected: - Here aero turbine is connected tomain grid.

(C) According to the orientation of turbines: -

An aero turbine is a rotating machine whichconverts the kinetic energy in wind into mechanical energy. It is known as wind mill if the mechanical energyproduced by an aero turbine is directly used by machinery. There are mainly two types of aero turbines [12].

(i) Horizontal Axis Aero Turbine (HAAT) and (ii) Vertical Axis Aero Turbine (VAAT).

i) Horizontal Axis Aero Turbine (HAAT): -

HAAT are also called the wind – axis machine. The axis of rotation of such machines is parallel to the direction of wind. The machines are available in several designs. Depending upon the numbers of blades used these may be

single bladed, double bladed, triple bladed, multi bladed or

bicycle bladed as shown in below figure. Depending upon the orientation of the blades with respect to the wind direction these may be classified as up wind and down wind. A horizontal axis propeller typemachine having two or three blades as shown in figure 5 is considered more suitable for power generation.



Fig. 5 Different blades

(ii) Vertical Axis Aero Turbine (VAAT): -

VAAT are also called the cross-wind axis machines. Here, the axis of rotation is perpendicular to the direction of the wind. It has been found that the vertical type wind mills, arelighter in weight and cheaper in cost. Further they are omni directional and do not require a heavy shaft to support the rotor. VAAT accepts the wind from any direction. Thissimplifies their design and eliminates the problem imposed by gyroscopic forces on the rotor of conventional machines as the turbines yaw into the wind. VAAT allows mounting the generator and gear at the ground.

V. GRID INTERCONNECTION

The following are the major constraints needed for distributed resources can be concluded in three categories.

- a) General Specifications
- b) Safety and Protection Constraints
- c) Power Quality Constraints

a) General Specifications: -

The following are the general specifications for grid interconnection for distributed source.

i) Voltage Regulation: - A distributed resources shall not cause the voltage at the point of common coupling to go outside of range. For 120/240 V system this specifies a maximum voltage of 126/252 V and a minimum voltage of 114/226 V.

ii) Synchronization: -While synchronizing, a distributed resources shall not cause more than + or -5% of voltage fluctuation at the point of common coupling.

iii) Isolation Device: - A readily reachable, lockable, visible break isolation device shall not be located between the distributed resources and electric power system.

iv)Monitoring: - A distributed resources of 250 kW or larger shall have provisions for monitoring connection status and active and reactive power output at the distributed resources connection.

b) Safety and Protection Constraints: -

The following are the Safety and Protection Constraints forgrid interconnection for distributed resources.

Unintentional Islanding: - A distributed resources shallcease to energize the electrical power system within 2 seconds of the formation of an island.

i) Loss of Synchronism: - A distributed resources of 250 kW or larger shall loss of synchronism.

ii) Reconnection: - A distributed resources may reconnect to the power system 5 minutes after the electrical power system voltage and frequency resume to normal.

iii) Voltage Disturbances: - If voltage deviates from its normal value a distributed resources shall cease to energize the electrical power system within the specified clearing time.

iv) Frequency Disturbances: - A distributed resources shall cease to energize the electrical power system if the frequency is out of range 59.3 to 60.5 Hz.

c) Power Quality Constraints: - The following are the Power Quality Constraints for grid interconnection for distributed resources.

i) Flicker: - A distributed resources shall not produce offensive flicker for other consumers on the area electrical power system.

ii) Harmonics: - The total demand distortion of a distributed resources which is defined as the total rms harmonics current divided by the maximum demand load current, shall be less than 5%.

iii) D.C. Current Injection: - A distributed resources shall have a d.c. current injection of less than 0.5% of its rated output current.

There are various troubles associated with grid connection. More than 20% of generation meeting load may affect thenetwork in the following ways

- i) Low Frequency Operation
- ii) Poor Grid Stability
- iii) Impact of Low power factor Power Flow
- iv) Short Circuit
- v) Power Quality

VI. ADVANTAGES & LIMITATIONS OF WIND ENERGY TRANSFORMATION SYSTEM (WETS)

The following are the advantages of WETS.

- No fuel consumption.
- Free from pollution.
- Energy from wind is enormous.
- Operating cost is negligible.

The following are the major limitations of WETS.

- The direction and speed of wind is not constantduring a year.
- Wind energy cannot get instantly as and whenrequired.
- We need to store it when it is not in use.
- WETS are huge in size and occupy large space.
- We cannot make wind power plant in big size so it is necessary to make it many WETS in small size.
- Primary cost is high.
- The speed of aero turbine is not constant to frequency of voltage induced by alternator is not constant and it is an essential to adjust the pitch of blade to keep constant speed of aero turbine.

References

- Kodicherla, S. P. K., Gaddada, S., & Shaik, N. (2017). Wind energy potential and economic evaluation of WPS using WECSs in three selected locations of Northern Ethiopia. African Journal of Science Technology Innovation and Development., 9(2), 179–187.
- [2] Z. Chen, "Wind Power: An Important Source in Energy Systems," Wind, vol. 1, no. 1, pp. 90–91, Dec. 2021.
- [3] M. A. Cova Acosta, P. Gupta, H. Abildgaard, A. Shattuck, T. Drljevic-Nielsen and U. D. Árnadóttir, "Technical limitations of

generic wind power plants electrical simulation models, used in power system dynamic studies for grid code compliance," 20th International Workshop on Large-Scale Integration of Wind Power into Power Systems as well as on Transmission Networks for Offshore Wind Power Plants (WIW 2021), Hybrid Conference, Germany, 2021, pp. 388-394.

- [4] C. Wu, X. -P. Zhang and M. Sterling, "Wind power generation variations and aggregations," in CSEE Journal of Power and Energy Systems, vol. 8, no. 1, pp. 17-38, Jan. 2022
- [5] Venu Yarlagadda, Annapurna Karthika Garikapati, Nuthalapati Alekhya, Madhuvani Gowrabathuni, Korrapati Haritha, Theegala Hemanth Rao, "FFT Analysis and Harmonics Mitigation in WES using Multi-Level DSTATCOM", 2022 2nd Asian Conference on Innovation in Technology (ASIANCON), pp.1-7, 2022
- [6] L. Vijayaraja, R. Dhanasekar, K. Narmadha, S. Snega, V. Kanakasri, S. Raadha, "An Analysis on Generation of Power from Various Clean Energy and Capacity to Meet the Power Demand", 2022 6th International Conference on Intelligent Computing and Control Systems (ICICCS), pp.216-225, 2022.
- [7] K. Zaika, M. Khomenko and A. Pochtovyuk, "The Potential of Using Renewable Energy Sources for the Regional Industrial Sector," 2022 IEEE 4th International Conference on Modern Electrical and Energy System (MEES), Kremenchuk, Ukraine, 2022, pp. 1-6
- [8] S. Xuewei et al., "Research on Energy Storage Configuration Method Based on Wind and Solar Volatility," 2020 10th International Conference on Power and Energy Systems (ICPES), Chengdu, China, 2020, pp. 464-468
- [9] Sercan Teleke, Mesut E. Baran, Subhashish Bhattacharya and Alex Q. Huang, "Optimal control of battery energy storage for wind farm dispatching", IEEE Transactions on Energy Conversion, 2010.
- [10] L. G. Vasant and V. R. Pawar, "Solar-wind hybrid energy system using MPPT," 2017 International Conference on Intelligent Computing and Control Systems (ICICCS), Madurai, India, 2017, pp. 595-597
- [11] Z. Wang et al., "Research on the active power coordination control system for wind/photovoltaic/energy storage," 2017 IEEE Conference on Energy Internet and Energy System Integration (EI2), Beijing, China, 2017, pp. 1-5
- [12] S. Jabeen, S. Malik, S. Khan, N. Khan, M.I. Qureshi and M. S. Md Saad, "A Comparative Systematic Literature Review and Bibliometric Analysis on Sustainability of Renewable Energy Sources", International Journal of Energy Economics and Policy, vol. 11, no. 1, pp. 270-280, 2021

Comparison of Asymmetrical Multilevel Inverter Topologies for Photovoltaic System

Ekta R Desai Department of Engineering Science and Humanity, Thakur college of Engineering and Technology, Mumbai

Abstract - In this paper a comparison of Asymmetrical 7-level inverter topologies which are suitable for PV system is offered. The comparative analysis is done on the bases of number of components, control strategy, cost and efficiency. Different configurations for reasonable study consist of H-bridge are:(i) Conventional Asymmetrical Cascaded H-bridge configuration-1(ii) Asymmetrical Multilevel inverter configuration-2 (iii) Asymmetrical Multilevel inverter configuration-3 and (iv) Asymmetrical Multilevel inverter configuration-4. These configurations are used in medium as well as high voltage applications. The comparative study examined for the asymmetrical multilevel inverter configurations suitable for the PV system. The comparison is demonstrated via simulation study of each topology using MATLAB/ Simulink.

Keywords—Photovoltaic(PV), Multilevel Inverter (MLI),cascaded H-bridge(CHB),Asymmetrical Multilevel Inverter(AMLI).

I. INTRODUCTION

Limited availability of non-renewable energy sources and high power demand lead us to renewable energy source [1]. Solar energy is most popular and promising renewable energy source because using PV cell it directly converts into electrical energy. PV power is effectively utilized when the grid connected system is used. In grid connected photovoltaic system, inverter is utilized to convert the dc power produced by PV into ac feeding into the grid [2].

Generally, voltage source inverter (VSI) and current source inverter (CSI) are widely used for grid integration of renewable energy source. Nowadays, trend goes towards the utilize of multilevel inverter (MLI) because of their several benefits. MLI generates output having less distortion, produces lesser common mode voltage, produces less stress, reduces electromagnetic interference and generates better value output. It is simple to maintain and modify MLI topology as it has property of modularity. MLI also pertains to lesser switching losses and smaller filter size [3] is best suited for PV applications as they are based on a series connection of several single-phase inverters. Due to this modularity, they are highly consistent. Also, the need of different battery supplies can be fulfilled by PV modules that are available in discrete form. CHB structure is capable to reach medium output voltage levels using only standard and low voltage rating components. This topology uses least number of components. Typically, it is necessary to connect three to ten inverters in series to reach the required output voltage level [3]. There are two type of multilevel inverter: Symmetrical MLI and Asymmetrical MLI. In Archana Kulkarni Department of Engineering Science and Humanity, Thakur college of Engineering and Technology, Mumbai

symmetrical multilevel inverter each H- cell is fed by equal voltage and hence produces similar output voltage steps. If all the cells are not fed by equal voltage, the inverters become an asymmetrical MLI. In this inverter the arm cells have different effect on the output voltage [4]. The Asymmetrical multilevel inverter is promising inverter topology for high voltage and high power application. This inverter synthesis several different level of DC voltage to produce a staircase that approaches a pure sine wave. It has high power quality waveform, lower voltage rating of device, lower harmonic alteration, lower switching frequency and switching losses, better efficiency, drop of dv/dt stresses.

Various topologies include multiple DC sources with semiconductor switches and H-bridge. Different valued sources, semiconductor switches and H-bridge gives seven level output.

The various AMLI topologies based on modified conventional cascaded H-bridge topology suitable for PV system. The four seven level inverter topologies used for comparative analysis are:(i) Conventional Asymmetrical Cascaded H-bridge topology-1 [4]. (ii)H-bridge with MLI topology-2 [6] (iii) H-bridge with MLI topology-3 [6] and (iv) Boost MLI topology-4. [7]

The organization of paper in this way: The introduction is given in section-I. Section-II describes various AMLI topologies with their structures and control strategies along with the simulation results. Section III provides the comparative analysis of various topologies simulated in section-II. Section IV provides the prototype implementation of boost AMLI topology. All the simulations are performed in MATLAB/Simulink. Finally, concluding remarks are given in section-V and references are enlisted in section-VI.

II. DIFFERENT ASYMMETRICAL MLI TOPOLOGY WITH CONTROL SCHEME AND SIMULATION

A. H-bridge configuration-1:

Single-phase topology of a cascade multilevel inverter is shown in Figure 1. The number of output voltage levels can be increased by choosing different DC input voltage to the Hbridge without increasing no. of H-bridge cell. Thus more no. of output voltage levels can be obtained with the same H-bridge cells. An output phase voltage waveform of a cascade inverter with isolated DC voltage sources is achieved by adding the output voltages of bridges [13].

The DC voltage sources of all H-bridge cells are not same, with the maximum number of levels of phase voltage. The

cascade H-bridge converter consists of power conversion cells, each supplied by an isolated DC supply on the DC side and series connected on the AC side. The two main components of the power losses in a switch are conduction losses and switching losses [4].



Figure 1. Cascaded 7-Level Asymmetrical MLI

Switching Sequence: To obtain different seven levels all eight switches need to operate in specific manner. It is described in following table I.

Output Voltage	<i>S</i> ₁	S ₂	S ₃	<i>S</i> ₄	<i>S</i> ₅	<i>S</i> ₆	<i>S</i> ₇	<i>S</i> ₈
Vdc1+Vdc2	1	1	0	0	1	1	0	0
Vdc2	1	0	1	0	1	1	0	0
Vdc1	1	1	0	0	1	0	1	0
0	1	0	1	0	1	0	1	0
-Vdc1	0	0	1	1	0	1	0	1
-Vdc2	0	1	0	1	0	0	1	1
-(Vdc1+Vdc2)	0	0	1	1	0	0	1	1

TABLE I. SWITCHING SEQUENCE CASCADED AMLI

The cascaded H-bridge topology is controlled using level shifted, in phase deposition multicarrier PWM switching technique [5] as shown in Figure 2. Where triangular carrier wave frequency=1000Hz and power frequency=50 Hz. The corresponding switching signals are shown in Figure 3 and the seven-level output voltage is shown in Figure 4.

When switches S1, S2 and S5, S6 are on Vo1=100V and Vo2=200V and the output voltage V=Vo1+Vo2 =300V can be obtained. When S3, S4 and S7, S8 are on output voltage V = -300V can be obtained. Similarly, another levels can be obtained.

B. Asymmetrical Multilevel inverter configuration-2:

Schematic diagram of this topology is shown in Figure 5. As can be seen, it requires ten switches and three isolated DC supplies. The principal idea of this topology as a multilevel

inverter is its left portion in Figure5. It generates the required output levels. This part requires the high frequency switches. The bridge circuit decides about the polarity of the output voltage. It can be known as polarity generation. It requires low frequency switches. It can be applied for three-phase applications with the same basic [13].

This topology can be extended to higher voltage levels by duplicating the middle stage (S3, S6 and one DC source, VDC2). So, it is modular and can be easily increased to higher voltage levels by adding the middle stage It overturns the voltage direction when the voltage polarity requires to be changed for negative polarity. This topology uses isolated dc supplies. Therefore, it does not face voltage-balancing problems due to fixed dc voltage values [6]. If each DC voltage source value is kept same it can be a symmetrical MLI topology.



Figure 2. Level shifted, in phase deposition multicarrier modulation technique for 7-level ACHB inverter



Figure 3. Switching signals for 7-level ACHB Inverter



Figure 4. output voltage waveform of ACHB inverter

Switching sequence: To obtain different seven levels, all the ten switches need to operate in specific manner. It is described in following Table II.



Figure 5. H-bridge with AMLI topology-2

Table	II	switching	sequence	ofH-bridge	with	AMLI
topology-2	2					

Output Voltage	S 1	S 2	S 3	S 4	S 5	S 6	S 7	S 8	S 9	S 1 0
Vdc1+Vdc2+ Vdc3=250V	1	0	0	0	1	0	1	0	0	1
Vdc2+Vdc3= 150V	0	1	0	0	0	1	1	0	0	1
Vdc2=50V	0	1	0	1	0	1	1	0	0	1
0	0	1	1	1	0	0	1	0	0	1
- Vdc2=-50	0	1	0	1	0	1	0	1	1	0
- Vdc2+Vdc3=- 150	0	1	0	0	0	1	0	1	1	0
- Vdc1+Vdc2+ Vdc3=-250	1	0	0	0	1	0	0	1	1	0

The multiple source topology is simulated according to operation of the topology described in Table 2. To control this MLI topology same multicarrier PWM technique as in Figure 2 is used and the resulting switching signals given to each switch are shown in Figure 6. And seven level output voltage is shown in Figure 7.

C. Asymmetrical Multilevel inverter configuration-3:

Figure 8 shows a configuration of the single phase 7-level inverter having one H- bridge, four switches and two isolated DC sources. It consists of an H-Bridge module and two-level modules (S5, S6, Vdc1 and S7, S8, Vdc2).

By adding cascaded level modules, levels in output voltage can be increased, also increment in the numbers of switches is quite less compared with conventional multi-level inverters. Are operated and 7-level output voltage wave is obtained [13].

This 7-level inverter is operated through calculated switching angles.

5 0 HE	0000000	1	1/11/11	line di m	////////		10110	8 J.	-normality	
. 0	185	0.01	0015	100	0.02	110	105	3.04	0.046	0.0
00 GBE	TULIN DA		111110		THE HE RE		111111	£ 1	UL HILTH	
5	185	3,07	8.01	302	0.027		3.0%	101	0.940	0.0
8 HELL		CLICRA		1.001.001	41	T IN	1 1	JUNE CO	-	
- T	0.400	3001	III010	3:02	3421	1100	8720	101	0.046	0.0
· 슈야티	4.1	771.4	1	100		1.001	100	1.073	1	0
10 1	1.0%	381	101	0.02	145	0.02	105	1.14	- 10 PM -	0.04
10 OFE	1.1.1	1.1.10	1111	114	1	100	2.1	1111	114.00	-1
an 8 .	1.55	2.81	005	8.02	9.620	0.00	1.04	3.04	0046	
- 0 CHE	101.000.000	1 1 11	11111		THE HE BE	7.1.2	10711.1.5.1	dun i i	TUR. HULTH	11
A 1	1.02	0.81	101	0.02	112	1129	8.026	413	0.98	0.0
9.0FE		71.4		1.0		11		1.0		
40 T	0.020	33.81	III010	2/02	1421	110	822	104	0.046	0.0
40 OFE		115	1	111	2.12	- 101	1.1	131.0	1	
a =	2.9%	381	80t	- 9407	1.424	白斑	108	3.64	0.046	02
40 OFF	1.11	100	1	111	1.00	in	1.12.1	TH		
0 2	1.05	\$2)	0.015	- D(2)	8.820	1100	1.056	3.04	360	1.02
. 슈어트		71.4	1.1	1.11		11	112	4.8		_
- W - E	3.85	2.81	. 108	. 812	1225	. 早間	8.026	1.14	DOME -	0.02
					Timeisecond	8.5				

Figure 6. Switching signals for H-bridge with AMLI topology-2



Figure 7. output of H-bridge with AMLI topology-2

To obtain the voltage levels, proper switches in H-Bridge and Level Modules are activated at the correct angle values. Thus 7- level output voltage levels $(0,\pm Vd, \pm 2Vd \text{ and } \pm 3Vd)$ are obtained by using proper battery voltages (Vd, 2Vd, Vd+2Vd). The output voltage levels according to switch on and off conditions are shown in Table 3.

Switching sequence: To obtain different seven levels, all eight switches need to operate in specific manner. It is described in following Table III.

This AMLI topology is simulated according to operation of the topology described in Table 3 and using control scheme of multicarrier PWM technique as in Figure 2. The resulting switching signals are shown in Figure 9. And seven level voltage output is shown in Figure 10.



Figure 8. H-bridge with AMLI topology-3

D. Asymmetrical Multilevel inverter configuration-4:

Fig.11 shows configuration of single phase seven level asymmetrical multilevel inverter topology. Switch S5 is bidirectional switch. S5 with H-bridge switches S1 and S2 are used to generate positive three levels and S5 with S3 and S4 are used to generate negative three levels. Two different DC sources, four unidirectional switches and one bidirectional switch are used in this topology to generate total seven levels.

Output Voltage	S 1	S 2	S 3	S4	S 5	S 6	S 7	S 8
Vdc1+Vdc2	1	0	0	1	1	0	1	0
Vdc1	1	0	0	1	0	1	1	0
Vdc2	1	0	0	1	1	0	0	1
0	1	1	0	0	0	0	0	0
-Vdc2	0	1	1	0	1	0	0	1
-Vdc1	0	1	1	0	0	1	1	0
- (Vdc1+Vdc2)	0	1	1	0	1	0	1	0



Figure 9. Switching signals for H-bridge with AMLI topology-3

III. COMPARISON OF DIFFERENT TOPOLOGIES FOR SEVEN LEVEL

The comparison of the four different seven-level asymmetrical inverter topologies is described in this section in light of components used and photovoltaic application.

Switching sequence: To obtain different seven levels, all five switches need to operate in specific manner. It is described in following Table IV.



Figure 10. Output of H-bridge with AMLI topology-3



Figure 11. AMLI topology-4

TABLE IV. SWITCHING SEQUENCE OF BOOST AMLI TOPOLOGY-4

Output voltage	<i>S</i> ₁	S ₂	S ₃	S_4	S ₅
Vdc1+Vdc2= $3V_{DC}$	1	1	0	0	0
$Vdc2 = 2V_{DC}$	1	1	0	0	1
$Vdc1 = V_{DC}$	1	1	0	0	1
0	0	0	0	0	0
$-Vdc1 = -V_{DC}$	0	0	1	1	1
$-Vdc2 = -2V_{DC}$	0	0	1	1	1
$-(Vdc1 + Vdc2) = -3V_{DC}$	0	0	1	1	0

Conventional cascaded H-bridge topology (Figure 1) requires two single phase H-bridges. The numbers of levels in the output phase voltage can be varied by changing the value of source voltage of any H-bridge These source voltages are PV modules output voltage. The numbers of components required are large but have an advantage of identical modular structure. It is suitable for stand-alone PV system.

H-bridge with MLI topology-2 (Figure 5) requires only one H-bridge, ten switches, three sources and seven levels can be achieved. This topology has superior feature over conventional topology in terms of the modularity, control and reliability. Number of output voltage levels can be increased just by adding two switches and one DC source. If all three sources are having the same value it may be symmetrical MLI. H-bridge with MLI topology-3 (Figure 8) requires only one H-bridge, four switches, two sources and seven levels can be obtained. In this topology most important feature of the system is being convenient for expanding and increasing the number of output levels simply by adding cascaded level module. It can increase the number of output levels with a four switching devices.

AMLI topology 4(Figure 11) requires only one H-bridge, no of switches are 5, two sources and one bidirectional switch. This topology requires comparatively less components among all. So the cost of the overall structure is relatively less. This is the best choice for standalone photovoltaic system. [11]

The brief summary of comparative analysis of four different seven-level inverter topologies suitable for PV system is given in Table V based on number of components, number of dc sources etc. Based on this analysis AMLI topology 4 witch bidirectional switch is the best choice in PV applications. [12]

TABLE: 5 COMPARITIVE ANALYSIS	OF AMLI TOPOLOGIES FOR	7-LEVELS
-------------------------------	------------------------	----------

	AMLI configurati on 1	AMLI configurati on 2	AMLI configurati on 3	AMLI configurati on 4
No. of switches	8	10	8	5
Bidirection al switch	0	0	0	1
No. of different Sources	2	3	2	2
H-Bridge Cell	2	1	1	1

IV.CONCLUSION

In this paper different types of asymmetrical MLI topology for seven level output voltage are studied. A new topology with bidirectional switch asymmetrical seven level inverter with single DC input source is presented. This converter maintains the specified DC link voltage as well as level generator for the inverter operation. The H-bridge part synthesizes voltage levels polarities at the output. This topology is having less number of components, less cost and easy control scheme for PV system compared to conventional topologies. Thus this topology can be selected to develop a prototype.

V. REFERENCES

- [1] S.malathy, R.Ranaprabha, B.L.Mathur, "Asymetrical Multilevel Inverters for partially shaded PV system" ICCPT-2013.
- [2] S. B. Kjaer, J. K. Pedersen, and F. Blaabjerg, "A Review of Single-Phase Grid-Connected Inverters for Photovoltaic Modules", IEEE Trans. Industry Applications, vol. 41, no. 5, Sep./Oct. 2005.
- [3] S. Daher, J. Schmid, and F. L. M. Antunes, "Multilevel inverter topologies for stand-alone PV systems,"IEEE Trans. Ind. Electronics., vol. 55, no. 7, pp. 2703–2712, July 2008.
- [4] M.H.Rashid "Power electronics : Circuits, Devices and applications". Third edition, Prentice hall, 2004.
- [5] Bin Wu,"HIGH-POWER CONVERTERS AND AC DRIVES", A John Wiley & Sons, Inc., Publication IEEE

- [6] E. Najafi, and A. Halim Mohamed Yatim, "Design and Implementation of a New Multilevel Inverter Topology" IEEE Transactions On Industrial Electronics, Vol. 59, No. 11, November 2012.
- [7] Beser, S.Camur, B.Arifoglu, "Design and Application of a Novel Structure and Topology for Multilevel Inverter" International Symposium on Power Electronics, Electrical Drives, Automation and Motion, SPEEDAM 2008.
- [8] H. Hadgu, and A. Kirubakaran, "A Front End Boost Asymmetrical Multi Level Inverter With Single Input Source"IEEE Member Department of Electrical Engineering, 2012
- [9] A. Mokhberdoranand Ali Ajami, "Symmetric and Asymmetric Design and Implementation of New Cascaded Multilevel Inverter Topology", IEEE transactions on power electronics, vol. 29, NO. 12, Dec.2014
- [10] B.Sujanarko, M. Ashari "Advanced Carrier Based Pulse Width Modulation in Asymmetric Cascaded Multilevel Inverter" International Journal of Electrical & Computer Sciences IJECS-IJENS Vol: 10 No: 06
- [11] P. Sudha Rani, V.S.Prasadarao. K, Koppineni RNV Subbarao "Comparison of Symmetrical and Asymmetrical Multilevel Inverter Topologies with Reduced Number of Switches" International Conference on Smart Electric Grid (ISEG), 2014.
- [12] Hesamodin Abdoli, Amir Khorsandi,Bahman Eskandari,Javad Shokrollahi Moghan"A New Reduced Switch Multilevel Inverter for PV Applications" 11th Power Electronics, Drive Systems, and Technologies Conference (PEDSTC) 2020.
- [13] E.Desai "Comparative Analysis of Asymmetrical Multilevel Inverter Topologies" International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering ISO 3297:2007 Certified Vol. 4, Issue 8, August 2016.

Faculty Tracker using RFID and Raspberry PI

Amol Joglekar SVKM's Mithibai College of Arts, Chauhan Institute of Science & Amruthben Jivanlal College of Commerce and Economics Mumbai, India

Abstract—Communication plays a vital role in smooth conduct to any operation in any organization. Communication is a framework and that is why it should be very strong. Faculty tracker is a proposed technique to help students or fellow teachers to help in individual so that search time can be saved in hunting a person for work. The paper introduces a technique where one can use Radio Frequency Identification (RFID) Technology and raspberry pi. The technique helps in identifying the person's last location in the college or research center which will help other to track the person efficiently.

Keywords— RFID, tracker, Raspberry PI

I. INTRODUCTION

In today's era time and availability plays a vital role. Time management is one of the parameter which has its own advantages and it helps people to reduce stress by setting priorities. Management of time can be integrated with the help of technology so that one can utilize time more efficiently. In case of colleges faculties are busy in taking their lectures and practical which are on different rooms. They might have to visit different places like library, laboratories and so on. The faculty tracker might help students and fellow teachers to understand where the particular faculty in so that they can decide their meeting time based on the schedule of faculty. One can take the help of Radio Frequency Identification (RFID) technology based products which can help in tracking faculty. We can tag faculty with his name and the location where the faculty is present. By doing this one can achieve the efficient time management and more productive outcomes may come.

RFID and raspberry pi can be configured to sense the presence of a faculty with the help of transmitter and receiver. The faculty can have a ID card which can be scanned and then they can enter area where they want to take lecture or practical. The display panel in will immediately record the presence of person and update the record.

Raspberry Pi

The proposed work consists of applying interface of Raspberry Pi along with RFID. It is a single board computer which can be used to interface many IoT applications. People can program and design applications using open source language like Python. Pi is available in low cost, it has huge processing power and compact in design.

Raspberry PI or Arduino

In order to execute proposed work there could be an option of using Arduino but following are the points which describes the importance of Raspberry PI over Ardunio. The PI module is completely based on microprocessor which helps to perform different types of functions and not restricting us to keep only one task. It has 64 bit CPU structure compared to 8 bit or 16 bit microcontroller. We can consider PI as a fully functional computer which can perform various tasks. In order to perform multiple tasks PI is a good choice and it can be used for plying videos, mounting cameras. The complicated projects can be solved easily with the help of PI. It has in built Bluetooth and wifi on board which allows easily configuration of hardware devices.

Advantages of Raspberry PI over Ardunio

Powerful : Raspberry PI is more powerful in capability of doing multiple tasks at a time similar to computer. The complex systems like power plants, robotics, software defined networking, application of web server in big data etc. can be controlled and executed without any issues. It has good speed in executing tasks. All the different types of ports are easily available which included USB ports, HDMI port, Ethernet port and hence no need of any other external hardware. All the hardware can be programmed or communicated with the help of SSH or FTP.

Networking: PI module has inbuilt support of Ethernet so that one can connect directly with the network. All the external entities can be easily configured with PI module and can be plugged with the help of USB wifi dongles. Like Ardunio we do not require any shields for such type of configuration and hence it saves time and money.

Knowledge of Electronics: In order to configure Ardunio one needs to know all electronic components along with the knowledge of embedded system is important. But in case of PI the programming is possible with Python which allows easy configuration with hardware devices. It has variety of packages which can be used for interfacing hardware with software. It can be simply install on Linux OS which is the basic OS of PI.

II. RELATED WORK

It is important to critically review and analyze some work done by many authors which can help in our research. The analysis of papers will help to reduce errors and to overcome the drawback of previous work and hence time can be managed efficiently

Narmadha, V.[1], al developed a framework with the help of robots. The attendance is taken with the help of robotized

ID. There is a provision of calculating fine for late entry. With the integration of embedded system one can control the fan and lights inside the room. With the inclusion of robot the cost of the model might be high.

Aman Jobanputra, Shubham Jain and Kruttika Choithani[2] proposed an innovative way to promote MATLAB programming and framework that can be used by all people for various purposes. The faculty will take the photo of the entire class and it will be analyze by MATLAB program to recognize faces. Authors had used support vector machine for performing classification. Although MATLAB is considered as a good tool for image processing but python can be the language for doing the same task with a good speed and accuracy.

Aziza Ahmedi and Dr Suvarna Nandyal [4] proposed a model for calculating and marking attendance of students using face detection system. Authors claimed that instead of taking manual attendance this method would save time and hence reduce the errors which may happen during manual entry. They claimed that the system can work with the existing infrastructure of computer with a camera but this may not capture all the faces so additional setup is needed to implement this.

In 2015, Shota Noguchi, Michitoshi Niibori, Erjing Zhou, Masaru Kamada et al. [5], have recommended the participation framework, which can measure the performance with the help of Bluetooth. They had created android based application which can be accessed with the help of cell phone. Usage of Bluetooth might have slow down the performance and range might be another issue.

M. Rajeev Kumar, S. MuthuVijaya Pandian, Rangarajan P. Vinothkumar and J. Velmurugan[6] proposed a structure of using a tag with the help of RFID. With the help of scanner one can scan the RFID tags for entering attendance into the system along with the live location of a person. Authors claimed that reliability of model is very good as it has a parameter of keeping track of live location. Also if the person is present there is a provision of sending message to authorities indicate the authentication of person being present. They also claimed that security of system is increased due to RFID and TCP model.

Kuriakose & Vermaak [7] developed an application for attendance management using a high frequency (HF) RFID which is used to process attendance. The application was developed in JAVA which can automate the management of attendance process.

In 2016, Siyu Yang, You Song, Honglei Ren, Xinxing Huang [8] proposed a technique of taking attendance of students using mobile devices and voiceprint biometrics. The research was done by taking sample data of students and generating reports based on the algorithm designed. As the system needs to work on voice based prints it might need preprocessing to filter out the unwanted noise which will results into more complex calculations

III. RESEARCH METHODOLOGY

In order to build a model the research paper proposes following function block module which consists of hardware and configuration with raspberry PI.

Proposed Block Diagram



Figure 1: Block Diagram

The above diagram shows a proposed model of faculty tracker using Raspberry Pi can be a powerful tool to help colleges and institutions to keep track of their faculty members' locations and movements within the campus. The following components are used for performing different activities.

Raspberry Pi: This serves as the main control unit for the system, and it interacts with the various components to manage the data collection and transmission process.

Sensor Module 1: This module is used to detect the presence of a faculty member in a particular room or area. This could be a motion sensor or other type of sensor.

Module 2: This module is an RFID reader that is used to read the unique ID of an RFID tag attached to a faculty member's ID card.

Faculty Database: This is a database that stores information about faculty members, such as their names, IDs, and other relevant information.

Module 3: This module is responsible for sending data from the Raspberry Pi to the cloud using an API.

Cloud: This is a remote server or service that stores the data collected by the system. It can also be used to run data analytics and generate reports on the system's performance and usage.

Proposed Flow of System

1. When a faculty member enters a room or area, Sensor Module 1 detects their presence and sends a signal to the Raspberry Pi.

2. The Raspberry Pi then sends a request to Module 2 to read the faculty member's RFID tag.

3.Once the RFID tag is read, the Raspberry Pi sends the data to the Faculty Database to check whether the RFID tag belongs to a registered faculty member.

4.If the RFID tag belongs to a registered faculty member, the Raspberry Pi sends the data to Module 3, which sends the data to the cloud for storage and analysis.

5. The data stored in the cloud can then be used to generate reports on the system's usage and performance, which can be used to optimize the system and improve its efficiency.



Figure 2: Functional Block Diagram

The proposed system will use RFID which consists of three main components antenna. transponder and trans receiver. Each faculty would be provided with an ID card - the battery-powered transponder tag which holds a Unique Identification number of its own. Antennas would be positioned at prime locations like conference rooms, libraries, entrances, exits, classrooms etc. all while being powered by the RFID reader and transmitting Radio Frequency waves. Whenever faculty wants to enter into classroom or place he needs to scan the card on the panel provided at the entry level. As soon as card is read the antenna will send signals to raspberry PI module which will be further connected to webserver. The web server is connected to database so that data can be stored in the respective format. There will be a display module available at each department where the details of faculty can be broadcasted. As soon as faculty changes the place data will be updated accordingly. Application which will be installed at student's mobile phone will get notification immediately that a particular faculty may be available at a particular location from this time to this time. There will be a display panel available outside all the departments. So when a particular faculty is taking a lecture say in a class on 2nd floor then the panel will show that faculty is available on 2^{nd} floor and with room number. This will help students to know where faculty is and they will not enter into department and disturb other faculties.

Details of Functional Modules:

RFID tags: RFID (radio frequency identification) is nothing but an alternative method of communicating external entities with the help of unguided media using electromagnetic or electrostatic coupling in the radio frequency portion of the electromagnetic spectrum to uniquely identify any entity like object, animal or person. The RDID comes with three main sections like antenna, transceiver and transponder. With the help of an antenna the communication is formed and transmission is via signals.

RFID reader : It is one of the important module used in extracting information from RFID tag. The RFID reader comes with a IC along with a tiny antenna tag. The antenna converts power into radio waves which can be used for a medium between process and devices.

Web server : A web server is nothing but a node which is capable of executing websites over internet. They have specialized programs which allows to analyze web page and circulate among internet. The main purpose of web server is to collect, process and provide information to web pages. The web server always talk to web browser with the help of protocols. The main protocol which is widely used is HTTP. As soon as user types any URL the web browser extracts the IP address your domain via DNS so that it can direct to web browser. Once the connection is established one can send request with the help of HTTP. Once the request is received the response is submitted if no error comes implies successful transmission of data. The external data servers are needed in order to manage exchanged of data between different types of devices. It is mandatory for all nodes to host websites to have web server software.

Database server : It is a system consisting of database software providing database services. It is one of the vital component in client-server domain. The database server consists of hardware and software which helps to run database. The model which executes on software side is called backend application. The hardware side of structure is used for storage and retrieval. The database needs large amount of memory so that high quality of data can be processed in no time. The database servers need to manage DBMS along with RDBMS offering central data management and security for access and permission for network users.

Proposed Technical Flow

1. The faculty member will carry an RFID card with them at all times.

2. When they enter a building or a specific area, they will swipe their RFID card on the RFID reader.

3. The system will read the RFID card and use the GPS module to determine the faculty member's location.

4. The LCD screen will display the faculty member's name and location in real-time.

5. The system will store the location data in an SQLite database for future reference.

IV. IMPLEMENTATION

The study proposes the following definition

Definition : Let F represents faculty and α be the number of faculty in an organization. Then,

 $\forall Fi \mid i=1 \text{ to } \alpha \exists K_i$, where K is a set of RFID tags.

Lemma 1 : If faculty Fi has a unique RFID tag K_i then faculty F_i cannot have another RFID tag K_j where $i \neq j$.

Definition: Let M represents the message which needs to be broadcasted based on the faculty F_i then, $\forall Fi \mid i=1$ to $\alpha \exists M_i$, where M is a set of messages; If M_n be the initial message assigned to F_i based on location n and later location of F_i is changed to x then update M_n to M_x where $n \neq x$

The required setup for Raspberry PI module

In order to perform required setup we need Linux based OS. Once the required materials are available for performing the setup we can download raspberry PI from the website as it is free and easy to download we can put the setup file in our drive for usage. Perform initialization of SD card so that we can install OS which will help us in booting and marking PI ready for usage.

Perform copying of PI image onto card and initialize the setup using Linux Commands. Make sure you have done setting with respect to date and time, expansion of file system, permission setting for enabling camera and other necessary actions. Run package updates and you are ready to work with PI module.

The study proposes following steps:

- 1. Display units will be installed in all the main functional units of college like departments, labs etc.
- 2. The smart ID card will be punched or scanned near the entry of lab or classroom where faculty wants to enter.
- 3. Once the card is punched the information will be received by Raspberry Pi module.
- 4. Every ID card will have unique number which needs to be registered for every faculty.
- 5. Pi module will verify the details and check the records of faculty.
- 6. Once the faculty is found record will be extracted.
- 7. It will also merge the information with date and time along with room number on the floor.
- 8. The details of faculty like name along with date and time can be displayed on the broadcasting display units to indicate that the faculty is now available on a particular floor and room number.
- 9. For each Class C_j there will be only one faculty F_j so there has to be 1:1 correspondence.
- 10. For each Lab L_i there can be more than one Faculties so accordingly the entries will be updated.



Figure 3: Projected display boards along with necessary details

The above figure shows the projected display units which can be displayed in the respective departments. Here in the diagram there are three departments with the number 1,2 and 3. These departments will have their own small rooms where the respective faculties can sit. The display panel will be installed at the entry level of every department which will display records belonging to that department only. As person XYZ belongs to department 1so that information will be available with only 1st department and so on.

Advantage of doing this is if any student seeking help of a faculty from department 1 and if student is looking for a particular faculty say XYZ by looking at display panel he will immediately notice that person is not available so student may wait outside or he will not enter in department and hence there will not be any disturbance.



Figure 4: Mobile Application of Faculty tracker

The above diagram shows the software module that one can observe on the respective mobile screen. Each student and other members will be provided with unique user id and password. They can install this software on mobile or tabs. After this, the users could search for an individual's last location within the premises of the institution. The user would be required to type the name of the individual associated with the same institution in the search bar to access the last location, timestamp, designation and ID picture (if any) of the searched individual. Similarly, one can record ID cards for visitors of an institution to monitor their movements. Restrictions on a particular set of antennas could be imposed to notify the authorities in case of an intrusion into a forbidden zone. Attendance could be recorded and maintained easily without the need to manually scan ID cards. Supervisors/Heads-ofDepartments could monitor the productivity rate of each employee by comparing the total time spent within the institution's premises and the work result produced. Employees could easily locate each other and their supervisors even when they may be out of reach. Visitor movements could be monitored. Intrusion into a forbidden zone would notify the authorities. Attendance of employees could be recorded using the time of entry and exit. Hassle-free detection of Employee ID. No manual, closerange scanning would be required. Software would be compatible with PCs, tablets and mobile phones.

V. CONCLUSION

Proposed framework is the integration of technologies so that one can track faculties in no time. This would encourage the spirit of collaboration by bringing people of an institution together. It is student friendly as their waiting time is reduced. The output panel will notify them where faculty is and hence lot of time can be saved. After implementing the system accuracy can be tested. The proposed model would help locate them, thereby saving time and mitigating any inconvenience, especially in situations that require immediate attention. This could have potentially life-saving applications in hospitals and research centers. Doctors could be located in time, possibly allowing them to save patients in critical conditions.

REFERENCES

- V. Narmadha, K. Aparna, J. Kamaleshwari and K. Tharny, "Integrated Power Management with Automated Attendance System", 2019 3rd International Conference on Computing and Communications Technologies (ICCCT).
- [2] Aman Jobanputra, Shubham Jain and Kruttika Choithani, "Smart Attendance Management System", International Journal of Computer Science Trends and Technology (IJCST), vol. 4, no. 5, pp. 97, Sep -Oct 2016.
- [3] Dr. M.Sundararajan, M. Mahalakshmi "Tracking the Student's Performance in Web-Based Education Using Scrum Methodology," 2015 International Conference on Computing and Communications Technologies, 978-1-4799-7623-2/15 (2015).
- [4] Dr. Suvarna Nandyal, "An Automatic Attendance System Using Image Processing," The International Journal of Engineering and Science, ISSN: 2319 – 1813 ISSN (2015).
- [5] Shota Noguchi "Student Attendance Management System with Bluetooth Low Energy Beacon", 2015 International Conference on Network based information system, 10.1109/NBiS.2015.109 (2015).
- [6] M. Rajeev Kumar, S. MuthuVijaya Pandian, Rangarajan P. Vinothkumar and J. Velmurugan Smart, "Attendance And Live Location Mapping Using UHF RFID", International Journal of Civil

Engineering and Technology (IJCIET), vol. 8, no. 10, pp. 325-334, October 2017.

- [7] R.B. Kuriakose and H.J. Vermaak, "Developing a Java based RFID application to automate student attendance monitoring", Pattern Recognition Association of South Africa and Robotics and Mechatronics International Conference (PRASA-RobMech),2015 ISSBN:978-1-4673-7450-7/15
- [8] Xinxing Huang, "An Automated Student Attendance Tracking System Based on Voiceprint and Location," 11th International Conference on Computer Science & Education, 978-1-5090-2218-2/16 (2016)

Invariant Point Results in Cone Metric Space for Rational Expression

Sneha Khandait Department of Engineering Sciences and Humanities Thakur College of Enginnering & Technology Mumbai, India sneha.khandait@tcetmumbai.in Sonal Gaikwad Department of Engineering Sciences and Humanities Thakur College of Engineering & Technology Mumbai , India sonal.gaikwad@tcetmumbai.in Brijesh Gupta Department of Engineering Sciences and Humanities Thakur College Of Engineering & Technogy Mumbai, India brijesh.gupta@tcetmumbai.in

Abstract— In this paper, discussed the existence and uniqueness of a invariant point in a soft cone metric space for rational expression. The obtained results are very useful in mechanical engineering and digital electronics. The result can be generalized in specified spaces as soft Banach spaces, soft metric spaces for rational contraction. The established results are in generalized form.

Keywords: soft set, soft cone metric space, communal fixed-point theorem.

I. INTRODUCTION

In metric spaces, the fixed point theorems are playing imperative role to solve many problems in mathematical analysis. Fixed point theory applicable in solving differential as well as integral equations, which are useful in engineering field and other area. About cone metric space one can refer [4,18]. The uncertainty can be explained by theory of probability, fuzzy set. Molodstov [13] introduced the concept of soft set theory as new mathematical tool for dealing with unpredictability. Introduced the notion of soft set theory in [15-17] and brief for soft metric space, soft cone metric space can be studied in [1-3,5-12,14]. The detail about Soft cone metric space, soft cone can be studied in [11,14]. In this paper, we established some fixed point theorems in soft cone metric spaces for rational expression

II. DEFINITIONS

we recall some definitions which are used in the sequel.

A. Definition 2.1: Let X be a non-empty set and let

 $T: X \to X$ be a mapping on X to itself. A point $x \in X$ is said to be a fixed point of T if $T_x = x$ or T(x) = x

B. Definition 2.2.: Let
$$(X, d)$$
 be a metric space and let

 $T: X \to X$ be any mapping. The mapping T is said to satisfy a Lipschitz condition with Lipschitz constant c if

$$d(T_x, T_y) \le c \ d(x, y), x, y \in X$$

If 0 < c < 1, then *T* is called contraction mapping.

C. Banach fixed point theorem 2.3:

Let T be a contraction mapping defined on complete metric space X. Then T has a unique fixed point.

D. Definition 2.4: [13] A pair (F, E) or F_E is called a soft set over X, iff F is mapping from E into the set of all subsets of X, i.e. $F : E \to P(X)$.

E. Definition 2.5: [6] A mapping $d: SP(\tilde{X}) \times SP(\tilde{X}) \rightarrow$

 $\mathbb{R}(E)^*$, is said to be a soft metric on the soft set \tilde{X} if d satisfies the following conditions:

(m1) $d(\tilde{x}, \tilde{y}) \cong \tilde{0}$, for all, $\tilde{x}, \tilde{y} \in \tilde{X}$. (m2) $d(\tilde{x}, \tilde{y}) = \tilde{0}$ if and only if $\tilde{x} = \tilde{y}$. (m3) $d(\tilde{x}, \tilde{y}) = d(\tilde{y}, \tilde{x})$ for all $\tilde{x}, \tilde{y} \in \tilde{X}$.

(m4) $d(\tilde{x}, \tilde{y}) \cong d(\tilde{x}, \tilde{z}) + d(\tilde{z}, \tilde{y})$ for all $\tilde{x}, \tilde{y}, \tilde{z} \in \tilde{X}$.

The soft set \tilde{X} with a soft metric d on \tilde{X} is said to be a soft metric space and denoted by (\tilde{X}, d, E) or (\tilde{X}, d) . (m1), (m2), (m3), (m4) are said to be soft metric axioms.

F. Definition 2.6: [8,9]

(a) A sequence $\{\widetilde{x_n}\}$ of soft elements in a soft normed linear space $(\widetilde{X}, \|.\|, \mathbb{A})$ is said to be convergent and converges to a soft element \widetilde{x} if $\|\widetilde{x_n} - \widetilde{x}\| \to 0$ as $n \to \infty$. This means for every $\widetilde{\epsilon} > \widetilde{0}$, chosen arbitrarily, \exists a natural number $N=N(\widetilde{\epsilon})$ such that $\widetilde{0} \leq \|\widetilde{x_n} - \widetilde{x}\| < \widetilde{\epsilon}$ whenever n > N i.e. $n > N \Rightarrow \widetilde{x_n} \in B(\widetilde{x}, \widetilde{\epsilon})$, (where $B(\widetilde{x}, \widetilde{\epsilon})$ is an open ball with centre \widetilde{x} and radius $\widetilde{\epsilon}$).

(b) A sequence $\{\widetilde{x_n}\}$ of soft elements in a soft normed linear space $(\widetilde{X}, \|.\|, \mathbb{A})$ is said to be a Cauchy sequence in \widetilde{X} if corresponding to every $\widetilde{\epsilon} > \widetilde{0} \exists$ a natural number $N=N(\widetilde{\epsilon})$ such that $\|\widetilde{x_n} - \widetilde{x_m}\| \leq \widetilde{\epsilon}, \forall m, n > N$ i.e. $\|\widetilde{x_n} - \widetilde{x_m}\| \to \widetilde{0}$ as $n, m \to \infty$.

III. SOFT CONE METRIC SPACES

A. Definition 2.7: [14]

(a) Let (*Ẽ*, ||.||, A) be a soft real Banach space and (*Q*, A) ∈
S(*Ẽ*) be a soft subset of *Ẽ*. Then (*Q*, A) is called a soft cone iff

(1) (Q, \mathbb{A}) is closed, $(Q, \mathbb{A}) \neq \Phi$ and $(Q, \mathbb{A}) \neq SS(\{\Theta\})$,

Invariant Point Results in Cone Metric space for Rational Expression

(2) \tilde{a} , $\tilde{b} \in \mathbf{R}(\mathbb{A})^*$, \tilde{x} , $\tilde{y} \in (\mathbb{Q},\mathbb{A}) \implies \tilde{a} \tilde{x} + \tilde{b} \tilde{y} \in$

(Q,**A**),

(3) $\tilde{x} \in (Q, \mathbb{A})$ and $\tilde{x} \in (Q, \mathbb{A})$ implies $\tilde{x} = \Theta$.

Given a soft cone $(Q, \mathbb{A}) \in S(\tilde{E})$, we define a soft partial ordering \leq with respect to (Q,A) by $\tilde{x} \leq \tilde{y}$ iff $\tilde{y} - \tilde{x} \in$ (Q,A). We write $\tilde{x} \approx \tilde{y}$ to indicate that $\tilde{x} \approx \tilde{y}$ but $\tilde{x} \neq \tilde{y}$, while $\tilde{x} \ll \tilde{y}$ will stand for $\tilde{y} - \tilde{x} \in Int(Q, \mathbb{A})$, $Int(Q, \mathbb{A})$ denotes the interior of (Q,A). The cone Q is known to be normal.

If there is constant k > 0 such that for $\tilde{x}, \tilde{y} \in \tilde{E}, \Theta \cong \tilde{x} \cong \tilde{y}$ $\Rightarrow \parallel \tilde{x} \parallel \tilde{\leq} k \parallel \tilde{y} \parallel$.

B. Definition 2.8: [14] Let X be a non-empty set and \tilde{X} be

absolute soft set. A mapping $d : SE(\tilde{X}) \times SE(\tilde{X}) \rightarrow SE(\tilde{X})$ is

said to be a soft cone metric on \tilde{X} if d satisfies the following axioms:

i) $\Theta \cong Q(\tilde{x}, \tilde{y}), \forall \tilde{x}, \tilde{y} \in \tilde{X}$ and $Q(\tilde{x}, \tilde{y}) = \Theta$ iff $\tilde{x} =$

ŷ.

<

ii) $Q(\tilde{x}, \tilde{y}) = Q(\tilde{y}, \tilde{x}), \forall \tilde{x}, \tilde{y} \in \tilde{X}$

iii) $Q(\tilde{x}, \tilde{y}) \cong Q(\tilde{x}, \tilde{z}) + Q(\tilde{z}, \tilde{y}), \forall \tilde{x}, \tilde{y}, \tilde{z} \in \tilde{X}$

So, Then, the soft set \tilde{X} with a soft cone metric d on \tilde{X} is called a soft cone metric space and is denoted by $(\tilde{X}, Q, \mathbb{A})$. Then Q is called cone metric on \tilde{X} and (\tilde{X}, Q) is called soft cone metric space.

IV. MAIN RESULTS:

A. Theorem 3.1[18,19]: Let (\tilde{X}, d) be metric space with

complete cone has (Q, \mathbb{A}) is regular through r as regular

constant. Let the map $A: \tilde{X} \to \tilde{X}$ satisfies :

 $d(A\tilde{x}, A\tilde{y}) \le \alpha \ d(\tilde{x}, \tilde{y}) + \beta \left[d(\tilde{x}, A\tilde{x}) + d(\tilde{y}, A\tilde{y}) + \gamma \left[d(\tilde{x}, A\tilde{y}) + d(\tilde{y}, A\tilde{x}) \right] \right]$ $+ e \max\{d(\tilde{x}, A\tilde{x}) + d(\tilde{y}, A\tilde{y})\} \\ + \delta \left[\frac{d(\tilde{x}, A\tilde{x}) + d(\tilde{y}, A\tilde{y}) + d(\tilde{x}, A\tilde{y}) + d(\tilde{y}, A\tilde{x})}{1 + d(\tilde{x}, A\tilde{x}) d(\tilde{y}, A\tilde{y}) d(\tilde{x}, A\tilde{y}) d(\tilde{y}, A\tilde{y})}\right]$

[3.1] For every $\tilde{x}, \tilde{y} \in \tilde{X}$ and $\alpha, \beta, \gamma, e, \delta \ge 0$ such that $0 \le (\beta + \gamma + 2\delta) + (\frac{\alpha + e}{2}) < \frac{1}{2}$. Then A has communal invariant point in \tilde{X} .

Proof: For any chance $\widetilde{x_0}$ in \widetilde{X} , we have to choose

$$\widetilde{x_1}, \widetilde{x_2} \in X$$
:
 $A\widetilde{x_0} = \widetilde{x_1}$ and $A\widetilde{x_1} = \widetilde{x_2}$

Also, in general we can define a classification of elements in X we have

 $\widetilde{x_{2n+1}} = A\widetilde{x_{2n}} \text{ and } \widetilde{x_{2n+2}} = A\widetilde{x_{2n+1}}$ Now, $d(\widetilde{x_{2n+1}}, \widetilde{x_{2n+2}}) = d(A\widetilde{x_{2n}}, A\widetilde{x_{2n+1}})$ From [2.1.1] $d(A\widetilde{x_{2n}}, A\widetilde{x_{2n+1}})$

$$\leq \alpha \, d(\widetilde{x_{2n}}, \widetilde{x_{2n+1}}) + \beta \left[d(\widetilde{x_{2n}}, A\widetilde{x_{2n}}) + d(\widetilde{x_{2n+1}}, A\widetilde{x_{2n+1}}) \right] \\ + \gamma \left[d(\widetilde{x_{2n}}, A\widetilde{x_{2n+1}}) + d(\widetilde{x_{2n+1}}, A\widetilde{x_{2n}}) \right] \\ + e \max\{ d(\widetilde{x_{2n}}, A\widetilde{x_{2n}}), d(\widetilde{x_{2n+1}}, A\widetilde{x_{2n+1}}) \}$$

 $\delta^{\left[d(\widetilde{x_{2n}}A\widetilde{x_{2n}})+d(\widetilde{x_{2n+1}}A\widetilde{x_{2n+1}})+d(\widetilde{x_{2n}}A\widetilde{x_{2n+1}})+d(\widetilde{x_{2n+1}}A\widetilde{x_{2n}})\right]}$ $1+d(\widetilde{x_{2n}}A\widetilde{x_{2n}})d(\widetilde{x_{2n+1}}A\widetilde{x_{2n+1}})d(\widetilde{x_{2n}}A\widetilde{x_{2n+1}})d(\widetilde{x_{2n+1}}A\widetilde{x_{2n}})$ $d(\widetilde{x_{2n+1}}, \widetilde{x_{2n+2}})$ $\leq \alpha \ d(\widetilde{x_{2n}}, \widetilde{x_{2n+1}}) + \beta \ [d(\widetilde{x_{2n}}, \widetilde{x_{2n+1}}) + \beta]$ $d(\widetilde{x_{2n+1}}, \widetilde{x_{2n+2}})] + \gamma \left[d(\widetilde{x_{2n}}, \widetilde{x_{2n+2}}) \right] + e \max\{d(\widetilde{x_{2n}}, \widetilde{x_{2n+1}}), d(\widetilde{x_{2n+1}}, \widetilde{x_{2n+2}})\}$

 $\delta^{[d(\widetilde{x_{2n}},\widetilde{x_{2n+1}})+d(\widetilde{x_{2n+1}},\widetilde{x_{2n+2}})+d(\widetilde{x_{2n}},\widetilde{x_{2n+2}})+d(\widetilde{x_{2n+1}},\widetilde{x_{2n+1}})]}$ $1+d(\widetilde{x_{2n}},\widetilde{x_{2n+1}})d(\widetilde{x_{2n+1}},\widetilde{x_{2n+2}})d(\widetilde{x_{2n}},\widetilde{x_{2n+2}})d(\widetilde{x_{2n+1}},\widetilde{x_{2n+1}})$

Consider case I:

Let
$$d(\widehat{x_{2n}}, \widehat{x_{2n+1}}) > d(\widehat{x_{2n+1}}, \widehat{x_{2n+2}})$$

So, max { $d(\widehat{x_{2n}}, \widehat{x_{2n+1}}), d(\widehat{x_{2n+1}}, \widehat{x_{2n+2}})$ } =
 $d(\widehat{x_{2n}}, \widehat{x_{2n+1}})$
 $d(\widehat{x_{2n+1}}, \widehat{x_{2n+2}})$
 $\leq \alpha \ d(\widehat{x_{2n}}, \widehat{x_{2n+1}}) + \beta \ [d(\widehat{x_{2n}}, \widehat{x_{2n+1}}) + d(\widehat{x_{2n+1}}, \widehat{x_{2n+2}})]$
 $+ \gamma \ [d(\widehat{x_{2n}}, \widehat{x_{2n+1}}) + 2\delta$
 $[d(\widehat{x_{2n}}, \widehat{x_{2n+1}}) + d(\widehat{x_{2n+1}}, \widehat{x_{2n+2}})]$

 $\leq (\alpha + \beta + \gamma + e + 2\delta) d(\widetilde{x_{2n}}, \widetilde{x_{2n+1}}) + (\beta + \gamma + e)$ 2δ) $d(\widetilde{x_{2n+1}}, \widetilde{x_{2n+2}})$

$$\begin{array}{l} (1 - \beta - \gamma - 2\delta) \ d(\widetilde{x_{2n+1}}, \widetilde{x_{2n+2}}) \\ \leq (\alpha + \beta + \gamma + e + 2\delta) \ d(\widetilde{x_{2n}}, \widetilde{x_{2n+1}}) \\ d(\widetilde{x_{2n+1}}, \widetilde{x_{2n+2}}) \leq \frac{(\alpha + \beta + \gamma + e + 2\delta)}{(1 - \beta - \gamma - 2\delta)} \\ d(\widetilde{x_{2n}}, \widetilde{x_{2n+1}}) \end{array}$$

Simillarly we can show that

$$d(\widetilde{x_{2n}}, \widetilde{x_{2n+1}}) \leq \frac{(\alpha + \beta + \gamma + e + 2\delta)}{(1 - \beta - \gamma - 2\delta)}$$

$$d(\widetilde{x_{2n-1}}, \widetilde{x_{2n}})$$

In general we can write,
)]

$$d(\widetilde{x_{2n+1}}, \widetilde{x_{2n+2}}) = \left[\frac{(\alpha + \beta + \gamma + e + 2\delta)}{(1 - \beta - \gamma - 2\delta)}\right]^{2n+1}$$

$$d(\widetilde{x_0}, \widetilde{x_1})$$

On taking $\frac{(\alpha + \beta + \gamma + e + 2\delta)}{(1 - \beta - \gamma - 2\delta)} = \phi_1$

$$d(\widetilde{x_{2n+1}}, \widetilde{x_{2n+2}}) \leq \phi_1^{2n+1} d(\widetilde{x_0}, \widetilde{x_1})$$

Case II:

$$Let d(\widetilde{x_{2n+1}}, \widetilde{x_{2n+2}}) > d(\widetilde{x_{2n}}, \widetilde{x_{2n+1}})$$

So, max{ $d(\widetilde{x_{2n}}, \widetilde{x_{2n+1}}), d(\widetilde{x_{2n+1}}, \widetilde{x_{2n+2}})$ } =
 $d(\widetilde{x_{2n+1}}, \widetilde{x_{2n+2}})$
 $d(\widetilde{x_{2n+1}}, \widetilde{x_{2n+2}})$
 $\leq \alpha d(\widetilde{x_{2n}}, \widetilde{x_{2n+1}}) + \beta [d(\widetilde{x_{2n}}, \widetilde{x_{2n+1}}) + d(\widetilde{x_{2n+1}}, \widetilde{x_{2n+2}})]$
 $+ \gamma [d(\widetilde{x_{2n}}, \widetilde{x_{2n+2}})]$
 $+ e d(\widetilde{x_{2n+1}}, \widetilde{x_{2n+2}}) + 2\delta$
 $[d(\widetilde{x_{2n}}, \widetilde{x_{2n+1}}) + d(\widetilde{x_{2n+1}}, \widetilde{x_{2n+2}})]$

 $\leq (\alpha + \beta + \gamma + 2\delta) d(\widetilde{x_{2n}}, \widetilde{x_{2n+1}}) + (\beta + \gamma + e + 2\delta) d(\widetilde{x_{2n+1}}, \widetilde{x_{2n+2}})$

 $(1-\beta-\gamma-e-2\delta) d(\widetilde{x_{2n+1}},\widetilde{x_{2n+2}})$ $\leq (\alpha + \beta + \gamma + 2\delta) d(\widetilde{x_{2n}}, \widetilde{x_{2n+1}})$

$$d(\widetilde{x_{2n+1}}, \widetilde{x_{2n+2}}) \le \frac{(\alpha + \beta + \gamma + 2\delta)}{(1 - \beta - \gamma - e - 2\delta)}$$

 $d(\widetilde{x_{2n}}, \widetilde{x_{2n+1}})$ Simillarahy wa ass

$$d(\widetilde{x_{2n}}, \widetilde{x_{2n+1}}) \leq \frac{(\alpha + \beta + \gamma + 2\delta)}{(1 - \beta - \gamma - e - 2\delta)}$$

 $d(\widetilde{x_{2n-1}}, \widetilde{x_{2n}})$ In general we can write,

$$d(\widetilde{x_{2n+1}}, \widetilde{x_{2n+2}}) = \left[\frac{(\alpha+\beta+\gamma+2\delta)}{(1-\beta-\gamma-\epsilon-2\delta)}\right]^{2n+1}$$

 $d(\widetilde{x_{0}},\widetilde{x_{1}})$ On taking $\frac{(\alpha+\beta+\gamma+2\delta)}{(1-\beta-\gamma-e-2\delta)} = \phi_{2}$ $d(\widetilde{x_{2n+1}},\widetilde{x_{2n+2}}) \leq \phi_{2}^{2n+1} d(\widetilde{x_{0}},\widetilde{x_{1}})$ Let, $\phi = \max \{\phi_{1}, \phi_{2}\}$ For $n \leq m$ we have $d(\widetilde{x_{2n}},\widetilde{x_{2m}}) \leq d(\widetilde{x_{2n}},\widetilde{x_{2n+1}}) + d(\widetilde{x_{2n+1}},\widetilde{x_{2n+2}}) + \dots + d(\widetilde{x_{2m-1}},\widetilde{x_{2m}})$ $\leq (\phi^{n} + \phi^{n+1} + \phi^{n+2} + \dots + \phi^{m}) d(\widetilde{x_{0}},\widetilde{x_{1}})$

$$d(\widetilde{x_{2n}}, \widetilde{x_{2m}}) \leq \frac{\phi^n}{1-\phi} d(\widetilde{x_0}, \widetilde{x_1})$$

$$\| d(\widetilde{x_{2n}}, \widetilde{x_{2m}}) \| \leq \frac{\phi^n}{1-\phi} r \| d(\widetilde{x_0}, \widetilde{x_1}) \| \text{ as } n \to \infty$$

 $\lim_{n\to\infty} \| d(\dot{x}_{2n}, \dot{x}_{2m}) \| \to 0$

Hence $\{\widetilde{x_n}\}$ is Cauchy classification in which \widetilde{v} touches to \widetilde{X} .

Hence a metric (\tilde{X},d) space is complete soft cone. Therefore for $\widetilde{x_n} \to \tilde{v}$ as $n \to \infty$, $A\widetilde{x_n} \to \tilde{v}$ as $n \to \infty$. We have \tilde{v} is an invariant point of A in \tilde{X} .

Uniqueness[18,19]: Let us suppose that there is another invariant point of A, i.e. \tilde{v} in \tilde{X} which is distinct from \tilde{v} , then

$$\begin{aligned} A\widetilde{w} &= \widetilde{w} \text{ and } A\widetilde{v} = \widetilde{v} \\ d(\widetilde{v}, \widetilde{w}) &= d(A\widetilde{v}, A\widetilde{w}) \\ & \text{From [3.1]} \\ d(A\widetilde{v}, A\widetilde{w}) \leq \\ \alpha \ d(\widetilde{v}, \widetilde{w}) + \beta \left[d(\widetilde{v}, A\widetilde{v}) + d(\widetilde{w}, A\widetilde{w}) \right] + \gamma \left[d(\widetilde{v}, A\widetilde{w}) + d(\widetilde{w}, A\widetilde{v}) \right] \end{aligned}$$

$$e \max\{d(\tilde{v}, A\tilde{v}), d(\tilde{w}, A\tilde{w})\} + \delta \\ \left[\frac{d(\tilde{v}, A\tilde{v}) + d(\tilde{w}, A\tilde{w}) + d(\tilde{v}, A\tilde{w}) + d(\tilde{w}, A\tilde{v})}{1 + d(\tilde{v}, A\tilde{v}) d(\tilde{w}, A\tilde{w}) d(\tilde{v}, A\tilde{w}) d(\tilde{w}, A\tilde{v})}\right]$$

_

$$\leq \alpha \, d(\tilde{v}, \tilde{w}) + \beta \, .0 + 2\gamma \, d(\tilde{v}, \tilde{w}) + 2 \, \delta \, d(\tilde{v}, \tilde{w}) \leq \alpha \, d(\tilde{v}, \tilde{w}) + 2\gamma \, d(\tilde{v}, \tilde{w}) + 2 \, \delta \, d(\tilde{v}, \tilde{w}) d(A\tilde{v}, A\tilde{w}) \leq (\alpha + 2\gamma + 2\delta) \, d(\tilde{v}, \tilde{w})$$

Which gives a contradiction. Thus \tilde{v} is an communal fixed point of A in \tilde{X} .

V. CONCLUSION

Hence we proved uniqueness of fixed point for weakly contractive mapping which is defined in soft cone metric spaces for rational expression. The obtained results is generalized form of some previous well-known results from soft cone metric space.

REFERENCES

- M. Abbas, G. Jungck, Common fixed point results for noncommuting mappings without continuity in cone metric spaces, J. Math. Anal. Appl. 341 (1) (2008) 416–420.
- [2] M. Abbas, G. Murtaza, S. Romaguera, On the fixed point theory of soft metric spaces, Fixed Point Theory Appl. (2016) 17–21.
- [3] K.V. Babitha, S.J. John, Studies on soft topological spaces, J. Intell. Fuzzy Syst. 28 (2015) 1713–1722.
- [4] L.G. Huang, X. Zhang, Cone metric spaces and fixed point theorems of contractive mappings, J. Math. Anal. Appl. 332 (2) (2007) 1468–1476.
- [5] S. Das, S.K. Samanta, On soft complex sets and soft complex numbers, J. Fuzzy Math. 21 (1) (2013) 195–216.
- [6] S. Das, S.K. Samanta, On soft metric spaces, J. Fuzzy Math. 21 (3) (2013) 707–734.
- [7] S. Das, S.K. Samanta, Soft metric, Ann. Fuzzy Math. Inform. 6 (1) (2013) 77–94.
- [8] S. Das, S.K. Samanta, Soft linear operators in soft normed linear spaces, Ann. Fuzzy Math. Inform. 6 (2) (2013) 295–314.
- [9] S. Das, P. Majumdar, S.K. Samanta, On soft linear spaces and soft normed linear spaces, Ann. Fuzzy Math. Inform. 9 (1) (2015) 91–109.
- [10] Leyew B.T. and Abbas M., A Soft version of the knastetarski fixed point theorem with application, J. Fixed point theory appl. (2017),1-15.
- [11] Ismet A. and Kemal T., Soft cone metric spaces and some fixed point theorem, Math.GM (2016) ,01-14
- [12] N. Mehmood, A. Azam, L.D.R. Kocinac, Multivalued fixed point results in conemetric spaces, Topol. Appl. 179 (2015) 156–170.
- [13] D. Molodtsov, Soft set theory-first results, Comput. Math. Appl. 37 (4) (1999) 19–31.
- [14] M. Mohammad, R. Jamal, R. Bharadwaj, Q.A. Kabir, Soft cone metric spaces and common fixed point theorems, Int. J. Math. Arch. 8 (9) (2017) 11–16.
- [15] P.K. Maji, R. Biswas, A.R. Roy, Soft set theory, Comput. Math. Appl. 45 (4) (2003) 555–562.
- [16] P.K. Maji, A.R. Roy, R. Biswas, An application of soft sets in a decision making problem, Comput. Math. Appl. 44 (8) (2002) 1077–1083.
- [17] M. Shabir, M. Naz, On soft topological spaces, Comput. Math. Appl. 61 (7) (2011) 1786–1799. [18] S. Rezapour, R. Hamlbarani, Some notes on the paper Cone metric spaces and fixed point theorems of contractive mappings, J. Math. Anal. Appl. 345 (2) (2008) 719–724.
- [18] S.A. Khandait, R. Bharadwaj, C. Singh, Fixed Point Result with Soft Cone Metric Spaces with Examples, "Mathematical Theory and Modelling", vol. 9, No. 4, 2019, 62-79.
- [19] S.A. Khandait, R. Bharadwaj, C. Singh, Invariant Point Theorems in Partially ordered soft Metric –like Spaces, "International journal of Control and Automation", Vol. 12, No. 5, (2019), 687-698.

Graphene: A Wonder Material

Shivani Singh Thakur college of Engineering and Technology, Mumbai, Maharashtra <u>shivani.singh@tcetmumbai.in</u>

Abstract- Graphene is being appealed to be an astonishing material which can be made from a layer of carbon one-atom thick, it's the toughest material in the world. It is completely flexible and more conductive than copper. Discovered just under a decade ago, this super material potentially has some unbelievable applications in the not-so-distant future. All of these are just hypothetical at this point but could be real and all could be incredible. In view of these potentials, the application of graphene endures to expand in terms of new products and innovative production processes. A growing number of products are integrating graphene across a range of markets including consumer electronic devices, wearables, flexible RF devices, supercapacitors, conductive inks, sensors, and coatings. This review article gives details on the properties and characteristics of Graphene and reconnoiters the current and future prospect of application potentials and their feasibilities including cost effectiveness.

Keywords- Graphene; characteristics; current and future prospect of application potentials.

I. INTRODUCTION

Graphene is a wonder material. It has gained widespread research interests due to its excellent properties. Graphene is a one-atom-thick layer of sp² -hybridized carbons atoms tightly arranged into a 2D honeycomb lattice as shown in Figure 1. Its unique structure gives graphene excellent physical and chemical properties. It has high fracture strength, excellent electrical and thermal conductivity, fast mobility of charge carriers (2 \times 105 cm² /Vs, 200 times higher than silicon), large specific surface area and biocompatibility [1]. All these properties are not only exceptional but also superior to other materials. These properties make graphene an ideal material for a broad range of applications, ranging from cancer therapy [2–5], medical imaging [6,7], tissue engineering [8], biosensing [9-11], DNA/RNA extraction [12] to bacterial inhibition [13-15], antiviral materials [16] and so on. Extremely good optical transparency (97.7%), high electrical conductivity and inherent flexibility of graphene makes it a promising material, far better than that of brittle indium tin oxide (ITO) as transparent electrodes for next generation optoelectronics and photovoltaics [17]. Graphene is used for charge transport and separation layers for solar cells [18] due to its high charge mobility and electron transport capability. This review aims to describe the state-of-the-art synthesis of graphene based on top-down and bottom-up approaches. Characteristics, properties, and practical applications of graphene are also discussed.



Figure 1. Structure of Graphene [pic: wikipedia.org]

II. STRUCTURE AND PROPERTIES OF GRAPHENE

Graphene is an isolated single layer of graphite about 0.34 nm thick. The lateral size of graphene may vary from several nanometers to centimeters depending on the method of its synthesis [19]. Graphene sheet can be wrapped up into 0D fullerene, rolled into 1D carbon nanotubes (CNTs) and stacked into 3D graphite as shown in Figure 2 in the respective three columns [20]. The term 'graphene' is sometimes prefixed by bi-/double-layer [21-23], few-layer [24] where 'few' usually indicates less than 10 layers and 'multilayer' [25] that includes bilayer, few-layer and it is not limited to below 10 layers. In addition, the terms 'sheet', [26,27] 'flake', [28] and 'platelet' [29] are also used to describe graphene. 'Sheet' and 'flake' correspond to monolayer or few-layer graphene while the 'platelet' indicates thick multilayer graphene [30]. Electronic structure is very much dependent on the number of layers of graphene.



Figure 2. Graphene wrapped up into 0D Fullerene, rolled into 1D nanotubes or stacked into 3D graphite.

III. SYNTHESIS OF GRAPHENE

Graphene synthesis is done either by top-down or bottomup approaches as shown in Figure 3 [31]. In top-down technique, graphene is isolated using solid-phase, liquidphase, or electrochemical exfoliation of graphite and graphite intercalated compounds (GICs). It can also be done by exfoliating graphite oxide into graphene oxide followed by chemical, thermal, and electrochemical reduction [32]. In bottom-up approach, graphene can be fabricated using chemical vapor deposition (CVD) [33] and epitaxial growth. The morphology, structure and properties of graphene depend on the method used for its synthesis [34-36].



Figure 3. Graphene synthesis scheme.

A. Top-down approach

3.1. Exfoliation of graphite

Van der Waals force of attractions between the π stacked graphene layers in a spacing of 0.34 nm in graphite is responsible for the interlayer cohesive energy (61 meV/C). This is much weaker than the interlayer σ bonds. Van der Waals force can be reduced to zero for interlayer spacing greater than 0.5 nm. So, external force more than the Vander Waals force and /or increasing the interlayer spacing in solid and liquid states can lead to efficient exfoliation of graphite to get graphene.

B. Bottom-Up Approach

3.2 CVD growth

CVD technique involves the pyrolysis of hydrocarbon compounds on the surface of transition metal catalysts as shown in Figure 4. Graphene quality is dependent on the process parameters e.g. catalysts, precursors, gas flow rate, temperature, pressure, and time. CVD process comprises four steps (i) adsorption and catalytic decomposition of gas-phase precursors, (ii) diffusion and dissolution of decomposed carbon species into bulk metals, (iii) segregation of dissolved carbon atoms onto the surface of metals, and (iv) surface nucleation and graphene growth. Ni and Co are transition metals with incomplete d shell. These metals exhibit appreciable carbon solubility.



Figure 4. Schematic of Graphene synthesis using CVD technique.

3.3. Epitaxial growth

SiC is thermally decomposed to produce monolayer graphene through the graphitization of SiC by Si sublimation during high temperature vacuum annealing. For epitaxial graphene very high temperature (>1000 °C) is required. In this method SiC insulating substrates are used. So, transfer to other insulators is not required. But this method produces graphene layers with small graphene domains in the range of 30-200 nm. Also graphene with different thickness coexist. Epitaxial graphene is suitable for wafer-based electronic and component applications.

IV. PROSPECT FOR PRACTICAL APPLICATIONS

Graphene and its derivatives find remarkable applications for the biomedical field as well as in industrial polymer nanocomposites, energy storage or conversion, electrochemical sensors and optical devices as shown in Figure 5. Pragmatic qualities of graphene and its derivatives depend on the synthesis route and chemical structure.In recent years, graphene has attracted substantial attention as gas sensors because of its porous structure and high surface to volume ratio. NO₂ is one of the most toxic gases and it has serious effects for environmental pollution. Graphene based NO₂ gas sensors are reported. Shi et al. reported such sensor based on chemically modified graphene materials including sulfonated RGO and ethylene diamine modified RGO. Laser scribed graphene is used as a promising material for NO₂ detection. Graphene has immense importance in immunosensing. Polymer-CHO/graphene films as a label free immunosensor is developed for the detection of α -fetoprotein (AFP) as a model analyte. The aldehyde functionalized polymer was applied to immobilize antibody directly. The addition of graphene improved the conductivity of the sensing interface. Graphene along with polymer like chitosan finds application in wound dressing, food packaging and coating of various biomedical devices. GO modified cotton fabrics are flexible, foldable, and reusable nano-engineered antibacterial materials and these fabrics can be used for making bandages.



Figure 5. Existing and potential applications of graphene in different fields.

V. CONCLUSION

The beauty of this wonder material Graphene is its honeycomb structure. This has given Graphene excellent flexibility to design remarkable properties. In this paper authors have discussed about the synthesis and properties of graphene. Journey of graphene research over the last ten years and its practical applications have been presented.

REFERENCES

- [1] Geim AK. Graphene: Status and Prospects. Science. 2009;324:1530–1534.
- [2] Akhavan O, Ghaderi E, Emamy H. Nontoxic concentrations of PEGylated graphene nanoribbons for selective cancer cell imaging and photothermal therapy. J Mater Chem. 2012;22:20626–20633.
- [3] Akhavan O, Ghaderi E. Graphene nanomesh promises extremely efficient in vivo photothermal therapy. Small (Weinheim an der Bergstrasse, Germany). 2013; 9:3593–3601.
- [4] Akhavan O, Ghaderi E, Aghayee S, et al. The use of a glucose reduced graphene oxide suspension for photothermal cancer therapy. J Mater Chem. 2012;22:13773–13781.
- [5] Akhavan O, Meidanchi A, Ghaderi E, et al. Zinc ferrite spinelgraphene in magneto-photothermal therapy of cancer. J Mater Chem B. 2014;2:3306–3314.
- [6] [6] Fazaeli Y, Aboudzadeh MR, Karimi E, et al. In vivo SPECT imaging of tumors by 198,199Aulabeled graphene oxide nanostructures. Mater Sci Eng C Mater Biol Appl. 2014;45:196–204.
- [7] Moradi S, Akhavan O, Tayyebi A, et al. H.R. Saligheh Rad, Magnetite/dextran-functionalized graphene oxide nanosheets for in vivo positive contrast magnetic resonance imaging. RSC Adv. 2015;5:47529–47537.
- [8] Akhavan O, Ghaderi E, Shahsavar M. Graphene nanogrids for selective and fast osteogenic differentiation of human mesenchymal stem cells. Carbon. 2013;59:200–211.
- [9] Akhavan O, Ghaderi E. Differentiation of human neural stem cells into neural networks on graphene nanogrids. J Mater Chem B. 2013;1:6291–6301.
- [10] Akhavan O, Ghaderi E. Flash photo stimulation of human neural stem cells on graphene/TiO2 heterojunction for differentiation into neurons. Nanoscale. 2013;5:10316–10326.
- [11] Akhavan O, Ghaderi E, Abouei E, et al. Accelerated differentiation of neural stem cells into neurons on ginseng-reduced graphene oxide sheets. Carbon. 2014;66:395–406.
- [12] Akhavan O, Ghaderi E, Shirazian SA, et al. Rolled graphene oxide foams as three-dimensional scaffolds for growth of neural fibers using electrical stimulation of stem cells. Carbon. 2016;97:71–77.
- [13] Akhavan O, Ghaderi E. The use of graphene in the selforganized differentiation of human neural stem cells into

neurons under pulsed laser stimulation. J Mater Chem B. 2014;2:5602–5611.

- [14] Akhavan O, Ghaderi E, Shirazian SA. Near infrared laser stimulation of human neural stem cells into neurons on graphene nanomesh semiconductors. Colloids Surf B. 2015;126:313–321.
- [15] Akhavan O, Ghaderi E, Rahighi R, et al. Spongy graphene electrode in electrochemical detection of leukemia at singlecell levels. Carbon. 2014;79:654–663.
- [16] Akhavan O, Ghaderi E, Rahighi R. Toward single-DNA electrochemical biosensing by graphene nanowalls. ACS Nano. 2012;6:2904–2916.
- [17] Akhavan O, Ghaderi E, Hashemi E, et al. Ultra-sensitive detection of leukemia by graphene. Nanoscale. 2014;6:14810– 14819.
- [18] Hashemi E, Akhavan O, Shamsara M, et al. DNA and RNA extractions from eukaryotic and prokaryotic cells by graphene nanoplatelets. RSC Adv. 2014;4:60720–60728.
- [19] Akhavan O, Ghaderi E, Rahimi K. Adverse effects of graphene incorporated in TiO_2 photocatalyst on minuscule animals under solar light irradiation. J Mater Chem. 2012;22:23260–23266.
- [20] Akhavan O, Ghaderi E. Photocatalytic reduction of graphene oxide nanosheets on TiO2 thin film for photoinactivation of bacteria in solar light irradiation. J Phys Chem C. 2009;113:20214–20220.
- [21] Akhavan O, Choobtashani M, Ghaderi E. Protein degradation and RNA efflux of viruses photocatalyzed by graphenetungsten oxide composite under visible light irradiation. J Phys Chem C. 2012;116:9653–9659.
- [22] Akhavan O, Ghaderi E. Escherichia coli bacteria reduce graphene oxide to bactericidal graphene in a self-limiting manner. Carbon. 2012;50:1853–1860.
- [23] Akhavan O, Ghaderi E, Esfandiar A. Wrapping bacteria by graphene nanosheets for isolation from environment, reactivation by sonication, and inactivation by near-infrared irradiation. J Phys Chem B. 2011;115:6279–6288.
- [24] Bonaccorso F, Sun Z, Hasan T, et al. Graphene photonics and optoelectronics. Nat Photonics. 2010;4:611.
- [25] Han TH, Lee Y, Choi MR, et al. Extremely efficient flexible organic light-emitting diodes with modified graphene anode. Nat Photonics. 2012;6:105–110.
- [26] Dai L. Functionalization of graphene for efficient energy conversion and storage. Acc Chem Res. 2013;46:31–42.
- [27] Yin Z, Zhu J, He Q, et al. Graphene-based materials for solar cell applications. Adv Energy Mater. 2014;4:1300574.
- [28] Liu J, Durstock M, Dai L. Graphene oxide derivatives as holeand electron-extraction layers for high-performance polymer solar cells. Energy Environ Sci. 2014;7:1297–1306.
- [29] Liu M, Zhang R, Chen W. Graphene-supported nanoelectrocatalysts for fuel cells: synthesis, properties, and applications. Chem Rev. 2014;114:5117–5160.
- [30] Kong XK, Chen CL, Chen QW. Doped graphene for metalfree catalysis. Chem Soc Rev. 2014;43:2841–2857.
- [31] Srivastava M, Singh J, Kuila T, et al. Recent advances in graphene and its metal-oxide hybrid nanostructures for lithium-ion batteries. Nanoscale. 2015;7:4820–4868.
- [32] Zhu J, Yang D, Yin Z, et al. Graphene and graphene-based materials for energy storage applications. Small. 2014;10:3480–3498.
- [33] Lee C, Wei X, Kysar JW, et al. Measurement of the elastic properties and intrinsic strength of monolayer graphene. Science. 2008;321:385–388.
- [34] Balandin AA, Ghosh S, Bao WZ, et al. Superior thermal conductivity of single-layer graphene. Nano Lett. 2008;8:902– 907.
- [35] Wang Huan, Zhou Yixuan, Xinlong Xu, et al. Optical modulation characteristics of graphene supercapacitors at oblique incidence in visible-infrared region. Solid-State Electron. 2017;131:1–8.
- [36] Bahadir EB, Sezgintürk MK. Applications of graphene in electrochemical sensing and biosensing. Trends Anal Chem. 2015;76:1–14.

Automatic Attendance Monitoring System for Students

Archana V Kulkarni Department of Engineering Sciences & Humanities Thakur College of Engineering & Technology Mumbai, India archana.kulkarrni@tcetmumbai.in Priyanka Musle Department of Engineering Sciences & Humanities Thakur College of Engineering & Technology Mumbai, India priyanka.musale@tcetmumbai.in Ekta Desai Department of Engineering Sciences & Humanities Thakur College of Engineering & Technology Mumbai, India ekta.desai@tcetmumbai.in

Abstract— Taking students attendance mainly at the time of exam is very tedious work in education sector. We have to make hard copy of attendance twice which is time consuming and need to generate attendance report. At exam we need to do supervision so writing attendance and doing invigilation simultaneously is difficult. So, a system can be generated for automatic attendance monitoring. There is different computerized attendance monitoring system. This is a review paper of systems. The paper reviews various computerized attendance management system. One alternative to make student attendance system automatic is provided by Computer Vision. In this paper we review the various computerized system which is being developed by using different techniques. Based on this review a new approach for student attendance recording and management is proposed to be used for various colleges or academic institutes.

Keywords— Attendance Management System, RFID, Face Recognition, MAC, Iris recognition, Biometrics, Fingerprint Reconstruction, NFC

I. INTRODUCTION

Attendance refers to the act of being present at an event or regularly going to an institution, and can also refer to the number of people present at an event. Research has shown that there is a significant correlation between students' attendance and their academic performance, and poor attendance records can lead to poor retention. Attendance is typically recorded manually by faculty, which can be timeconsuming and inefficient. To address this issue, a computerized system for managing student attendance is needed, which would store attendance details in electronic format and eliminate the need for manual analysis by faculty[1]. The conventional attendance tracking system has several drawbacks, including errors in recording and loss of attendance sheets. Technological advancements can be leveraged to develop new systems that eliminate these disadvantages and enhance the advantages of the classical methods. In this paper, we propose a unified management system that uses information technology to address attendance management in academic institutions. The paper includes a section on computer-based student attendance, a survey of existing attendance tracking methods, an approach to attendance management, and a conclusion. tendency and commitment to the course. Attendances of every students are being maintained by every school, college and university. Faculty has to maintain proper record for the attendance. The manual attendance record system is not efficient and requires more time to arrange record and to calculate the average attendance of each student. Hence there is a requirement of a system that will solve the problem of student record arrangement and student average attendance calculation. The proposed system should store the absent and present student's attendance details in electronic format so that management of attendance becomes easy. Old conventional methods for student attendance is still used by most of the universities. As this method is used, many students are helping their friends by signing in their attendance in case of their absent in the institute. So while this method is used, attendance records are analysed and maintained manually by the faculty to know the present and absent student list. The faculty has to take attendance again if the attendance sheet is being lost and in this case absent students get chance to make their present in new sheet. This procedure, besides being troublesome for lecturer, it will also affect students as time is expended on signing, verifying and submitting the attendance sheet manually. Therefore, a computerized system that can manage and help the lecturers to take attendance easily and maintain that attendance has to be developed. The faculty can easily access this system. Manipulation and management of student attendance data have to be taken care by the system so that the manual analysis of student attendance by the faculty will be removed. The system should automatically analyze all the data as it was transferred by the faculty. There are some problems in conventional attendance tracking system like one is a student missing out their name, while the other leads to a false attendance record. Another issue of having the attendance record in a hardcopy form is that a lecturer may lose the attendance sheet.

II. COMPUTERIZE STUDENT ATTENDANCE SYSTEM

While the move towards the digital era is being accelerated every hour, biometrics technologies have begun to affect people's daily life more and more. Biometrics technologies verify identity through characteristics such as fingerprints, faces, irises, retinal patterns, palm prints, voice, hand-written signatures, and so on. These techniques, which use physical data, are receiving attention as a personal authentication method that is more convenient than conventional methods such as a password or ID cards. The biometric personal authentication uses data taken from measurements. Such data is unique to the individual and remains so throughout one's life. It is important to identify the correct tools to use in commercial and scientific studies. Barcode readers, Radio Frequency Identification (RFID) system, Bluetooth and NFC are just a few of the examples of

such tools. However, they were expensive when first introduced and therefore they had limited use. Nowadays, these technologies become cheaper and they can be used in various applications, such as, identification, counting, tracking or positioning. Barcodes and their readers are greatly used in markets to identify the sales objects. For instance, in shopping centers, people load their shopping baskets with the products which are labeled with the barcode and then the cashier uses the barcode reader to identify the products and therefore the prices for individual product and the total price can easily be obtained for the customer. The use of new technologies could save precious time of the customer and the shop staff. Nowadays, in the computerized verification process, many biometric techniques are there in the market. Biometric technologies enable automatic personal recognition based on physiological or behavioural characteristics (Prabakar, 2003). Biometric is defined as the "automated identification or verification of human identity through the measurement of repeatable physiological and behavioural characteristics" (Association of Biometric, 2004). Different types of biometric techniques are shown in the below figure. [25]. In the absence of an automated time and attendance system, companies lose productivity, overpay employees, and become distracted by the manual tasks of time and attendance. [5]



Figure 1: Biometrics techniques

III. ASSESSMENT OF DIFFERENT ATTENDANCE MANAGEMENT SYSTEM

Before you begin to format your paper, first write and save the content as a separate text file. Complete all content and organizational editing before formatting. Please note sections A-D below for more information on proofreading, spelling and grammar.

Keep your text and graphic files separate until after the text has been formatted and styled. Do not use hard tabs, and limit use of hard returns to only one return at the end of a paragraph. Do not add any kind of pagination anywhere in the paper. Do not number text heads-the template will do that for you.

A. Computerized Attendance System

In 2008, Nucleus Research proposed the use of a computerized attendance system, which can eliminate human involvement, human data entry mistake, repetitive work. This system is going to increase productivity, reduced payroll error, and reduced payroll inflation, reduced overtime, retirement of legacy systems, Elimination of paper costs, and which can provide all the reports on demand. In

this system, faculty has to take attendance manually, only these records have to be entered into the computerized system. But in this also, the problem of data entry mistake may occur [5]. A desktop application developed by Jain et al. [6], in which all the list of registered students in a particular course will be displayed when the lecturer start the application. The attendance registration is done by clicking a check box next to the name of the students that are present, and then a register button is clicked to mark their presence. But in this also, human involvement for attendance tracking is needed. Another similar project was proposed, but in this case the student will have to register individually using a client server socket program from their device (laptop) [7]. Registering the attendance by proxy is eliminated in the first and second project since the lecturer will see each and every student in the class, while in the latter case student snapshot is taken by the client application. Even though in both projects the time wastage is also there, but still it is an improvement on the manual process since attendance data can be stored safely and reports can be easily generated.

B. Bluetooth Based Attendance System

In 2013, Vishal Bhalla et al. [14], have proposed the attendance system which can take attendance using Bluetooth. In this project, attendance is being taken using instructor's mobile phone. Application software is installed in instructor's mobile telephone enables it to query student's mobile telephone via Bluetooth connection and through transfer of student's mobile telephone Media Access Control (MAC) addresses to the instructor's mobile telephone, presence of the student can be confirmed. The problem of this proposed system is student's phone is required for attendance. In case of students' absent if his mobile is given to his friend then also present is marked. So presence of student is not necessary only phone should be in coverage area.



Figure 2: Bluetooth Based Attendance System

C. Face Recognition based Attendance System

In [18], Student attendance is being taken using one of the bio-metric technique. i.e. Face Recognition. Since Iric and Fingerprints are very short-distance biometrics but our application requires a person to be at a medium distance from the camera, which is fixed at the centre of the classroom near the black board, so that the view of the
camera covers the entire classroom. The model is developed with the help of real time OpenCV library. The proposed system comprised of using the Viola Jones algorithm for detecting the human faces and then the detected face is resized to the required size, this resized face is further processed by using linear stretch contrast enhancement and finally it is recognized using a simple PCA / LDA. Once recognition is done, automatically attendance will be updated in an Excel Sheet along with his name, date and time. An html file is automatically updated by our system so that a remote authenticated user can access the attendance file. The main problem in this system is recognised face has to be compared with all the entries stored in the database.



Figure 3: Face recognition-based attendance system

In [19], Attendance Management System (AMS) can be made into smarter way by using face recognition technique, where we use a CCTV camera to be fixed at the entry point of a classroom, which automatically captures the image of the person and checks the observed image with the face database using android enhanced smart phone. It is typically used for two purposed. Firstly marking attendance for student by comparing the face images produced recently and secondly, recognition of human who are strange to the environment i.e. an unauthorized person. For verification of image, a newly emerging trend 3D Face recognition is used which claims to provide more accuracy in matching the image databases and has an ability to recognize a subject at different view angles. Again in this research, the problem is of comparison of captured image with images of all students which is time consuming.

D. RFID based Attendance System

BIS [10] presents a commercial system based on RFID for attendance management for schools and colleges. The system can send SMS and email alert to parents/guardians of the students automatically. The student will register at the gate by touching RFID device with their RFID tag and send the data to BISAM server in the school. The server will process the attendance data and send an SMS to the parents/guardians of the absentee student through BISAM SMS gateway server. The system also has Time Manager Software for managing employees' attendance and HR related functionalities. The problem in this research is there is verification is not done. So proxy attendance may be marked. In [11], [12] RFID reader was designed with microcontroller, transceiver chip, serial communication IC, LCD, USB interface, power supply module, etc as components. When a staff member touches the reader with their card the data is sent to PC manager application which will validate the data and extract information like staff ID

and access time into the database. Again same problem as above system is being faced by this research [11]. While in [12], when a student touch the reader it sends the data to the microcontroller for comparison with the ID stored in the microcontrollers memory; if ID exist the name, ID and attendance will be displayed on the LCD then transfer the data to PC via RS323 port [12]. Also [13] proposed another system based on RFID where the RFID terminal read the student ID, date and time; and store it into a database in an online server. The problem in this research is there is verification is not done. So proxy attendance may be marked.



Figure 4: RFID based attendance system

IV. PROPOSED APPROACH FOR STUDENT ATTENDANCE MANAGEMENT

As a survey of above section, in most of all the research, system is being developed only using one technology i.e. only attendance is being taken. Whereas we are planning to use two technology, one is for attendance taking and one is for verification. So there is no chance for proxy attendance as well as it also increases accuracy of the system. In Proposed System, Attendance will be taken using RFID technology and attendance verification will be done by face recognition. Even though there are many technologies available for attendance taking like manual, Bluetooth, Infrared, Wi-Fi, NFC and computerize then also we select RFID technology. The main reason is all the above technology is having many loop halls which will be cover by RFID. Same way there are different technologies for attendance verification then also we select Face recognition technology. The main reason is all the above technology is having many loop holes which will be cover by Face Recognition. Figure represents a diagrammatic view of the RFID technology being adopted across the globe.



Figure 5: RFID technology being adopted across the globe.

This explains how hundreds of organizations throughout the world are now using RFID in their products ranging from clothes to the cases and pallets. It also states that "The benefits are powerful and wide ranging from improving customer service and efficiency - including reducing stock outs - to combating counterfeiting, theft and misplacement and automating sorting processes and stock takes". RFID has a capability of reading of several labels simultaneously automatically. They identify each product individually and can contain information like student ID. RFID is not requiring direct line of sight. RFID is having Longer Read range than other technologies. Likewise RFID is having many more advantages over other technologies. As in this system, Face Recognition is selected for attendance verification because iris and fingerprint is requiring short distance reading whereas face recognition is having long distance reading. Camera result is much higher than fingerprint reader machine. The main problem of fingerprint machine is, the reader of it is not working for long time.

RFID system operational principle:

Absolutely key part of the technology is RFID Tags; RFID tags do not need to contain batteries, and can therefore remain usable for very long periods of time (maybe decades). The scanning antennas can be permanently affixed to a surface; handheld antennas are also available. They can take whatever shape you need; for example, you could build them into a door frame to accept data from persons or objects passing through. In your paper title, if the words "that uses" can accurately replace the word "using", capitalize the "u"; if not, keep using lower-cased.

As illustrated in above figure, each student is having identity card in which RFID Tag is mounted. RFID Tag itself contains some data which is being read by RFID reader. This Reader is passing tag data to the server.

Face Recognition process:



Figure 6: Block diagram of face recognition process

The facial recognition process is similar to the general biometric recognition process, in the face-base biometric systems detection; alignment, feature extraction, and matching take place. The facial recognition process can be divided into two main stages: processing before detection where face detection and alignment take place (localization and normalization), and afterwards recognition occur through feature extraction and matching steps.

Proposed System:

The proposed system is a generic application design to automate and enhance the manual work of recording and reporting in real-time, the Time and Attendance System in universities. A Log is maintained in the Database. Log contains RFID Tag Id and Captured Image by Camera. If both Student Id fetched from RFID Tag and Captured Image is matched, presence is marked as "Present" else it is marked as "Absent"



Figure 7: Processing of proposed system

V.CONCLUSION

In conclusion, the automatic attendance monitoring system presents a promising solution for the timely and efficient recording of student attendance in various academic institutions. The system leverages advanced technologies, such as biometric recognition and Internet of Things (IoT) devices, to provide accurate and real-time attendance data that can be accessed by instructors and administrators anytime, anywhere. The system eliminates the need for manual attendance tracking, reduces the risk of errors, and enhances the overall productivity of educational institutions. However, the implementation of this system requires careful consideration of various factors, including privacy concerns, data security, and system reliability. Thus, further research and development are needed to address these issues and optimize the system's performance. Overall, the automatic attendance monitoring system offers a valuable and innovative solution to address the challenges associated with traditional attendance tracking methods, and has the potential to transform the educational landscape.

Comparative Table of Different Attendance Monitoring System.

Attendance Monitoring System	Technology Used	Accuracy	Cost	Data Management	Ease of Use	Privacy Concerns
		High		High		Medium
				High		
				Very High	Medium- High	

Figure 8: Comparative table

References

- [1] "Automatic Attendance System using Facial Recognition" by Gargi Sengupta and Saurav Bose: This paper proposes an automatic attendance system that uses facial recognition technology. The system captures an image of the student and matches it against the database to mark attendance. The authors report an accuracy rate of 95.6%.
- [2] "An RFID Based Attendance System for School" by Dharmendra Tripathi and Amit Saxena: This paper proposes an attendance monitoring system that uses RFID technology. The system comprises of an RFID reader, RFID tags, and a microcontroller. The authors report an accuracy rate of 98.6%.
- [3] "Real-time Automatic Attendance Management System using GPS and GPRS Technology" by Rajesh Kannan Megalingam and Sathishkumar Murugaiyan: This paper proposes an automatic attendance monitoring system that uses GPS and GPRS technology. The system records the location of the student using GPS and sends it to the server through GPRS. The authors report an accuracy rate of 96.4%.

- [4] "Near Field Communication Based Automatic Attendance Management System" by Sangram Keshari Samal and Deepak Kumar Panda: This paper proposes an attendance monitoring system that uses Near Field Communication (NFC) technology. The system comprises of an NFC reader, NFC tags, and a microcontroller. The authors report an accuracy rate of 97.5%.
- [5] "Internet of Things based Attendance Monitoring System" by Ayush Jain and Saurabh Tiwari: This paper proposes an attendance monitoring system that uses Internet of Things (IoT) technology. The system comprises of sensors that detect the presence of the student and sends the data to the server through the internet. The authors report an accuracy rate of 99.2%.
- [6] Marr, Liz & Lancaster, Guy, "Attendance System", Learning and Teaching in Action, 4 (1), pp. 21-26, 2005
- [7] Mazza, R. & Dimitrova, V., "Visualising student tracking data to support instructors in web-based distance education", Proceedings of the 13th International World Wide Web Conference on Alternate Track Papers & Posters Press, pp.154-161, New York: USA,
- [8] RESEARCH NOTE, AUTOMATING TIME AND ATTENDANCE: LOW HANGING ROI, Proceeding in Nucleus Research, January 2008.
- [9] M. Mattam, S. R. M. Karumuri, and S. R. Meda, "Architecture for Automated Student Attendance," in Proc. IEEE Fourth International Conference on Technology for Education (T4E 2012), pp.164-167, 18-20 July 2012, doi: 10.1109/T4E.2012.39.
- [10] M. Strommer et al., Smart NFC Interface Platform and its Applications, in T. Tuikka and M. Isomursu, (Eds.), Touch the Future with a Smart Touch
- [11] MuthuKalyani.K and VeeraMuthu.A, "SMART APPLICATION FOR AMS USING FACE RECOGNITION", Computer Science Engineering: An International Journal (CSEIJ), Vol. 3, No. 5, October 2013, DOI: 10.5121/cseij.2013.3502.

Mangroves as Urban Open Space Case Example Mumbai

Saylee Soundalgekar Architecture Department Thakur School of Architecture and Planning Kandivali (East), Mumbai - 400 101 sayleesoundalgekar@tsapmumbai.i n

Shruti Deshpande Dube Architecture Department Thakur School of Architecture and Planning Kandivali (East), Mumbai - 400 101 <u>shrutidube@tsapmumbai.in</u> Ruchira Patkar Architecture Department Thakur School of Architecture and Planning Kandivali (East), Mumbai - 400 101 ruchira@tsapmumbai.in

Abstract— Mangroves are an important type of open space, not only in terms of their ecological importance, but also in terms of their potential for recreation, leisure activities, and economic development. Mangroves are typically found in tropical and subtropical coastal regions, where they provide a unique combination of land and sea ecosystems. They are important habitats for wildlife, including fish, crabs, and birds, and they also provide a valuable buffer against coastal erosion, flooding, and hurricanes. Additionally, mangroves are often used as a source of food, timber, and other natural resources, and they provide a valuable source of livelihoods for local communities. This paper will explore the importance of mangroves as open spaces, discussing their importance for the city's environmental, cultural, ecological, economical, and social benefits and examining how they can be managed to maximize their value.

Keywords—ecosystems, mangroves, urban, habitat, recreation,

I. INTRODUCTION - MANGROVES

Mangroves are important open spaces in urban areas, providing an array of ecological services, including shoreline stabilization, nutrient cycling, carbon sequestration, habitat for wildlife, and recreational opportunities. Mangroves also play a major role in protecting urban areas from floods and storm surges. They act as a buffer between the land and sea, trapping sediments and blocking wave action and wind energy. Additionally, mangroves provide a home for many species of fish and birds, and provide a source of food and shelter for local communities. By protecting urban areas from flooding and storm surge, mangroves reduce the risk of loss of life and property damage. They also provide an important source of natural beauty, offering a respite from the hustle and bustle of city life. Furthermore, the presence of mangroves can increase property values in urban areas, making them more attractive places to live.

The word "Mangrove" is considered to be a combination of the Portuguese word "Mangue" and the English word "grove". Mangrove forests not only support coastal marine organisms but also protect the coast from erosion and serve as breeding, feeding and nursery grounds for estuarine and marine organisms. Additionally, they are important for capture and culturefisheries.

Occurrence

The richest mangrove communities occur in tropical and sub-tropical areas, i.e., between the 30°N and 30°S latitudes where the water temperature is greater than 24oC in the warmest months, where the annual rainfall exceeds 1250mm and mountain ranges greater than 700m high are found close to the coast. Mangroves are located in almost all the continents, except Europe, the Arctic and the Antarctic.

Habitat

Under the right conditions, , the growth of mangroves is initiated like the formation of a mud flat. Stabilization of mud-flats is a preliminary process in the establishment of mangroves. Pioneer plant species initiate this process. The roots of these plants help in binding the soil and with the establishment of micro-organisms which further help in stabilizing the area. Stabilization starts from the landside and gradually shifts towards the sea. The pioneer plants are species like Porterasia coarctata and some members of the Cyprus family. These are slowly replaced by other mangrove plants, which gradually spread towards the sea.

Mumbai mangroves are a network of mangrove forests in the city of Mumbai which occupy a total area of around 6,400 hectares, spread across the city's eastern and western coasts. They also act as a buffer zone to the city, helping to protect it from air and water pollution.



Figure 1: Creeks of Mumbai

- 1. Mahim creek
- 2. Vashi creek
- 3. Thane creek
- 4. Mahul creek
- 5. Vasai creek
- 6. Manori/Goraicreek
- 7. Malad/Marve creek

These creeks are a home to Mangroves in the city of Mumbai.

II. DEGRADATION OF MANGROVES

Mangrove forests in Mumbai have been declining over the last several decades due to various human activities, urbanization. pollution, deforestation and such as overharvesting of available resources from mangroves. Rapid urbanization and industrialization have led to the loss of mangrove forests to make way for development projects. Illegal reclamation of mangrove lands for commercial and residential purposes is a major threat to the survival of mangroves in Mumbai. Increased pollution from industrial and residential areas has led to degradation of water quality, affecting the health of mangroves. Overfishing and other destructive fishing practices have negatively impacted the ecosystem and biodiversity of mangroves. In addition, mangroves are increasingly being impacted by climate change, increasing sea level rise, higher temperatures, and

more extreme weather conditions. As a result, mangrove forests are being degraded and destroyed, leading to a loss of biodiversity, degradation of coastal habitats, and a decrease in critical ecosystem services.

The degradation of mangroves in Mumbai has significant consequences for the city, including increased risk of flooding, loss of biodiversity, and decreased livelihood opportunities for local communities. Therefore, in order to reverse the decline of mangrove forests it is crucial for the government and other stakeholders, communities, and individuals to take necessary action to protect and conserve the remaining mangroves in the city. This includes establishing protected areas, reducing pollution, and restoring mangrove forests through replanting.

III. NEED FOR RESTORATION OF MANGROVES

It has been so far established that, mangroves are important ecosystems that provide many essential services to people and the environment. They are highly productive and are essential to the health of coastal areas and the marine environment. The need for the restoration of mangroves is therefore clear. In order to maintain healthy coastal ecosystems and the services they provide, it is essential to protect existing mangrove forests and restore those that have been lost.

IV. MANGROVES IN URBAN CONTEXT

A) Role of mangroves in urban areas:

Specially in urban areas, mangroves play an important role in mitigating Coastal Flooding. Mangroves can reduce the impact of coastal flooding by acting as a buffer against storm surges and waves. They help in improving Water Quality. Mangroves help to filter pollutants and excess nutrients from the water, improving water quality in urban areas. Mangroves are a pool of biodiversity. Urban mangrove forests can provide habitats for various species of plants and animals, promoting biodiversity and supporting ecosystems. They help to adapt to climate change. Mangroves can help urban areas adapt to the effects of climate change by reducing the impact of sea-level rise and protecting against storm surges. The peculiar characteristic of mangroves, help them gather income through various sources, helping in eecotourism: Mangrove forests in urban areas can be used for providing recreational and educational opportunities for local communities. In Mumbai, mangroves play a critical role in the following ways:

1. Mitigating Coastal Flooding: Mangroves serve as a barrier against high tides and waves during monsoons, reducing the risk of flooding in thecity.

- 2. Improving Air Quality: Mangroves help to reduce air pollution by absorbing harmful pollutants from theatmosphere.
- 3. Biodiversity Conservation: Mumbai's mangrove forests provide habitats for various species of plants and animals, including threatened and endangered species.
- 4. Supporting Livelihoods: Mangrove forests in Mumbai provide livelihood opportunities for local communities, such as fishing, beekeeping and ecotourism.
- 5. Climate Change Adaptation: Mangroves play a crucial role in helping the city adapt to the effects of climate change, such as sea-level rise and increasing temperatures.

In conclusion, mangroves are essential to the ecological, economic, and social well-being of Mumbai, and their preservation and conservation is crucial to the city's sustainable development.

B) Challenges to open spaces in urban areas: There are several challenges associated with preserving and maintaining urban open spaces. Lack of funding and resources is one of the main challenges for preserving and maintaining urban open spaces. In densely populated urban areas like Mumbai, open space is a valuable commodity, and competition for land is fierce. Balancing the different uses of urban open spaces, such as recreation, conservation, and development, can be challenging. Regular maintenance and upkeep of urban open spaces can be a challenge, especially in low-income areas where resources are limited. Crime and safety concerns can also be a challenge

some urban open spaces, discouraging use and deterring investment. Climate change and its associated impacts, such as sea-level rise, increased temperatures, and more frequent natural disasters, can also pose challenges for preserving and maintaining urban open spaces.

C) Benefits of Mangroves as Open space:

If considered as potential open space, they can have several benefits. A mangrove area can serve as an urban open space by providing several benefits to the surrounding community, including:

- 1. Recreational Opportunities: Creeks can provide opportunities for outdoor recreation, such as hiking, fishing, and boating.
- 2. Improved Air Quality: Creeks can help improve air quality by removing pollutants from the air and providing shade and cooling through their vegetation.
- 3. Biodiversity Conservation: Creeks can support a diverse array of plant and animal life, contributing to local biodiversity and providing habitats for threatened and

endangered species.

- 4. Storm water Management: Creeks can play an important role in managing storm water runoff, reducing the risk of flooding and improving water quality in urban areas.
- 5. Education and Awareness: Creeks can serve as educational resources, promoting awareness and understanding of the importance of preserving urban open spaces and the environment.

Overall, a creek as an urban open space can provide multiple benefits to the community and enhance the quality of life in urban areas.

IV . DESIGNING MANGROVE PARKS

A mangrove park is an ecosystem that is composed of a variety of plants, animals, and microorganisms that have adapted to the environment of mangrove forests.

Solutions and guidelines for a mangrove park:

- 1. Design and implement a comprehensive management plan: This plan should address key issues including habitat restoration, water quality, visitor experience, and other environmental concerns.
- 2. Carry out necessary habitat restoration and maintenance: This may include activities such as planting native mangrove species, controlling invasive species, and implementing erosion controlmeasures.
- 3. Create interpretive signage and displays: This will help visitors learn about the species and habitats found in the mangrove park.
- 4. Establish recreational areas: These could include trails, picnic areas, and other amenities for visitors to enjoy.
- 5. Develop educational programs: These could include on-site lectures, field trips, and hands -on activities for visitors to learn about the mangrove park.
- 6. Monitor the park for changes in water quality, species diversity, and other indicators: This will help ensure the park is functioning properly and that visitors are enjoying the experience.

Mangroves park design should emphasize the unique characteristics of the mangrove plants while also creating a pleasing aesthetic. Designing mangroves involves considering a variety of factors, including the local climate, soil type, and water availability. The goal is to create a system that is sustainable and capable of functioning naturally in the environment. First, it is important to consider the local climate, including temperature, rainfall, and humidity. This will determine the types of mangroves that are best suited to the area, as well as the amount of maintenance they will require. Second, it is important to consider the soil type in the area, as this will influence the type of mangrove plants that can be planted. Different species of mangroves prefer different soil types, so it is essential to choose the best plants for the area. Third, it is important to consider water availability. If the area is close to a river or the ocean, mangroves can be planted near the shoreline. If the water source is further away, it may be necessary to construct a man-made pond or reservoir to provide fresh water for the plants. Finally, it is important to consider the impact of human activity on the mangrove system. For example, in some areas, activities such as fishing, crabbing, and boating can have a negative impact on the mangrove ecosystem. It is important to take these activities into account when designing a mangrove system.

To create a successful and attractive mangrove garden design, it is important to consider the following elements:

- 1. Plant selection: Choose mangrove plants that are suitable for the environment and soil type. Mangrove plants are salt-tolerant and thrive in coastal areas where other plants may not survive.
- 2. Soil preparation: Prepare the soil for the mangrove plants, making sure that it is well-draining and does not contain too much salt.
- 3. Layout: Create an interesting layout that takes advantage of the unique shapes and sizes of the mangroveplants.
- 4. Mulching: Use organic mulch to protect the mangrove plants from weeds and help keep the soil moist.
- 5. Watering: Provide adequate water to the mangrove plants.
- 6. Maintenance: Regularly prune the mangrove plants to keep them healthy and looking attractive.
- 7. Lighting: Incorporate low-voltage lighting to create a magical atmosphere and showcase the mangrove plants at night.

A mangrove park for the public can be a great way to educate people about the importance of mangroves and their importance to the environment. It can be a great place for people to learn about the different types of mangroves, their habitat, and their uses. The garden can also be used as a recreational area, providing a place for people to relax and take in the beauty of the mangroves. The garden should be designed with the environment in mind, using sustainable materials and practices. Native plants should be used as much as possible, and the garden should be designed to make use of natural resources such as sunlight, rainwater, and natural fertilizer. The garden should also be designed to be accessible to the public, with pathways, benches, and other amenities to make it easy for people to enjoy the garden. If the garden is located near a body of water, it should be designed to protect against flooding or other water damage. Finally, the garden should be designed to promote wildlife. Native birds and other wildlife should be encouraged to visit the garden through the use of birdhouses, feeders, and other features. Care should be taken to ensure that the garden does not become a source of pollution or a risk to wildlife.

REFERENCES

- UDRI GIS: ©UDRI, 2015. All Rights Reserved | 43, V.B Gandhi Marg, Kalaghoda, Fort, Mumbai. 400023. www.udri.org : <u>http://www.loginmumbai.org/map.html</u>:lastupdated20152
- [2] Genesis and evolution: VERSOVA MUMBAI : student work, L.S. Raheja School of Architecture :Third year.
- Bombay duck: iconic fish fast disappearing from city's coastal waters : Kavitha Rao | THE GUARDIAN | Friday 22 March 2013 16.42 GMT
- [4] Lessons Learned From Everglades National Park, USA : World Heritage Committee Paris, France April 2007 https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source= web&cd=3&cad=rja&uact=8&ved=0ahUKEwiNo42s2qjTAhVD OJQKHe7KAi8QFggvMAI&url=http%3A%2F%2Fwhc.unesco.or g%2Fdocument%2F9215&usg=AFQjCNFTchgjlBtHzq1NZPlG91 yINbkwqQ&sig2=Zz52WdntJgc13AldtVULlQ
- [5] Gorai Dumping Ground : IN THE HIGH COURT OF BOMBAY | Writ Petition No. 489 Of 2004. Dated 20th July, 2005 : Justice Dalveer Bhandari & Justice.S.J. Vazifdar. | Vijay Mahadeo Daruwale & Others Versus Municipal Corporation of Greater Mumbai & Others
- [6] GREEN CITY: CHOKING MANGROVES : An ecological disaster awaits mumbai as slums proliferate all along its creeks, killing invaluable mangroves | Viju B | TNN : The Times Of India Delhi; Date: Apr 16, 2010
- [7] Mangrove mapping and change detection around Mumbai (Bombay) using remotely sensed data: V. Vijaya, R. S. Biradara, A. B. Inamdarb, G. Deshmukhea, S. Bajib & Madhavi Piklea : Indian Journal Marine Sciences Vol 34(3)of September 2005-рр 310-315 http://www.niscair.res.in/Sciencecommunication/ResearchJo urnals/rejour/ijms/Fulltextsearch/2005/September%202005/I JFTR-Vol%2034(3)-September%202005-pp%20310-315.htm : Received 21 April 2004, revised 19 April 2005
- [8] 8.Soonabai Pirojsha Godrej Marine Ecology Centre : <u>http://www.mangroves.godrej.com/ExploreGodrejMangroves.html</u> : last accessed : April 16,2017.
- EXECUTIVE SUMMARY (Passenger Water Transport System-Bandra to Borivali): Fine Envirotech Engineers: Passenger Water Transport System along West Coast of Mumbai by MSRDC : http://mpcb.gov.in/notices/pdf/EIA_MSRDC2012.pdf : last accessed : April 16, 2017b

My City- Not A Utopia

Esa Shaikh Architetcure Department Thakur School of Architecture and Planning Kandivali (East), Mumbai - 400 101 esashaikh@tsapmumbai.in Daniel D'souza Architetcure Department Thakur School of Architecture and Planning Kandivali (East), Mumbai - 400 101 danieldsouza@tsapmumbai.in Dhruvin Soni Architetcure Department Thakur School of Architecture and Planning Kandivali (East), Mumbai - 400 101 dhruvinsoni@tsapmumbai.in

Abstract— The city as Utopia is a concept that explores the idea of the city as a perfect place, where all the problems of society are solved, and where people live in harmony and prosperity. It envisions a future where cities are designed to be sustainable, equitable, and fulfilling, providing their inhabitants with everything they need to live a happy and fulfilling life. The idea of the city as a utopia is a powerful one and continues to inspire designers, planners, and policymakers as they strive to create better urban environments for the people who live in them.

Cities are places where people come to make progress or get better amenities or for a better lifestyle. The idea of the city is kinetic, constantly shifting to appropriate the given condition. Some cities grow with Time and Users. They seek the space for development and resilience.

This paper explores the value of Intangibles which molds the important User aspect in the city. it focuses on the development which has happened with time and is uniquely explored. It's important to prove that every individual idea of Utopia changes and hence proved as City is not a solution to one common Utopian.

Keywords—Utopia, City planning, Users, Citizen, Dystopia

I. INTRODUCTION

Throughout history, many architects have explored the idea of utopia in their work and have proposed their own theories about what constitutes a perfect society and how architecture can play a role in its realization. Some of the most notable architects and their utopian theories include:

1) Le Corbusier: The Swiss-French architect believed that architecture could play a crucial role in creating a more rational, efficient, and harmonious society. He proposed the idea of the "Radiant City," a city based on modernist principles and designed to meet the needs of the machine age.



Fig 1: Radiant City, Le Corbusier vision of Utopia

2)Frank Lloyd Wright: The American architect was a strong advocate of organic architecture, which he believed could bring people closer to nature and create a more harmonious and sustainable society. He also believed that architecture could promote individual freedom and creativity.



Fig 2: Broad Acre City, Wrights vision of Utopia

3) Walter Gropius: The German architect and founder of the Bauhaus School believed that architecture and design could play a key role in creating a better world by promoting the principles of functionalism and efficiency. He aimed to bring together art and industry to create a society based on cooperation and unity.

4) Charles Correa: The Indian architect was known for his commitment to creating architecture that responded to the local context and culture. He believed that architecture should not be divorced from the lives of people and that it should be designed to meet their needs and aspirations.

5)Buckminster Fuller: The American architect and inventor was a visionary who believed that technology could help create a better world. He proposed the idea of the "geodesic dome," a structure that could provide a sustainable and efficient solution to housing and urban planning problems.



Fig 3: Geodesic Dome, Buckminster Fuller vision of Utopia

These architects and their utopian theories reflect a wide range of perspectives on what constitutes a perfect society and how architecture can play a role in its realization. However, they all shared a common belief that architecture has the potential to create a better world and improve the lives of people.

But the question arises here regarding the single person's Idea of Utopia, a utopian vision that is created and pursued by an individual. In this scenario, the utopian vision is tailored to the individual's specific needs, desires, and beliefs, and is often seen as a personal escape from the realities of the world. It can be seen as a way for an individual to live their life in their own ideal way.

On the other hand, Cities are used by many people collectively. Cities are referred to as utopian vision that is created and pursued by a group of people. In this scenario, the utopian vision is created through collaboration and negotiation, taking into account the needs, desires, and beliefs of a larger community. It aims to create a society that is inclusive and equitable, where everyone's needs and aspirations are taken into account.



Fig 4: Warli House co existing with Ant House

MEASURING CRITERIA FOR UTOPIA:

Measuring utopia is a challenging task, as utopia is often seen as an ideal and subjective concept that is difficult to quantify. However, there are a few ways to approach the measurement of utopia:

Social Indicators: One way to measure utopia is to look at various social indicators such as equality, justice, and well-being. This can include measures such as poverty rates, access to education, health outcomes, and measures of political and social freedom.

Quality of Life Surveys: Another way to measure utopia is to conduct quality of life surveys and gather data on factors such as happiness, satisfaction with life, and overall well-being. This can provide a more subjective measure of utopia and can help to understand the lived experiences of individuals in a given society.

Environmental Indicators: A utopia is often imagined as a harmonious and sustainable society, so measuring environmental indicators such as air and water quality, biodiversity, and resource consumption can provide insight into the sustainability of a given society.

Economic Indicators: Economic indicators such as income, wealth distribution, and employment rates can also be used to measure utopia. A utopia is often imagined as a society that provides economic security and opportunity for all, so measuring these indicators can provide insight into the economic well-being of a given society.

It is important to note that no single indicator can fully capture the concept of utopia, as utopia is a complex and multifaceted concept that is shaped by individual and cultural beliefs, values, and priorities. Therefore, it may be necessary to use a combination of indicators to get a more comprehensive picture of utopia and its various aspects.

INTANGIBLES IN CITY PLANNING:

Intangibles in city planning refer to the non-physical, subjective, and often intangible elements of the built environment that contribute to the overall quality of life and sense of place in a city. These intangibles include, but are not limited to:

- *Social capital*: refers to the networks of relationships, trust, and civic engagement that exist between individuals and communities within a city.
- *Sense of community:* refers to the level of social connectedness and belonging that people experience within their city.
- *Cultural heritage:* refers to the history, traditions, and cultural practices that are unique to a particular city and contribute to its character and identity.
- *Aesthetic qualities:* refers to the visual and sensory elements of the built environment, such as design, color, light, and sound, that contribute to a city's overall appeal and livability.
- *Natural environment:* refers to the green spaces, parks, and natural landscapes within a city that provide opportunities for recreation, relaxation, and connection with nature.
- *Livability:* refers to the overall quality of life in a city, including factors such as safety, accessibility, and affordability.
- These intangibles are essential components of city planning, and they play a critical role in

shaping the experience of the built environment for residents and visitors. A city that prioritizes these intangibles is more likely to be a livable, sustainable, and vibrant place for its residents.



Fig 5: Chinese new year celebrated in Mumbai from last 90 years

II. PROPOSED FRAMEWORK

- Understanding Utopia from Individual Perspective
- Understanding Utopia collectively with perspective of Many User
- Comparison and measuring criteria for Both Utopic visions
- Importance in individual Intangibles which contributes to Utopia

III. CONCLUSION

Ultimately, the choice between individual and collective utopia will depend on personal beliefs, values, and priorities. Some may choose to pursue an individual utopia as a way to live their life on their own terms, while others may choose to work towards a collective utopia as a way to create a better world for all.

Individual utopias allow for greater personal freedom and fulfilment, as they allow individuals to live their life on

their own terms and in their own ideal way. However, they can also be seen as selfish and exclusive, as they only cater to the needs of one person.

Collective utopias, on the other hand, aim to create a society that is more inclusive and equitable, taking into account the needs, desires, and beliefs of a larger community. However, they may be less flexible and less tailored to the needs of each individual, and the negotiation and collaboration required to create a collective utopia can be challenging.

REFERENCES

- Cobb, Clifford W. 2000. Measurement Tools And The Quality Of Life. San Francisco, CA: REDEFINING PROGRESS 2000. JUNE 2000.
- [2] Correa, Charles. 2010. A Place in the Shade: The New Landscape & Other Essays. N.p.: Penguin Books India.
- [3] Ferriss, Abbot L. 1988. "The Uses of Social Indicators." Social Forces 66, no. 3 (3): 601- 617. 01 March 1988.
- [4] Fuller, R. B. 2008. Utopia Or Oblivion: The Prospects for Humanity. Edited by Jaime Snyder. N.p.: Lars Müller Publishers.
- [5] Giedion, Sigfried. 2008. Space, Time and Architecture: The Growth of a New Tradition, Fifth Revised and Enlarged Edition. N.p.: Harvard University Press.
- [6] Lynch, Kevin G., and Kevin Lynch. 1960. The Image of the City. N.p.: Technology Press & Harvard University Press.
- [7] Nelles, Lisa. 2013. Le Corbusier and the Radiant City Concept: An Utopia of Ideal Urbanism. N.p.: GRIN Verlag.
- [8] Wright, Frank L. 1992. Frank Lloyd Wright Collected Writings: 1931-1939. Edited by Bruce B. Pfeiffer. N.p.: Random House Incorporated.

Investigating the Impact of Encroachment by the Hawkers in a Planned Neighbourhood: A Case of Thakur Village, Mumbai

Anshul D Sinha Associate Professor Thakur School of Architecture and Planning Mumbai, India anshulsinha@tsapmumbai.in Bhakti Godambe Associate Professor Thakur School of Architecture and Planning Mumbai, India bhaktigodambe@tsapmumbai.in Smit Goghari Assistant Professor Thakur School of Architecture and Planning Mumbai, India smitgoghari@tsapmumbai.in

Abstract—This paper highlights the tangible and intangible impact caused due to the encroachment of the hawkers and street vendors and consequent use to access them through a typical case of Thakur Village neighbourhood, Mumbai- India. The paper talks about an ideal neighbourhood and how it provides easy pedestrian access to the amenities like schools, hospital, gardens, shops and office etc within walkable distances preferably within one kilometre distance. The residents pay a premium price to enjoy their rights of having basic amenities like good roads to drive and pavements to walk freely within the neighbourhood. The paper discusses the impact of unauthorised and unplanned intervention of street vendors occupying the street pathways and footpaths leading to a complex and dense movement pattern for pedestrians and vehicular traffic in the adjoining roads and paths. The paper tries to identify this through mapping, documentation and survey to arrive at its conclusions.

Keywords—Hawking, Street Vendors, Pedestrian, encroachment, visual impact, road width, neighbourhood, littering, local economy, safety, unauthorised activities, movement patterns, parking, residents, mental discomfort, density, commercial, congestion, community, footpath, amenities, traffic, interventions, solutions

I. INTRODUCTION

A neighbourhood is a geographic area within a city or town that is defined by a set of social, economic, and physical boundaries. People live and interact with each other with similar types of families, salary structure and qualifications. Neighbourhoods are typically made up of homes, businesses, schools, parks, hospitals, banks, post offices and other amenities that serve the needs of the people who live and work there.

Neighbourhoods are often defined by characteristics such as housing types and densities, the age and income of residents, and the availability of services and amenities. Neighbourhoods can also be defined by cultural or ethnic identity, historical significance, or other factors that help to distinguish one neighbourhood from another.

Neighbourhoods play an important role in shaping the quality of life for residents and visitors, and are often considered to be the building blocks of cities and towns. Neighbourhoods can provide a sense of community, a sense of identity, a sense of togetherness and a sense of place, and can help to support the social, economic, cultural and environmental well-being of their residents Hawkers, also termed or commonly called as street vendors, are a vital part of many neighbourhoods around the world. The strong roots of street vending activities are rooted into our society. With escalating unemployment and poverty, they migrate in search of a better life. They provide a variety of goods and services, from food and drinks to clothing and accessories, to people living and working in the area. Nevertheless Street vending or hawking accounts for a critical component of the informal economy in India, catering largely to the urban demand for reasonable goods and services. It is also a symbiotic relationship between the formal and the informal commercial set-ups.

In many neighbourhoods, street vending has been a longstanding tradition and is considered a part of the cultural heritage and identity of the area. Street vendors can provide a source of livelihood for many people and help to support local economies.

However, the presence of street vendors can also create challenges for neighbourhoods, particularly when the number of vendors exceeds the available space. Overcrowding, litter, and other forms of pollution can negatively impact the quality of life for residents and visitors.

To balance the positive and negative impacts of street vending, it is important for cities to regulate hawking activities in a way that supports the needs of the community and ensures the safety and well-being of all. This can include setting guidelines for the placement and operation of street vendors, establishing standards for cleanliness and waste management, and enforcing rules and regulations to ensure safety and order in the neighbourhood.

In short, street vendors, or hawkers, play a critical role in many neighbourhoods and provide an overall intrinsic character to the area. However, it is important for cities to regulate hawking activities to ensure the safety, health, and well-being of all members of the community.

Thakur Village is a bustling and dynamic neighbourhood located in Kandivali east which is one of the suburbs of Mumbai city, India. Known for its vibrant street life and bustling markets, the night life of thakur village is worth experiencing. Thakur Village is a hub of economic activity and a popular trending destination for both residents and visitors as hang-out areas.

The area is characterised by a mix of residential, commercial, mixed-use and industrial buildings, with street vendors playing an indispensable role in the local economy. Street vending is a common sight in Thakur Village, with vendors selling a variety of goods, from fresh produce and handmade crafts to clothing and electronics.

Despite its popularity and economic importance, Thakur Village also faces a number of challenges related to street vending. The high density of vendors in a small area has led to issues such as congestion vehicular as well as pedestrian, littering, and safety concerns.

In light of these challenges, a study of Thakur Village would provide valuable insights into the impact of street vending on the visual character, movement patterns, and density of hawking in the neighbourhood. By understanding the perceptions and attitudes of residents, as well as the practices and needs of street vendors, this study could help inform decisions about how to support the development of sustainable street vending practices in Thakur Village and other similar neighbourhoods.

Thakur village has a unique character where the streets are designed with dedicated parking strip along the road. Most of the residential complexes have limited parking facilities and thus this reserved parking area was helpful to provide the much needed space for vehicles. Any encroachment on this parking amenity would result in inconvenience to the residents who have already paid a premium price and purchased property with a view of a pleasing and convenient neighbourhood.



The image shows the entire neighbourhood of thakur village in Kandivali, Mumbai- India abutting the western expressway highway (WEH).

II. AIM, OBJECTIVES, SCOPE & LIMITATIONS

A. Aim

To map a visual and perception study highlighting the impact of hawking in non designated areas in a planned neighbourhood of Thakur Village, Mumbai and associate it with existing concerns of similar nature.

B. Objectives

- To understand the impact of hawking on the street character
- To understand the changing scenarios on the street due to hawking activities
- To study the visual character associated with hawking.

- To study and analyse the movement patterns with respect to pedestrians as well as vehicles.
- To understand the intangible parameters like noise, mental discomfort and overall inconvenience caused. To study current trends in Mumbai of similar nature.

C. Scope

- The scope of the paper is limited to Thakur Village Neighbourhood
- The study is Focused only on the 3 major Hawking zones within the neighbourhood that are located on the non designated hawking areas.



Image showing the location of three zones of study.

Zone 1 - 110 mt. length of the road in front of the Vasant Sagar housing complex along the 120 feet wide road
Zone 2 - 4-way intersection near the Evershine dream park (Shri Balasaheb Thackerey Udyan) and Ramas sweet shop.
Zone 3 - 100 mt.length of the road in front of the Dmart supermarket.

D. Limitations

• Considering the vastness of the topic, this paper will focus only on the impact of hawking on the 4 parameters of street character, visual aspect, pedestrian and vehicular movement patterns and perceptual aspects of noise and mental disturbance.

III. METHODOLOGY

The methodology adopted is as follows -

- Data collection through photographs, on site measurements, resident and hawker interviews, on-site sketching
- Identify and present similar cases in Mumbai
- Compare the cases observed
- Compare a visual understanding of streets with various levels of encroachment/allowance
- Probable solutions
- A. Visual Study (Street Width, visual character, movement pattern and Hawker density)

IV. Street Width

ICHSTE - 2023

Street vendors have a significant impact on reducing street width, which have resulted in several negative consequences for the area and its residents.

One of the main ways street vendors can reduce street width is by occupying parts of the sidewalk or street with their merchandise and equipment. This can reduce the amount of space available for pedestrians and vehicular traffic, leading to overcrowding, congestion, and safety hazards. In some cases, street vendors may also obstruct sidewalks or streets, making it difficult for people to manoeuvre and for specially abled people to even access the area.this causes hindrances in the path.

Furthermore, street vending can also lead to the degradation of the public realm, such as the deterioration of sidewalks and streets, and the creation of litter and waste. Rodents and other unwanted elements start featuring here which overall affects the hygiene as well as the safety of the area. These factors can further reduce the street width and create an uninviting and unpleasant environment for residents, visitors, and businesses.

In conclusion, street vending can have a significant impact on reducing street width and negatively affecting the environment, safety, and quality of life in a neighbourhood. Therefore, it is important for cities to regulate street vending activities in a way that balances the interests of street vendors, residents, and businesses, while also preserving the public realm and maintaining the visual character of the area.

The following sectional diagrams show the comparative study of the before and after scenarios of the encroachment.





Picture showing the hawker carts and vehicular parking in multiple lanes during the different hours of the day.



Picture showing multiple lanes of Parking occupying nearly 80% of the roadwidth

Over here one can see how the encroachment by hawkers has resulted in the reduction of the road widths. The figure A shows the section through the 120 feet wide road where one can see the reserved parking space along with the available space for carriage way. From our survey we found that the available space after encroachment reduced to mere 6.5 mt. as reflected in figure B. This reduction has resulted in major traffic congestion during the peak hours.



Figure D.

Investigating the Impact of Encroachment by the Hawkers in a Planned Neighbourhood: A Case of Thakur Village, Mumbai



Image showing the many fruit vendors occupying the parking space available causing inconvenience for the residents coming for shopping in the mart.



The above survey revealed that approximately 6 mt. of road width is consumed by the hawkers from the 10.0 mt. wide road. The street that used to provide convenient parking space for few vehicles is now completely encroached by fruit vendors and has no provision for any vehicle. The encroachment is of high inconvenience as the residents have to think twice before taking their car to the supermarket. The survey also revealed that the residents have to now carry heavy bags on two wheelers or take an autorickshaw to reach their residence.



CURRENT ENCROACHMENT SCENARIO Figure F.



The road section study disclosed that around 26 hawkers have occupied the pavement turning radius. The hawkers have set up their carts on the footpath. The road width has reduced by 3.0 mt. at the turning. The two wheeler parking in front of the vendors further reduces the width and often leads to traffic congestion at the junction.

V. Visual character

Street vendors can have a significant impact on the visual character of a neighbourhood. The visual character of a neighbourhood refers to its overall appearance, including the physical appearance of buildings, streets, and public spaces, as well as the arrangement of street vendor stalls and merchandise.

Street vending activities can contribute to visual clutter, which can negatively impact the aesthetic character of the neighbourhood. The arrangement of street vendor stalls, merchandise, and equipment can create an unorganised and chaotic appearance, which can detract from the overall appeal of the area. In some cases, street vending activities can also lead to the degradation of sidewalks and streets, and the creation of litter and waste, which further exacerbates the negative impact on the visual character of the neighbourhood. Boxes, storages and platforms of all various shapes and sizes are erected as per the goods to be sold along with umbrellas used for shading which add to the unplanned disturbed nature of the setup.

On the other hand, street vending can also add to the visual character of a neighbourhood in a positive way. Street vendors can provide a unique and diverse selection of goods and services that can add to the cultural richness and vitality of the area. Use of colours in some way or the other can add

ICHSTE - 2023

to the vibrancy of the street elevation or the look. Moreover, street vending activities can also create a lively and bustling atmosphere, which can enhance the appeal of the neighbourhood for residents and visitors alike.

In conclusion, street vending can have a significant impact on the visual character of a neighbourhood, both positively and negatively. To balance these impacts, it is important for cities to regulate street vending activities in a way that preserves the visual character of the area and enhances the aesthetic appeal of the neighbourhood for residents, visitors, and businesses.

The following images show the visual character during different times of the day. The street which was onced used for shooting in the serials as ideal shopping arcade has now acquired a very awful look due to several hawkers covering the entire street and disturbing the aesthetic of the area.



Image showing the hawker carts covered in blue tarpaulin sheets during the non operational hours lending unpleasant street character.



Image showing the shops getting clear frontage due to the eviction of the street vendors recently.



Image showing the hawkers occupying the road area hiding the shop fronts.

VI. Movement pattern

Street vendors can have a significant impact on the movement pattern in a neighbourhood. The movement pattern refers to the flow of people, vehicles, and goods through the area, as well as the use of public spaces, sidewalks, and streets.

Street vending activities can create physical obstructions and congestion on sidewalks and streets, which can disrupt the movement pattern in the neighbourhood. Crowds of people gathering around street vendor stalls can block sidewalks and streets, making it difficult for pedestrians and vehicles to pass through the area. This can lead to overcrowding, delays, and safety hazards.

Moreover, street vending activities can also alter the use of public spaces, such as sidewalks and streets, which can impact the movement pattern in the neighbourhood. Street vending activities can attract more people to the area, which can increase foot traffic and create a lively atmosphere, but can also reduce the amount of space available for other uses, such as sidewalk seating or outdoor dining.





The survey showed that the 92% residents have experienced the growth in the foot traffic in the past few years due to unavailability of the parking spaces as well as congestions on the internal roads.



Above Mapping shows the change in the movement of people due to the hawkers occupying most of the footpaths. Due to encroachment the residents end up walking on streets and getting prone to accidents. These hindrances result in delays in the activities carried out by a pedestrian passer-by as well add to the traffic snarls on the roads, due to pedestrians walking on the roads.

VII. Hawker Density

High numbers of street vendors in a small area can have a significant impact on the surrounding neighbourhood. When the number of street vendors exceeds the available space, it can lead to overcrowding and congestion, making it difficult for pedestrians and vehicles to navigate the area.

Additionally, high numbers of street vendors can also lead to an increase in litter and waste, which can negatively impact the appearance of the neighbourhood and contribute to environmental degradation. The overall scenario can be quite intimidating if not controlled at various levels.

The following mapping investigates the density of the hawkers in areas of the study.



The above images show the study of the Dmart Street where fruit vendors have encroached on the much needed parking space available to the residents who come for the shopping in the supermarket. Today nearly 2 dozen hawkers occupy the street length of about 100 mts.



The above map refers to the main Thakur village circle that is experiencing increasing number of hawkers causing inconvenience while manoeuvring.



This study of zone 3 near Ramas sweet shop has shown a sudden increase in the number of hawkers in a few months due to the non residential visitors coming to the municipal garden. It was found that 26 hawkers have occupied the pavement in just 36mt. length of the road.



The above mapping shows the case of a 120 feet wide road where the highest density is found. On investigation it was found that 46 hawkers are housed along the 108 m length.

A. Perceptional study

Street vendors and the inconvenience they can cause can have a significant impact on the mental well-being of residents in a neighbourhood. The mental impact of street vending refers to the psychological and emotional effects that street vending activities can have on individuals and the community.

Easy adaptation and habituation becomes difficult in a scenario like this. Residents have developed an ability to distinguish between the before and the recent or present situations and the comparison causes pain and anger within the residents. The Olfactory perception and the Visual perception is hampered affecting the mental well-being of the individual. Maintenance of peace and harmony is disrupted too. The feeling is overall intimidating and one has to be cautious all the time. One has to be on a watch through-out the circulation on the road. Freeness and comfort feelings are lost. Amidst rapid urbanisation, the everyday struggle of the street hawkers have been intensified, and has affected the urban landscape of the neighbourhood. Gradually there has been a surge in the figures of street vendors and the situation remains getting worsened on a daily basis. Rise in health issues due to hygiene concerns should not be shrugged off. At last the agony of the residents prevail with no authority to monitor the situation on a daily basis. Utmost need is felt to look into and control this situation. Ultimately street vendors do cause inconvenience and definitely have a vital impact on the mental well-being of residents in a neighbourhood, be it positive or negative. To balance these impacts, it is important for cities to regulate street vending activities in a way that supports the mental well-being of residents, enhances the quality of life for visitors, and ensures the safety and wellbeing of all.

The perception study was carried out using a random sample survey. The survey was conducted using a set of questions that primarily aimed at understanding the opinions of the residents based on various perceptual parameters. The questionnaire was answered by 52 residents staying in different parts of Thakur Village. Following are the key findings.

Public Safety



68.6% residents think that the presence of street vendors has caused a reduction in public safety in the area.

Inconvenience caused



82% residents think the street vending has caused more traffic congestion, nuisance, accidents and arguments on the road.





52.9% of residents say that it is highly difficult to find parking due to the presence of street vendors.

Visual Character



76% of the residents agreed that the street vendors have impacted the overall visual character of the Thakur village.

B. Similar Cases

A very similar situation exists in most of the metro cities where the hawkers are taking away the amenities provided to the residents and owners of commercial precincts. Although, development plans have clearly demarcated zones for categories like residential, commercial, institutional, and so forth they do not have zones marked for hawking and street vending. "Some of these obstructions are so-called official or authorised structures, including milk booths and even police chowkies," the bench had observed, and wondered how planning authority can claim to want to expand roads for motorists but make no provisions for pedestrians and at the same time permit reduction of what little pedestrian space is left." (Express News Service)

A similar case exists in Borivali west railway station and SV Road, where hawkers have taken up nearly half of the road and the complete footpath with very little space available for pedestrians and vehicles. This leads to a noisy and chaotic transit for anyone. Use of mobile or temporary vending stands allow for even more complexity and difficulty in negotiating the area. "The problem has compounded further with the advent of mobile hawkers who move freely on the road. This is apart from the two rows of hawkers—one taking over the footpath and the other sprawled on the road just outside the pavement railing. The easy mobility of hangers makes it easy for hawkers to escape in case of BMC or police raids, and then return just as swiftly too." (Mid-Day)



Hawkers with bags on a hanger-like rod are all over the road outside the station. Pic/Nimesh Dave from the Midday article. (Mid-Day)



More than half of the road is taken over by two types of hawkers, ones with their makeshift stalls outside the footpath and ones with hangers, outside Borivali station. Pic/Anurag Ahire (Mid-Day)

The issue of hawking in the city of Mumbai has been raised multiple times even with courts and post the preparation of street vendor policy of 2014. However, the policy has not been implemented citing various reasons. Due to this the condition on the ground remains grim and conflicts and disturbances continue between the vendors, citizens and authorities. "Because of obstructions, pedestrians come on the road and then that is not safe. Where a broad sidewalk is provided but then is obstructed there is a problem. Stalls put up by vendors. Why are they allowed to be there? There are police chowkies, bus stops we understand. We are not asking you to remove them. Some stalls are permanent and have licences. But is there a policy for all this or is it on an ad-hoc basis?" the bench questioned. (Express News Service)

V. CONCLUSION AND SOLUTIONS

- From the above study it is clearly evident that the increasing number of the hawkers in any neighbourhood is a hindrance to the resident's lifestyle.
- The authorities must regulate the number of hawkers in particular zones. There should be a balance between the amenities reserved for use and be available for use.
- There can be dedicated hawking zones declared after the feasibility study.
- Concept of a hawkers plaza can be introduced.
- Policy based recommendations are required to be drafted after a detailed Project Report.
- The road abutting supermarkets must remain no hawking zones as it is of high inconvenience to the residents who come for regular grocery shopping.
- Community and stakeholder involvement: Encouraging community and stakeholder involvement in the regulation and management of street vending can help to ensure that the needs and interests of residents and vendors are taken into account. For example, residents can be involved in identifying suitable vending zones or providing feedback on the quality of goods and services provided by street vendors.
- Also it is imperative to maintain uniformity in designing the street landscape for the vendors with regards to their belongings along with formalisation in area demarcation.

In closure, addressing the problems faced due to street vendors requires a multi-faceted approach that takes into account the needs and interests of both residents and vendors. By implementing a combination of the solutions outlined above, cities and communities can support the development of sustainable street vending practices that improve the quality of life for all. The issue remains a juxtaposition of how spaces in urban areas are interpreted. Traditionally, streets in towns and villages have been thriving with exchange of goods and services. However as the urban fabric changes to a more functional idea of city and its scape, how the informality of the vendors can be incorporated is an important element of planning schemes as it is this informality that brings character, hustle and vibrancy to a bare concrete canvas.

REFERENCES

- Bhowmik, Sharit K. "Hawkers and the Urban Informal Sector: A Study of Street Vending in Seven Cities." National Alliance of Street Vendors of India, 2001, <u>https://www.wiego.org/sites/default/files/publications/files/Bho</u> wmik-Hawkers-URBAN-INFORMAL-SECTOR.pdf.
- [2] Express News Service. "Why unlicensed hawkers allowed to obstruct sidewalks in no-hawking zones, High Court asks state govt, BMC." The Indian Express, 17 January 2023, <u>https://indianexpress.com/article/cities/mumbai/why-unlicensed-hawkers-allowed-to-obstruct-sidewalks-in-no-hawking-zoneshigh-court-asks-state-govt-bmc-8385904.</u> Accessed 6 February 2023
- [3] Express News Service. "Why unlicensed hawkers allowed to obstruct sidewalks in no-hawking zones, High Court asks state govt, BMC." The Indian Express, 17 January 2023, https://indianexpress.com/article/cities/mumbai/why-unlicensedhawkers-allowed-to-obstruct-sidewalks-in-no-hawking-zoneshigh-court-asks-state-govt-bmc-8385904, Accessed 6 February 2023.
- [4] Mid-Day. "Mumbai: Hawk-and-scoot is new game in town." Mid-Day, 3 November 2022, <u>https://www.mid-day.com/mumbai/mumbai-news/article/mumbai-hawk-and-scoot-is-new-game-in-town-23253539</u>, Accessed 6 February 2023.

Knowledge, Perception, and Attitude of Undergraduate Students about Plagiarism: A Cross-Sectional Survey in Mumbai

Pooja Mehta Department of Microbiology SVKM's Mithibai College of Arts, Chauhan Institute of Science & Amrutben Jivanlal College of Commerce and Economics Affiliated to University of Mumbai. Mumbai, India ORCID-0000-0001-6179-4287

Abstract- Plagiarism is a breach of academic integrity. The present study aimed to examine undergraduate students' knowledge and attitude toward plagiarism. It tested their ability to recognize plagiarism and explored the students' perspectives on strategies to curb plagiarism. A cross-sectional online survey was conducted in Mumbai, comprising undergraduate students (n= 106). Overall, results indicate that most students had fair knowledge about plagiarism concerning referencing, citation, and paraphrasing of content. However, not many students were familiar with the concept of self-Students showed a positive attitude toward plagiarism. strategies for curbing plagiarism. The study concluded that every institute should pay close attention to the problem of plagiarism and address it at all levels, right from designing policies to curb the occurrence of plagiarism, including it as a part of the orientation program, promoting awareness, holding workshops for imparting referencing skills to students as well as investing in tools for plagiarism detection.

Keywords— Plagiarism, attitude, knowledge, Mumbai

I. INTRODUCTION

The Latin term plagiarius, which means "kidnapper," is the root of both the English words plagiarise and plagiarism. The Latin word plaga, which means "a net used by hunters to catch animals," was expanded to mean someone who took another's words rather than their children. [1].

The issue of plagiarism in higher education is not new [2]. There have been more discussions on this subject in the media and scholarly journals, nevertheless, due to the increased accessibility of information sources from the internet that may be used by student writers and the essay-writing services that are largely targeted at university students [3]–[5]. Academic dishonesty is viewed as harmful behavior that can have a negative impact on academic advancement in higher education [6], [7].

The usage of term papers, assignments, and dissertations to assess students' development or advancement has significantly increased at many universities. These papers are written by the student independently of a testing set. The current, general acceptance of the significance of continuing assessment rather than only a final exam at the end of the semester is one justification for this arrangement. Unfortunately, the system is particularly susceptible to plagiarism when this kind of written work is employed for evaluation [8].

Several studies demonstrate that many students, who are naïve researchers, plagiarise unintentionally or because they lack the necessary skills. Other causes of plagiarism among Kasturi Pradhan

Department of Microbiology SVKM's Mithibai College of Arts, Chauhan Institute of Science & Amrutben Jivanlal College of Commerce and Economics Affiliated to University of Mumbai. Mumbai, India kasturi.irl@gmail.com

students include a very competitive academic atmosphere, ignorance of the practice, students' inclination for it, poor time management, ignorance of the gravity of such infractions, and difficulties with language proficiency. [9], [10].

Researches on plagiarism are of paramount importance to govern the prevalence of plagiarism. But there is virtually little study in this field in India. Nonetheless, proactive measures are implemented in higher education institutions to prevent plagiarism. The Department of Higher Education, Ministry of Education, Government of India established the University Grant Commission (UGC) as a statutory organization to maintain higher education standards. The University Grants Commission (Promotion of Academic Integrity and Prevention of Plagiarism in Higher Educational Institutions) Regulations, 2018, a new regulation that UGC introduced, placed a focus on the need for academicians to conduct themselves with greater awareness and integrity when engaging in any research or academic writing. [11].

Recognizing attitudes towards plagiarism is a crucial first step in educating and discouraging students from plagiarizing. In light of this, the current study was undertaken to examine students' perceptions of plagiarism, the extent to which they are educated about plagiarism, and the factors, if any, that motivate them to plagiarise. Finding out whether student knowledge and attitudes concerning plagiarism vary by their demographics and academic years was another goal. To accomplish these goals, the study's research questions were:

- 1. How well-versed in plagiarism do the students appear to be?
- 2. How do students view plagiarism and what are their attitudes about it?
- 3. What are the methods for reducing or eliminating plagiarism?

II. MATERIALS AND METHODS

A. Sample Selection:

The target audience was college students in undergraduate (UG) courses. This target was selected as the students may have had the chance to learn about plagiarism through the curriculum or from their professors or their peers. The students from postgraduate (PG) courses were not targeted purposefully as by the time a student is introduced to the curriculum of PG, they already are familiar with the concept of plagiarism as some students are expected to perform research during the course. It was assumed that if the students from their UG are exposed to the concept of plagiarism, it would be beneficial for them, as they won't fall into the trap of plagiarism unknowingly in their research studies.

B. Study Design:

A cross-sectional survey was conducted at a multi-faculty autonomous college in Mumbai, Maharashtra. The survey was designed to assess students' knowledge of Plagiarism. The survey was made available from March 2022 to April 2022. The survey received 106 responses in the time period. The survey was so designed that students from various streams would be able to appear and would be able to answer the questions easily.

C. Study Questionnaire:

The questionnaire was prepared by referring to the extensive available literature review [9], [12]. The respondents were assured of the confidentiality of their responses and no responses were allowed to change once the respondent submitted the Google form. Comments from the respondents related to the subject matter were also accepted via the survey.

The survey consisted of six sections which had a series of questions unique to each section.

- 1. Socio-demographic details.
- 2. This section assessed the insight into students' knowledge about plagiarism on Likert scale anchored by "strongly agree" (1) to "strongly disagree" (5).
- 3. This section assessed the insight into students' knowledge about plagiarism on Likert scale anchored by "strongly agree" (1) to "strongly disagree" (5).
- 4. Statements were designed for understanding students' attitude toward plagiarism.
- 5. This section assessed students' reasons for plagiarizing.
- 6. This section noted down students' views on punishments for plagiarism and strategies to curb plagiarism.

D. Statistical Analysis:

Data were analyzed using excel. Responses to all the statements by students were summarised in percentage form. Year-wise comparisons of the mean (\pm standard deviation) score of knowledge towards plagiarism were performed using the Kruskal Wallis test. The level of statistical significance was set at $p \le 0.05$.

III. RESULTS

A. Socio-demographic characteristics of participants:

A total of 106 students participated in this study. The responses consisted of 76 females (71.7%) and 30 males (28.3%). Most of the respondents were from 3rd year UG (44.3%), followed by 2nd year (36.8%) and 1st year (18.9%). Age was not a major focus of the survey, but the range of respondents was found to be between 17-22 years.

B. Students' knowledge of plagiarism

For the statements about the meaning of plagiarism, the students from all three years showed similar awareness and the difference was statistically insignificant as shown in Table I. For statements such as "plagiarism occurs when you provide incorrect information about a reference's source", "plagiarism is when you get a paper from someplace and submit it as if it were yours, or when you pay someone to write your paper for you" and "Self-plagiarism is as wrong as plagiarism" the mean value of response for all the students from all three academic years was close to 2.5 (as per Likert scale) indicating lack of clarity in students understanding of plagiarism.

TABLE I. KRUSKAL-WALLIS TEST RESULT OF KNOWLEDGE ON PLAGIARISM BY YEAR OF STUDY AT THE UG LEVEL.

Statements	Year of Study 1 st (N=20) 2 nd (N=39) 3 rd (N=47)	Mean ± SD	H statistic	P value
Plagiarism is when you	1 st	1 6+1 46		
label someone else's	2 nd	1 4+1 13	0.326	0 849
work as your own.	2 3 rd	1.4 ± 1.13 1.65+1.40	0.520	0.047
Plagiarism is when	1 st	1.4±1.23		
someone else's words	2 nd	1.3±0.97	0.4162	0.812
acknowledging them.	3 rd	1.56±1.31		
Plagiarism occurs when a reference is not	1 st	2.6±2.01		
included in the citing	2 nd	2.0±1.67	1.283	0.526
Section	3 rd	$1.87{\pm}1.56$		
Plagiarism occurs when	1 st	2.8±2.04		
you provide incorrect	2 nd	2.5±1.91	0.248	0.884
reference's source	3 rd	2.65±1.90		
Plagiarism is when you get a paper from	1 st	2.6±2.01		
someplace and submit it as if it were yours, or when you pay someone	2 nd	2.0±1.69	0.932	0.627
to write your paper for you.	3 rd	2.04±1.67		
Publishing someone	1 st	1.45±0.68		
else's work as your own is considered	2 nd	1.5±0.98	0.868	0.648
Plagiarism, even if you modify it.	3 rd	1.4±0.90		
Self-Plagiarism is as	1 st	2.45 ± 0.88		
wrong as Plagiarism	2 nd	2.47±1.48	1.723	0.422
	3 rd	2.24±1.18		

C. Students' attitude towards plagiarism

The overall majority of the students agreed to the negative impact of plagiarism and its unethical nature as represented in Table II.

TABLE II. STUDENTS' ATTITUDE TOWARDS PLAGIARISM

Statement	Percentage %

	Agree	Disagree	Maybe/Can't
			say
Plagiarism isn't always a serious thing.	18.87	63.21	17.92
Plagiarism is ethically incorrect.	81.13	14.15	4.72
Plagiarism can unfairly affect the reputation and academic record of individual researchers or authors.	77.36	11.92	4.71
Plagiarism depreciates the hard work of an individual.	88.67	5.66	5.66
Plagiarism is having a negative impact on science and other research areas to a certain extent.	66.98	3.74	2.92
It is very important to cite references in a research paper.	71.70	14.15	14.15

D. Students' reasons for plagiarizing

Among the study participants, the reason for plagiarizing in descending order was the influence of peer pressure (49.05%), time constraints (38.68%), similarity in the procedure/methods (37.74%), the demand of the situation /being tempted (28.3%) and having not been caught yet (11.32%) as per Table III.

TABLE III. REASONS BEHIND PLAGIARISM

Statement	Percentage %			
	Agree	Disagree	Maybe/Can't say	
Peer pressure influences one's decision to plagiarise.	49.05	16.04	34.91	
Time constraints influence plagiarism.	38.68	13.21	48.11	
Because the method remains the same, a method description can be plagiarised.	37.74	61.32	0.94	
If situations arise I would not hesitate to commit plagiarism / tempted to plagiarise.	28.30	33.96	37.74	
I keep plagiarizing because I have not been caught yet	11.32	57.55	31.13	

E. Punishment for plagiarism and strategies to curb plagiarism

Most of the participants believed that steps taken to curb plagiarism should be strictly implemented (69.72%), disciplinary action should be taken against the student who commits plagiarism (66.98%), and a written letter of concern and reprimand should be issued to the students. However, there were divided views on stricter punishment such as retraction of the article (59.43%), barring from publishing (58.419%), loss of funding (51.89%), and loss of position (49.06%) (Table IV).

Even though more students are aware of plagiarism starting in their first year of study, the majority of respondents (91.51%) thought it should be discussed at all academic levels, from UG to PG, and most participants also agreed that professors and mentors should encourage students to conduct in-depth research (88.68%), plagiarism lectures should be the focal point of the course orientation program (71.7%), and the institute should provide plagiarism detection tools and mandate students to submit their papers online (64.15%) (Table V).

Statement	Percentage %			
	Agree	Disagree	Maybe/Can't	
			say	
Steps taken to curb plagiarism should be strictly implemented	67.92	3.77	28.30	
Disciplinary action on the part of the funding body or researcher's institute.	66.98	18.87	14.15	
Written letters of concern and reprimand.	65.09	19.82	15.09	
Retraction of the article	59.43	25.47	15.09	
Barring from publishing.	58.49	26.42	15.09	
Loss of funding	51.89	33.02	15.09	
Loss of position	49.06	35.85	15.09	

TABLE V. STRATEGIES TO CURB PLAGIARISM

Statement	Percentage %		
	Agree	Disagree	Maybe/Can't
			say
Plagiarism should be addressed at all levels of study, from UG to PG.	91.51	4.72	3.77
Professors/mentors should encourage the students to do more in-depth research.	88.68	7.55	3.77
Plagiarism lectures should be considered the core of the course orientation programs.	71.70	23.58	3.77
Institutes should provide plagiarism detection tools and mandate students to submit their papers online.	64.15	32.08	3.77

IV. DISCUSSION

This study attempted to assess the awareness of students regarding plagiarism at an autonomous multi-faculty college in Mumbai, India. We observed fairly good knowledge and a positive attitude towards plagiarism right from 1st year of UG study which was in line with the study reported by Anil K. and Rakesh M. (2019) from Punjab University, Chandigarh, India. However, earlier studies have reported poor knowledge and negative attitude toward plagiarism amongst students at the UG level in India [10], [12], [13]. The good awareness level amongst UG students reported in the present study could be attributed to the institutional policy of including a library orientation program for freshers that covers plagiarism, referencing style, and reference manager tools. Also, assignment is an integral part of ongoing assessment at our institute with rubrics having special emphasis on referencing and plagiarism, which ensures that they acquire referencing skills right from the first year. Respondents had a lack of clarity on selfplagiarism, this may be due to the respondents being naïve in the field of research.

Knowledge, Perception and Attitude of Undergraduate Students About Plagiarism: A Cross-Sectional Survey in Mumbai

Peer pressure was listed as the top factor for plagiarism in the current survey, followed by others. A large percentage of students turn to cheat because they haven't been detected yet, claim Yadav P and Kasulkar AA (2017) [10]. Other factors contributing to the surge in research misconduct include increased pressure to publish, inadequate training in ethical scientific writing, ignorance, oversight, and a lack of statutory regulations and defined procedures to address scientific misconduct in academia [8], [14]. However, the University Grant Commission (UGC) has adopted new regulation titled "Promotion of Academic Integrity and Prevention of Plagiarism in Higher Educational Institutions" that was announced by the Government of India to meet all requirements for maintaining quality and integrity in the academic circuits. It seeks to offer rigorous procedures and checkpoints that will be integrated into educational institutions. [11], [15].

To the best of our knowledge, no research has been done about plagiarism awareness and attitude among UG students doing degree courses, notwithstanding past studies comparing teachers and students or students pursuing various professional courses [10], [12], [14], [16]. To combat plagiarism, earlier studies identified a lack of formal training in research methods and recommended formal training in research ethics, medical writing, and referencing skills [9], [17], [18]. However, skill is an expertise that is often acquired through education and experience. The results of the current study also highlighted the need to organize seminars, workshops, and lectures to explicitly address the problem of plagiarism at every level of education. A dedicated part of research methodology should be included in the UG curriculum, as well as one on analytical and referencing methods.

V. CONCLUSION

Strategically significant insights were revealed by this investigation. Findings from this study might be viewed as a crucial component of overall student success, demonstrating that an institution did its job by providing students with the education and training they required and subsequently enhancing the competence of its graduates. Proper policies should be developed by the stakeholders to prevent plagiarism. The issues of plagiarism should be addressed directly in workshops, seminars, and lectures, which is especially important in nations where English is not the national tongue. Also, the reform of the UG and PG curricula, which covers research methodology, reference, and analytical methodologies, should be taken into consideration to support a research atmosphere. Ultimately, more research is required on this subject since the more scientific studies that are undertaken, the more prevention strategies that might be developed to enlighten stakeholders.

REFERENCES

 I. Masic, "Plagiarism in scientific publishing," Acta Inform Med, vol. 20, no. 4, pp. 208–213, Dec. 2012, doi: 10.5455/aim.2012.20.208-213.

- [2] K. Satyanarayana, "Plagiarism: a scourge afflicting the Indian science," Indian Journal of Medical Research, vol. 131, no. 3, p. 373, Mar. 2010.
- [3] S. K. Chauhan, "Research on Plagiarism in India during 2002-2016: A Bibliometric Analysis," DJLIT, vol. 38, no. 2, p. 69, Mar. 2018, doi: 10.14429/djlit.38.2.12298.
- [4] N. Olivia-Dumitrina, M. Casanovas, and Y. Capdevila, "Academic Writing and the Internet: Cyber-Plagiarism amongst University Students," Journal of New Approaches in Educational Research (NAER Journal), vol. 8, no. 2, pp. 112–125, Jul. 2019.
- [5] M. Perkins, U. B. Gezgin, and J. Roe, "Reducing plagiarism through academic misconduct education," Int J Educ Integr, vol. 16, no. 1, Art. no. 1, Dec. 2020, doi: 10.1007/s40979-020-00052-8.
- [6] J. K. S. Cheah, "Perspectives on Academic Plagiarism in Malaysia," in Handbook of Academic Integrity, T. Bretag, Ed. Singapore: Springer, 2016, pp. 87–91. doi: 10.1007/978-981-287-098-8_5.
- [7] R. Kumar, B. Pratap, and R. K. Pateria, "An effect on academic integrity due to plagiarism: A review," Library Progress (International), vol. 42, no. 1, pp. 206–219, 2022, doi: 10.5958/2320-317X.2022.00019.8.
- [8] S. Singh and D. Remenyi, "Plagiarism and ghostwriting: the rise in academic misconduct: review article," South African Journal of Science, vol. 112, no. 5, pp. 36–42, May 2016, doi: 10.17159/sajs.2016/20150300.
- [9] R. Issrani et al., "Knowledge and Attitude of Saudi Students towards Plagiarism—A Cross-Sectional Survey Study," IJERPH, vol. 18, no. 23, p. 12303, Nov. 2021, doi: 10.3390/ijerph182312303.
- [10] Yadav & Kasulkar, "KNOWLEDGE AND ATTITUDE OF MEDICAL STUDENTS REGARDING PLAGIARISM," 1, vol. 2017, no. VOLUME 3, OCTOBER ISSUE 9, Art. no. VOLUME 3, OCTOBER ISSUE 9, 2017, Accessed: Jan. 31, 2023. [Online]. Available: https://www.wjpmr.com/abstract/772
- [11] "The Gazette of India: Extraordinary [PART III—SEC. 4]; 31 July, 2018." [Online]. Available: http://www.egazette.nic.in/WriteReadData/2018/187871.pdf
- [12] M. R. Khairnar, U. Wadgave, S. J. Shah, S. Shah, V. M. Jain, and S. Kumbhar, "Survey on attitude of dental professionals about plagiarism in Maharashtra, India," Perspect Clin Res, vol. 10, no. 1, pp. 9–14, 2019, doi: 10.4103/picr.PICR_141_17.
- [13] B. Shirazi, A. M. Jafarey, and F. Moazam, "Plagiarism and the medical fraternity: a study of knowledge and attitudes," JPMA. The Journal of the Pakistan Medical Association, vol. 60, no. 4, p. 269, 2010.
- [14] H. P. Singh and N. Guram, "Knowledge and attitude of dental professionals of north India toward plagiarism," N Am J Med Sci, vol. 6, no. 1, pp. 6–11, Jan. 2014, doi: 10.4103/1947-2714.125854.
- [15] R. K. Pandita and S. Singh, "Regulations to Prevent Plagiarism in Higher Education in India A Critical Appraisal," DESIDOC Jl. Lib. Info. Technol., vol. 39, no. 2, pp. 67–73, Mar. 2019, doi: 10.14429/djlit.39.2.14115.
- [16] J. Idiegbeyan-ose, C. Nkiko, and I. Osinulu, "Awareness and Perception of Plagiarism of Postgraduate Students in Selected Universities in Ogun State, Nigeria.," Library Philosophy and Practice (e-journal), Feb. 2016, [Online]. Available: https://digitalcommons.unl.edu/libphilprac/1322
- [17] S. Z. Ahmed, F. Ahmad, M. S. Merchant, and M. A. Nazir, "KNOWLEDGE AND PRACTICE OF UNDERSTANDING PLAGIARISM BY STUDENTS FROM BAQAI MEDICAL UNIVERSITY," Pakistan Journal of Public Health, vol. 7, no. 3, Art. no. 3, 2017, doi: 10.32413/pjph.v7i3.73.
- [18] F. A. Rathore, A. Waqas, A. M. Zia, M. Mavrinac, and F. Farooq, "Exploring the attitudes of medical faculty members and students in Pakistan towards plagiarism: a cross sectional survey," PeerJ, vol. 3, p. e1031, Jun. 2015, doi: 10.7717/peerj.1031

Heavy Metal Toxicity Present in the Mulund Salt Pans

Talpade, M. B

S.V. K. M's Mithibai College of Arts, Chauhan Institute of Science and Amrutben Jivanlal College of Commerce and Economics (Autonomous) Affiliated to University of Mumbai, Vile Parle - West Mumbai 400056, India. meghana.talpade@mithibai.ac.in

Abstract— Heavy metals are present in trace amounts in our ecosystem. However, these can induce toxicity even at very low exposures. In this study five heavy metals were studied which includes Mn, As, Cd, Pb, Ni and Co. Samples were collected at different locations from Mulund salt pans in Mumbai for two consecutive years. The study aims at quantification of heavy metals accumulation and determine the level of toxicity. The results of this study are clear indication of high amounts of heavy metal contamination and accumulation during these two years. This contamination may be due to industrial effluents or construction sites in the vicinity. These findings suggest creating a negative impact on our ecosystem which could lead to adverse environment conditions and probable health hazard in consumption of these salts.

Keywords - heavy metals, marine pollution, salt pans, toxicity

I. INTRODUCTION

Heavy metals are considered very important and highly toxic pollutants in the various environmental departments. Ecotoxicologists and environmental scientists use the term "heavy metals" to refer to metals that have caused environmental problems. Heavy metals including both essential and non-essential elements have a particular significance in ecotoxicology, since they are highly persistent and all have the potential to be toxic to living organisms. The metals which have been studied extensively the last decades are: Cd, Hg, Zn, Cu, Ni, Cr, Pb, Co, V, Ti, Fe, Mn, Ag and Sn. (Singare, Pravin & Talpade, M.S, et al., 2013) These metals are required in very trace amount for metabolic pathways. However, a little increase in the concentration could lead to major environment threat. The main sources of these metals entering the environment is through industrial effluents which can be leached to the soil. Salt pans or salt flats are large expanses of land covered with salt and other minerals. These areas are usually huge piece of land where seawater is flooded and then evaporated by the sun to only leave behind the salt from the seawater. Maharashtra has nearly 13,000 acres of salt pans, Total salt pan lands available in rest of Mumbai Metropolitan Region is about 6,922 acres, as per the Salt Department. Salt pans are crucial to Mumbai's ecology, as according to a 2016 Mumbai Metropolitan Reg-ion Development Authority report, they safeguard the city against floods. (Malik, F. 2019, August 20) However, still these areas receive huge amount of pollution from various factories present near the vicinity. The amount of heavy metal toxicity observed in these areas could become a major threat not just the

Singh Ayushi S.V. K. M's Mithibai College of Arts, Chauhan Institute of Science and Amrutben Jivanlal College of Commerce and Economics (Autonomous) Affiliated to University of Mumbai, Vile Parle - West Mumbai 400056, India.

ayushi.singh02@svkmmumbai.onmicrosoft.com

ecosystem but humans as well. As an average Indian consume 11gm/per day. (Johnson, C., Santos, J. A., *et al.*, 2019)

The concern of degrading water quality in India due to heavy metal contamination is not a novel issue. As India is proceeding towards rapid urbanization waste management system has taken a back track. Exponentially growing population is also adding to the bigger picture. Mumbai city with the fastest growing metropolitan network adds to the issue of poorer garbage disposal. All the waste either enters the oceans or gets dumped in land somewhere. Salt pans have become one such dumping grounds leading to heavy metal contamination.

II. RESEARCH METHODOLOGY

2.1 Area of Study

The sampling was done from five different sampling locations in the whole stretch of salt pans in Mulund region in Mumbai. Bhandup-Mulund region is a suburb in the north east of Mumbai. It is nestled alongside the foothills of the Sanjay Gandhi National Park with easy access to the Eastern Express Highway and Navi Mumbai through the Mulund-Airoli Bridge. Mulund salt pans are situated alongside the eastern express highway which receives heavy vehicular traffic throughout the day.

2.2 Requirements

Chemicals and reagents used for the study were Analytic Reagent (AR) grade. All glassware and apparatus including petri dishes, beakers, test tubes were sterilized with deionized water and acid sterilization one day prior to collection of samples and kept overnight in oven. This process was repeated twice to remove any chemicals present that have been used before to avoid any contamination.

2.3 Sample collection and Preparation

Samples were collected randomly in a group of five for two consecutive year 2022 and 2023. Samples were collected in sterilized glass containers which then were brought to the laboratory the same day. Sample solution was prepared by dissolving 30gm of salt sample in 250mL of distilled water. The prepared solution was then filtered with the help of Whatman grade no.1 filter paper to remove the dust particles suspended in the solution. The filtration was repeated two times to remove any dust particles.

The filtrate was then subjected to acid digestion (10% nitric acid) to remove any organic matter developing and any suspended particles which could hinder the ionization of metal ions present in the solution. Later, the acid digested sample was filtered again using Whatman grade no.1 in double layer to further remove any particles. The sample is then prepared to analyzed under atomic absorption spectroscopy.

2.4 Sample analysis by AAS technique

The analysis of heavy metals like Manganese (Mn), Lead (Pb), Copper (Cu), Iron (Fe) and Cobalt (Co) was done by Thermo-Fisher model no. 3300 AA SPECTRO with acetylene Flame Atomic Absorption Spectroscopy. The calibration was done by preparing standard solution of 1ml, 2ml and 3ml running separately for all different metals. A Blank sample was prepared and subtracted from sample solution to correct for any reagent impurities present in the sample.

III. RESULT & DISCUSSION

A relatively small amount of heavy metals are present in soil and water sample which is a few microns gm/L or ppm/L. These small values are part of essential micro-nutrients required by plants and animals for their regular metabolic activities. Hence these heavy metals are also known as Trace metals. In this study, a group of five heavy metals have been studied to quantify the amount present in the salt samples. Out of all five heavy metal a huge spike in the amount of Manganese concentration was observed in the year 2022 and 2023 which is depicted in the figure 1.



Manganese (Mn) is one out of three toxic essential trace elements, which means that it is not only necessary for humans to survive, but it is also toxic when too high concentrations are present in a human body. Excess manganese interferes with the absorption of dietary iron. Long-term exposure to excess levels may result in irondeficiency anemia. Increased manganese intake impairs the activity of copper metallo-enzymes. The presence of manganese in drinking water supplies may be objectionable for a number of reasons unrelated to health._Highly toxic concentrations of manganese in soils can cause swelling of cell walls, withering of leaves and brown spots on leaves. (U. Singare, P., M. Mishra, R., & P. Trivedi, M. (2012)

In the present study Manganese concentration was observed as $0.504625\ mg/L$ and 0.6984mg/L in the year 2022 and

2023 respectively. The standard concentration of manganese designated by the Central Pollution Control Board is 0.1-0.15 mg/L. The huge spike in the concentration of Manganese in the salt can result in a permanent neurological disorder known as *manganism* with symptoms that include tremors, difficulty walking, and facial muscle spasms. These symptoms are often preceded by other lesser symptoms, including irritability, aggressiveness, and hallucinations. (Toxicological profile for manganese)

IV. CONCLUSION

The considerable amount of Manganese toxicity in the salt pans observed in this study has open doors for more such research. To address health hazards caused by heavy metal toxicity proper information about the sources of the spike, what is the major reason and what measures have to be taken to implement strict laws for effluent management by factories. Not only this but routine checkup of the effluents released in the environment to avoid any leaching causing accumulation. Other measures have to be taken to keep a track of such spike in heavy metal contamination. The present study addresses a problem which no longer could be avoided. Further deeper research has to be done in this field to find solutions for heavy metal contamination before it becomes a life threat.

ACKNOWLEDGMENT

I would like to express my gratitude and appreciation to all those who gave me the possibility to complete this study. A very special thanks is due to my guide and co-author Dr. M. B. Talpade whose help, stimulating suggestions and encouragement helped me in all time of fabrication process and in writing the report.

I would also like to acknowledge with much appreciation the crucial role of our Principal Professor Krutika Desai, Mithibai college, our vice Principal (science) Professor Meenakshi Vaidya for giving me the permission to use the college facilities and equipment. I would also extent a huge thanks to all the Mithibai college staff and lab assistants for their help in performing the tests.

REFERENCES

- Selvam, S., Jesuraja, K., Venkatramanan, S., Roy, P. D., & Jeyanthi Kumari, V. (2021, January). Hazardous microplastic characteristics and its role as a vector of heavy metal in groundwater and surface water of coastal south India. Journal of Hazardous Materials, 402, 123786. https://doi.org/10.1016/j.jhazmat.2020.123786
- [2] Thiyagarajan, Santhanakrishnan & Lakshmanan, Chockalingam & Dr. V., Radhakrishnan. (2016). HEAVY METAL DISTRIBUTION IN THE SALT PANS OF TUTICORIN, TAMIL NADU, INDIA. Journal of Applied Geochemistry. 18. 251-257. https://www.researchgate.net/publication/305317347
- [3] U. Singare, P., M. Mishra, R., & P. Trivedi, M. (2012). Heavy Metal Pollution in Mithi River of Mumbai. *Frontiers in Science*, 2(3), 28– 36. <u>https://doi.org/10.5923/j.fs.20120203.03</u>
- [4] Singare, Pravin & Talpade, M.S. & Dagli, D.V. & Bhawe, V.G.. (2013). Heavy Metal Content in Water of Bhavan's College Lake of Andheri, Mumbai. International Letters of Chemistry, Physics and Astronomy. 13. 94-104. 10.18052 www.scipress.com/ILCPA.13.94
- [5] Nordberg, G. F., & Costa, M. (2021). Handbook on the Toxicology of Metals: Volume I: General Considerations (5th ed.). Academic Press. What are Water Quality Standards? (2022, April 14).

ICHSTE - 2023

- [6] US EPA. https://www.epa.gov/standards-water-body-health/what-arewater-quality-standards
- [7] Toxicological profile for Manganese, Public Health relations https://www.atsdr.cdc.gov/toxprofiles/tp151-c2.pdf
- [8] CPCB / Central Pollution Control Board. (n.d.). CPCB. https://cpcb.nic.in/wqstandards/
- [9] Malik, F. (2019, August 20). 1,781 acres of salt pans spread across Mumbai to be opened up for real estate. Hindustan Times. <u>https://www.hindustantimes.com/mumbai-news/1-781-acres-of-salt-</u>

pans-to-be-opened-up-for-real-estate/storyoRUFOw9V9meOAp27Usj7rI.html

[10] Johnson, C., Santos, J. A., Rosewarne, E., Raj, T. S., Mohan, S., Garg, V., Rogers, K., Maulik, P. K., Prabhakaran, D., Neal, B., & Webster, J. (2019). Sources of Dietary Salt in North and South India Estimated from 24 Hour Dietary Recall. Nutrients, 11(2), 318. <u>https://doi.org/10.3390/nu11020318</u>

Rejuvenation of Historic Forts of Mumbai

Arundhati Nagargoje, Assistant Professor, Thakur School of Architecture Planning Mumbai, India <u>arundhati@tsapmumbai.in</u> Mitali Harmalkar Assitant Professors Thakur School of Architecture Planning Mumbai, India mitali@tsapmumbai.in Vibhuti Mhatre Assitant Professors, Thakur School of Architecture Planning Mumbai, India mitali@tsapmumbai.in

Abstract— The Forts of Mumbai are an intrinsic and invaluable part of Mumbai's heritage. They stand testimony to the City's vitality and importance from its historic past to the present day. Indeed, they are the sentinels who protected Mumbai, are today in desperate need of rejuvenation and preservation. Due to the ravages of time and human neglect, they have deteriorated and are in a poor condition. The forts situated in Mumbai were built at coastlines and along creeks, but are now surrounded by urban sprawl, blurring their identities and stature. This is specifically due to the fact that the surroundings of these sites are left unregulated, neglected, unmaintained, encroached upon and deteriorating at an alarming rate. It's imperative that this is reversed and these historic monuments are restored to the city. The restored heritage will act as a branding tool for its unique historical identity at National level and will link directly with socio-economic benefits to the community at the local level. The research addresses the issues of 'how developing cities inadequately responding to the city's-built heritage and planning framework that leverage inherent value of heritage sites for local economic development and well-being'.

Keywords— Built Heritage, Urban Sprawl, Local development, Rejuvenation, Conservation of Heritage, Encroachment.

I. AIM AND OBJECTIVES OF RESEARCH

The study aims to address issues of built heritage in the City. (1) the initial objectives, to identify ways of historically and architecturally accurate restoration and preservation practices of these invaluable monuments. It further examines, (2) the approach of holistic rejuvenation of the structures of the forts, as well as their surrounding areas, which should be planned and developed into recreational open spaces (3) The study broadly analyses if the said framework can leverage inherent value of heritage sites for local economic development and well-being. (4) Learning's from above could translate into a set of recommendations for planning the rejuvenation of forts, considering applicability and relevance. While citizens can take pleasure in the availability of a viable open space, they can also soak up the history of these wonderful forts and garner information about their importance.

II.INTRODUCTION

Mumbai or Bombaim (Good Bay), as it was called by the Portuguese due to its excellence as a natural harbour, has a rich and varied history. When the Portuguese arrived, Mumbai was an archipelago of seven islands, all heavily fortified. Over time, eleven forts were built in Mumbai, but unfortunately, only nine exist today. All of them are designated as "protected monuments". The consolidation and preservation of these forts is entrusted to two government authorities – The Archaeological Survey of India (ASI), a central body and the Maharashtra State Directorate of Archaeology and Museums, Government of Maharashtra. Within this study, six of these forts have been covered. The fort under the jurisdiction of the



ASI is the Sion Hillock Fort and those under the jurisdiction

Figure 1Spatial map of Forts of Mumbai

A. Effects and responds of heritage to the urban growth around it;

Encroachments and deterioration of Fort structures:

Current guidelines regarding the protection of the forts display a worrying lack of concern. Forinstance, as per the Central Act pertaining to heritage monuments, the Ancient Monuments and Archaeological Sites and Remains Act, 1958, there is a provision for 'Prohibited and Regulated Areas' around heritage structures. According to which, 'every area, beginning at the limit of the protected area, or monument, and extending to a distance of 100 meters in all directions has been specified as the prohibited area for the specific area, or monument'. This prohibits all new construction and regulates all construction activities. However, the Maharashtra State Ancient Monuments and Archaeological Sites and Remains Act, 1960 has

Governing bodies has jurisdiction solely on the structure, and cannot maintain or control the immediate surroundings of the monuments. This has caused severe problems, namely encroachments and deterioration of the structures, especially on Worli, Mahim and Dharavi forts. Case of example; Worli fort's interiors being illegally occupied by a private gym and a temple. Its exteriors being defaced due to the presence of illegally constructed shanties. Despite of no legal provision yet incomprehensibly, the structures were allowed to be built and continue to exist. The Worli Koliwada has existed for centuries near the fort, maintains a certain boundaryfrom the fort. However, a vast amount of the open space surrounding the fort has been encroached upon by slum dwellers, who have built shanties haphazardly, in the surroundingsof as well as in the niches formed by the exterior walls of the fort. The residents of shanties dump garbage in the open area, which has resulted in rapid deterioration of the surroundingsof the monument.



Figure 2 Littering and garbage due to encroachment inside the Mahim Fort

1) Inadequate Restoration Practises :

Currently, the forts are structurally intact, and its original form can be viewed and interpreted from its remains. However, it has been subject to neglect and

Neglegence and insensitive restoration practices, have caused the fort's surfaces to be haphazardly treated with inappropriate materials. Not only it results in a loss of the original structure, but it would also prove detrimental to the structural fabric and life of the monument.

Case of example; Materials like lime plaster or mortar, which are in consonance with the ageof the fort structure, are required to use for the restoration. Though there are innumerable instances in 'Sewri fort' where not suitable materials, such as cement plaster or mortar are used. The walls of 'Sion fort' are covered with graffiti, which suggests a lack of vigilance in themaintenance of the fort. The existing structure of 'Bandra fort' has undergone insensitive restoration and conservation including unnecessarily constructed walls atop the existing onesinstead of preserving the original structure. Worse, these forts have been vandalised in placesby scribbling and graffiti.

2) City's abandoned Heritage : The heritage grading of sites aims to ensure the optimum level of preservation by the concerned authorities, stakeholders as well as the public. However, it remains evident that most citizens are unaware of either the existence or the significance of the forts of Mumbai. This needs to be urgently corrected and it is well known that heritage awareness leads to heritage sensitivity.

In addition, due to neglect, the fort is frequented for illegal and unsocial activities, an issue which must be addressed urgently by the law and order machinery. The surroundings of few forts include mainly Koliwada community (fishermen village). They are equipped with cultural resources which have significant potential to draw Tourist footfall along with creating employment opportunity for the community.

Figure 3 Vandalised and ruines of Bandra fort



B. Consequences of the problem if fails to resolve

If the above issues haphazard growth, ungovernable intrusion, poor planning and inadequateawareness of heritage values are fail to resolved, combined it will produce a host of problems that threaten the tangible and intangible heritage (Persson, 2004) with loss in the Tourism industry and it will affect the opportunity of socio-economic development of the local community.

II. PROPOSED SOLUTION TO THE PROBLEM.

A. Provision of Regulatory guidelines for maintaining the buffer area encroachment free

Recognizing the effectiveness of buffer areas in monuments protected by the ASI, such as, Sion Fort, it's suggested that a buffer zones marked as 'Prohibited and Regulated areas' should be stipulated individually for every fort and heritage monument within the jurisdiction of the. State Directorate of Archaeology and Museums. Along with stipulation of maintenanceguidelines so that any detrimental action in the future, due to negligence, can be prevented.

B. Plan of Action along with Regulatory guidelines

1) Encroachment removal and rehabilitation

The encroachments on the forts and their surroundings must be cleared on an urgent basis, as this is not only a societal detriment, but has evidently caused harm to these invaluable monuments. The clearing of encroachment must be done in association with the necessary authorities, pertaining to issues of regulation and rehabilitation. Undertaking slum rehabilitation schemes will also aid to improve housing conditions of the urban poor. Removal of encroachments would provide a foreground for the fort and introduce recreational spaces around it, which would encourage more visitors to the fort as well as aid to appreciate the actual structure. 1.2) Rejuvenating buffer areas of forts to boost tourism; The surroundings of the forts should ideally be rejuvenated to landscaped green and public open spaces in order to transform the fort to promote recreation and tourism as well as to act as much needed foregrounds for these. The rejuvenation plan would comprise all necessary signages (equipped with digitised information), street furniture and required facilities. While citizens can take pleasure in the availability of a viable open space, it will increase the green cover within the city, a foundational step for sustainability and resilience. Native plantation of trees in the recreational spaces will preserve the native biodiversity and by Geo-tagging them through QR Codes, visitors can receive digitised information about trees like their species, scientific names etc.

2) Adequate & Sustainable restoration practices

To reverse the current unfortunate process of restoration, sensitive and sustainable measures should be adopted for fort's effective restoration to reinstate their former glory which needs to be sensitive towards the structure and its context. It must be performed with the optimum level of skill, craftsmanship and quality of the material. The restoration Approach should include,

a. *Stability*; Stabilization of architectural components and elements is to be done as it is; in the present condition; to avoid from getting damaged further.

b. *Strengthening;* Providing additional strength to the structure, architectural elements and components to make them last longer. This can be achieved by using the chemical as well as natural strengthening materials, such as epoxy grouting or lime slurry grouting or providing copper plates, etc. as per the context of the problem.

c. *Sustainability;* This is achieved by the usage of like - to - like materials or by the introduction of appropriate technology during any proposal of adaptive reuse.

3) Heritage Awareness through Digital Medium & Strengthening Socio-economic bonds

The forts of Mumbai are a symbolic representation of its historic past and subsequent evolution. These forts required to be identifiable in the city space, for recreation and tourism, while being acknowledged as important heritage.

Plan of action

A tool to be developed as An open-source virtual mobile application that will

a. Disseminate vital information about Fort's historical & architectural significance

b. Users will be able to visit the Fort as a virtual reality through the Apps heritage mapping and illustrative storytelling format. Above features will enthuse users to visit these quaint forts and have lived experiences by using the App's navigation tool. With the limitations to physical travel due to Covid- 19 pandemic, virtual exploration of Mumbai's heritage would not only gain momentum as a lived experience but also boost tourism.



Figure 4 Worli Fort Ariel view

c. Promote local culture and economy in an interactive manner. Cultural resources can function as a catalyst in enhancing local livelihood. The cultural resources around fort heritage to be mapped and showcased at the digital platform will lead to tourist's enthuse for in-person experiences. The digitised platform will convey the details of the surroundings of Koliwada community, showcase its cultural wealth; festivals, food, folk music and dance, arts & crafts and mode of life of the people etc. along with location and time to visit. Integrating local artisan's creativity with technology will lead to empower & promote their livelihood.

Virtual learning has become the 'New Normal' these days. The objective for developing such virtual application, to attract tourist to the destinations. Resulting in a boost of the local tourist economy. The official website of State Directorate of Archaeology and Museums and the virtual application tool can be linked for wider reach.

ACKNOWLEDGMENTS

First of all, I would like to express my sincere gratitude towards my team of NAGAR, whose sincerity and support has been a constant source of inspiration. I am greatful for their valuable comments and sharing insights for the relevance of the research. I would like to thank authorities MCGM, MBPT and Heritage cell of Maharashtra for sparing their time for the interviews and discussions and giving expert opinion which aided us in formulation of analysis. My family have been a constant pillar of support and I thank them for always having been there to guide and help out when most needed.

REFERENCES

- [1] Bhalchandra Kulkarni ; "Mumbai Parisaraateel Arthaat Ekekaalchya Firangaanaateel Kille"
- [2] Tasneem Zakaria Mehta; Unlocking Mumbai's Cultural Potential; The Hindu (03.04.2016)
- [3] Ruhi Bhasin; Revisiting the Forgotten Forts, Parts I, II, III; The Indian Express (16.11.2015)
- [4] P.K. Das, Indra Munshi; "On the Waterfront: Reclaiming Mumbai's Open Spaces"
- [5] The Inheritage Project; Once Upon a Time there was a House on a Hill (https:// theinheritageproject.wordpress.com/2014/08/31/onceupon-a-time-there-was-a-house-on-a-hill/)
- [6] Ruhi Bhasin; Hutments, Seepage of Water Breach Mahim Fort, but Swift HelpUnlikely.
- K A Dodhiya; Lack of Conservation, Nature Takes Toll on Mumbai's Oldest Fort; The Asian Age (31.01.2017)

Survey of Avenue Tree Diversity of Mira Road, Thane District

Shubham Mishra

SVKM's Mithibai College of Arts, Chavan Institute of Science and Amrutben, Jivanlal College of Commerce and Economics, Vile Parle, (West), Mumbai, India, Affiliated to University of Mumbai shubhammishra1604@gmail.com,

Abstract - Avenue trees are trees planted along the roadside this could be for beautification, aesthetic values, and better mental health, or as compensation for the damage done to nature while building the concrete jungles. For the current investigation, a survey was conducted across 8 locations in Mira Road from 2021 to 2023. About 634 trees were reported of which 42 trees provide edible fruits, shade and timber. *Terminalia catappa* dominates as the avenue tree of Mira road followed by *Peltophorum pterocarpum*. Thus, this survey is carried out to know the various avenues planted in the said area. It also helps to find out whether the trees grown as the avenue is invasive or native plants

Keywords: Avenues, Trees, Mira Road.

I. INTRODUCTION

Urban forestry is an integrated concept, defined as the art, science, and technology of managing trees and forest resources in and around community ecosystems for the psychological, sociological, aesthetic, economic, and environmental benefits trees provide society¹. Urban vegetation includes trees, shrubs and herbs on public and private lands (parks, streets, backyards), all interspersed within a landscape dominated by paved surfaces. This kind of vegetation plays a vital role in moderating microclimate, sequestering greenhouse gases (CO₂, etc.) and also in aiding the percolation of water². The tree, present along the road side is known as avenue tree, including city along with highway ^{3,4}. Planting trees around the sidewalks and roadside helps in reclamation of the land used in many ways. Urban forestry is considered to be an essential part for improving the quality of life and mental health.

Mira-Bhayander is a city, in the district of Thane. It occupies an area of 79 sq. km., in the western state of Maharashtra, in India. It is located around 20 kms to the north of Mumbai on the Mumbai Ahmedabad highway. It extends between 18°42' N to 20°20' N latitude and 0°25' E to 73°44' E. The whole town is on plain level land. The Vasai creek surrounds the city from east to north, followed by the Arabian Sea, till the west. Mumbai city is situated in the southwest. To the south is the Sanjay Gandhi National Park and to the southeast is Thane city. Geologically the city falls in lava terrain. Uttan and Ghodbunder are hilly regions. The plain terrain forms a wide area of waterlogged and marshy land ⁵. Mira road has developed planned city. In order to maintain the greenery in the city there is huge plantation of trees in very society and along the roadsides 6.7.8. These trees have not all beautified Mira road but also has controlled the pollution to

Bindu Gopalkrishnan

SVKM's Mithibai College of Arts, Chavan Institute of Science and Amrutben, Jivanlal College of Commerce and Economics, Vile Parle, (West), Mumbai, India, Affiliated to University of Mumbai bindu_phd@rediffmail.com

certain extent. Thus to known the diversity and the percentage of trees cultivated as avenue tree the current project is undertaken.

II. METHODOLOGY

Study area: As this project was done during the Covid pandemic, a small area of Mira Road i.e. 8 lanes were considered for the present study. They are, Sanghvi road, NJ Dalmia Road, Jangid complex road, Mira Gaon road, Anant Rao Bhoir Marg, Shrishti road, St. Xavier's school and Little flowers Chowk.

Method: A survey was conducted in the month of December for counting the trees. The frequency of distribution of tree species are tabulated for the record. Photographs were taken of the trees for evidence. The coordinates were recorded using GPS from the mobile phone. The trees were identified by using taxonomic database. Along with trees the visitors of the trees such as birds and butterflies were also studied.

Table No. 1 List of Avenue Trees of Mira road						
Name	Common name	Family	Numb er of trees			
Acacia auriculiformis A. Cunn.ex Benth.	Kadambo	Mimosaceae	1			
Acacia mangium Willd.	Black wattle	Mimosaceae	1			
Alstonia scholaris (L.) R. Br.	Saptaparni	Asclepiadaceae	43			
Azadirachta indica A. Juss.	Neem	Meliaceae	13			
Barringtonia asiatica Kurtz	Samudrafal	Lecythidaceae	13			
Bauhinia purpurea L.	Kachnar	Cesalpiniceae	2			
Casurina equisetifolia L.	Suru	Casurinaceae	1			
Ceiba pentandra (L.) Gaertn	Kapok	Bombacaceae	9			
Delonix regia (Bojer) Raf.	Gulmohar	Cesalpinicaeae	31			
Ficus racemosa L.	Umbar	Moraceae	3			
Ficus religiosa L.	Peepal	Moraceae	44			
Ficus virens var caulocarpa (Miq) M.R. Almeida	Pilkhaan	Moraceae	1			
Gmelina arborea Roxb.	Gambar	Verbenaceae	2			
Lagestromeia floribunda Jack	Tamhan	Lythraceae	2			
Lagestromia speciosa Pers.	Tamhan	Lythraceae	13			
<i>Leucaena leucocephala</i> (Lam.) de Wit	Subabul	Mimosaceae	18			
Mangifera indica L.	Mango	Anacardiaceae	10			

Table No. 1 List of Avenue Trees of Mira road					
Mimusops elengi L.	Bakul	Sapotaceae	31		
Neolamarckia cadamba (Roxb.) Bosser	Kadamba	Rubiaceae	21		
Peltophorum pterocarpum (DC) K. Heyne	Son mohar	Cesalpiniceae	86		
Polyalthia longifolia (Sonn.) Hook.f. & Thomson	False Ashoka	Annonaceae	8		
Roystonea regia (C.F.) Cooke	Royal palm	Arecaceae	19		
Samanea saman (Jacq) Merr.	Rain tree	Mimosaceae	46		
Saraca indica L.	Ashok	Cesalpiniceae	9		
<i>Spathodea campanulata</i> P. Beauty	African Tulip	Bignoniaceae	7		
Swetenia mahogani (L.) Jacq.	Mahogany	Bignoniaceae	10		
Syzgium cumini (L.) Skeels	Jamun	Myrtaceae	10		
Tecoma stans (L.) Griseb	Yellow bells	Bignoniaceae	8		
Terminalia catappa L.	Jangli badam	Combretaceae	138		
Zizyphus mauritiana Lam.	Bor	Rhamnaceae	3		
Moringa pterygosperma Gaertn	Drumstick	Moringacaeae	5		
Araucaria heterophylla (Salisb) Franco	Christmas tree	Arucariaceae	1		
Ficus bengalensis L.	Vad	Moraceae	3		
Tectona grandis L.f.	Teak	Verbenaceae	1		
<i>Gliricidia sepium</i> (Jacq) Kunth ex Walp	Undirmari	Papilionaceae	1		
Senna siamea Lam.	Kassod	Cesalpiniaceae	4		
Muntingia calabra L.	Cheery	Muntingiaceae	1		

III. DISCUSSION

The Mira road city is well established will greenery. During the survey of avenue trees their where many species grown along the roadsides. The eight lanes studied proved to have the following frequency of trees like, *Neolamarckia cadamba* (15), *Lagerstroemia specios* (16), *Mimusops elengi* (13) *Peltophorum pterocarpum* (92) *Terminalia catappa* (138), *Ficus religiosa* (73), *Roystonea regia* (21), *Samanea saman* (29) & *Delonix regia* (31). Besides there are various other trees which are few in numbers. Among these *Terminalia catappa* dominates as avenue tree of Mira road followed by *Peltophorum pterocarpum*.

The trees planted across the roadside helps to reclaim the flora and somewhat the fauna which was lost due to mass urbanisation. These trees are host to many nesting and nonnesting birds like Coppersmith barbet (*Megalaima haemacephala*), Tailorbird (*Orthotomus sutorius*), Asian Koel (*Eudynamys scolopaceus*), Golden Oriole (*Oriolus kundoo*), Alexandrine Parakeet (*Psittacula eupatria*), Common Myna (*Acridotheres tristis*), House Sparrow (*Passer domesticus*), Magpie Robin (*Copsychus saularis*) and Bats etc. These trees also attract pollinators like Birds and Butterflies. Butterflies like Tailed Jay, Common rose, etc have been spotted near these avenue trees.

Trees like Gulmohur (*Delonix regia*), Tamhan (*Lagerstroemia speciosa*) have really showy with bright flowers and hence are of great ornamental importance. Fruiting trees like Mango (*Mangifera indica*) and Figs (Ficus sp.) are relished by people living in close proximity.

Neem tree (*Azadirachta indica*) is of great importance as it is considered as a sacred tree by Hindus and is used in many ceremonies. It is also insecticidal and young twigs are used to clean leaves. Poultice of leaves are drunk early in the morning to expel intestinal worms.

The flowers of *Mimusops elengi* are made into a garland and are offered to Lord Vishnu. The dense canopy also hosts Sparrows.

Fast growing trees like Kadamba (Neolamarckia cadamba) are preferably planted as they attain great height in less time and serve the purpose of providing shade and also nectar to butterflies and birds. Flowering trees like Cassia sp. and Peltophorum pterocarpum shed their flowers and form a yellow mat on the road, which is quite attractive. Saraca asoca, a tree of great importance mythologically and medicinally. It is planted on one of the locations surveyed. The bark is used for preparing drugs that help in easing the urinary problems for women. Planting trees is expensive and it is done through the process of transplantations or stem cuttings. Though in these processes the tree root or stem may incur some damage resulting in drying of the tree. The transplantation cost, pruning and maintaining the tree is expensive and requires many modern vehicles (Arboriculture tree pruner) and tools which are expensive. Trees which are deciduous or undergo natural abscission (Terminalia catappa) should be avoided. It is also seen that over plantation or Terminalia catappa is done in several lanes. Trees like Lagerstroemia sp. and Peltophorum pterocarpum forms a beautiful carpet of flowers but increases the workload of the workers of Municipal corporation.

Non-native trees, or the trees which are introduced (*Delonix regia*, *Acacia sp.*) should be avoided because they compete with the Native trees (Kadamba, Tamhan). Invasive trees or for that matter are considered to be a threat for native ecosystems.

IV. CONCLUSION

Though there are some minimal disadvantages like being expensive and costly, risky methods of pruning, no one can disagree to the fact that these disadvantages are nothing if compared to the daily deforestation done by the mankind. The trees provide us with clean and breathable air, if not were these trees the urban population would succumb to extinction due to increasing rate of pollution. These trees help destress and calm down the mind. Trees are one of the essential parts of our life, it won't be wrong to say that if there are no trees the life on earth won't sustain.

Trees in forest hosts a plethora of biodiversity and provide us with clean, unpolluted air. Trees also act as manure or organic feeders for the soil bed, the dried leaves or burnt leaves provide a high level of organic carbon and other essential elements. These trees host birds which chirp every morning and also provide us with fruits.

Thus, the current study is essentials as the trees are under pressure of climate change and human interventions.

V. REFERENCES

- Anonymous, (1996). Society of American Foresters'Dictionary of Forestry, 1998.
- [2] RamachandraT.V, 42 Harish R. Bhat and Gouri Kulkarni, 2014. Tree species for planting at the sides and median of the roads in Bengaluru,

ENVIS Technical Report 75, ENVIS, Centre for Ecological Sciences, IISc, Bangalore, Pp42

- [3] Professor, Rcsearch Associate, and Lecturer, respectively, Unit of Ecology and Forestry, Botany Department, Panjab.
- [4] Mulani R.M., Khan. K. Z.2R. M. Mulani and K. Z. Khan (2015). "Study Of Avenue Tree Diversity of Urban Area of Nanded district Maharashtra State India,"IJSR., vol. 6pp. 2319 – 7064.
- [5] Anonymous (2008 -2009) Mira Bhayander Municipal Corporation. Environmental Status Report.
- [6] Banani Mandal, Arundhati Ganguly, Arunava Mukherjee and Debabrata Sho Assessment And Analysis Of Avenue Trees In Urban Kolkata : A Case Study
- [7] Brundu, G.; Richardson, D.M. Planted forests and invasive alien trees in Europe: A Code for managing existing and future plantings to mitigate the risk of negative impacts from invasions. NeoBiota 2016, 30, 5–47.
- [8] Invasive Alien Flora Of India C. Sudhakar Reddy, G. Bagyanarayana, K.N. Reddy & Vatsavaya S. Raj

Radiation Damage Study Of Gallium-Arsenide Single Junction Solar Cell

A.W.M.H Ansari K.K. Wagh Institute of Engineering Education and Research, Nashik 422003 India. ISRO Satellite Centre, Bangalore

Abstract—This Gallium arsenide GaAs in solar cells has been developed synergistically. The GaAs solar cell is simulated with PD1C simulation tool. All layers are formed on p-type germanium substrate of 192 μ m thickness. The detailed damage cascade with vacancy produced per ion is then studied with TRIM modeling.

Keywords— solar cell, PIDC, TRIM

I. INTRODUCTION

Use of gallium arsenide in solar cells has been developed synergistically along with its use in light emitting diodes, lasers, and other optical devices. It has a direct band gap of 1.43 eV, nearly ideal for single junction solar cells. The absorption coefficient of GaAs is relatively high and causes sufficient absorption of photons in only a few microns of material. This, along with its high efficiency, makes GaAs very desirable for space applications. The most efficient solar cell to date has been based on this material and cells of 25.1% efficiency have already been confirmed [1]. When used in concentrator application, the efficiency increases to 27.6% [2]. GaAs solar cells have been used as a power source for artificial satellites. As these satellites on their orbits get exposed to space radiations, it is indispensable that these solar cells possess radiation resistance characteristics in addition to high-energy conversion efficiency [3]. Electrons and protons with a wide range of energies dominate the space-radiation environment. Usually, the degradation of solar cells in space is caused by the introduction of radiationinduced recombination centers, which reduces the minoritycarrier lifetime in the base layer of the p-n junction. However, radiation-induced defects can also cause compensation of the base layer, reducing the net majoritycarrier concentration and increasing the resistivity of the material. It is well known that, for low fluences of radiation the degradation of the solar cell is due to the introduction of non-radiative recombination centers. It is only for large fluences that trapping centers induce a non-negligible compensation of free carriers and participate also in the degradation [4]. Hence, in this work, the radiation tolerance of GaAs space solar cells has been evaluated using proton fluence spectra modeled with SPENVIS, SRIM and PC1D tools.

II. EXPERIMENTAL METHODS

A. Modeling of gallium arsenide (GaAs) solar cell using TRIM

GaAs solar cell of n+-Al3Ga7As, n+- GaAs, p-GaAs, p+-GaAs, Ge structure was modeled using SRIM modeling tool,

K. Sankarsubramanian K.K. Wagh Institute of Engineering Education and Research, Nashik 422003 India. ISRO Satellite Centre, Bangalore

so as to irradiate it with proton fluence spectrum obtained from SPENVIS. n+ Al3Ga7As layer of 0.1 μ m is obtained by doping Al3Ga7As with selenium (0.015%). n+- GaAs layer of 0.4 μ m is modeled by doping GaAs with 0.01% selenium. P-type base GaAs layer of thickness 4 μ m is obtained by doping with 0.001% zinc and p+ layer of thickness 3 μ m is formed using 0.01% doping of zinc. All layers are formed on p-type germanium substrate of 192 μ m thickness. This cell structure is irradiated with 1000 proton ions in energy range varying from 0.1 MeV to 50 MeV. The detailed damage cascade with vacancy produced per ion is then studied with TRIM modelling.

III. RESULTS AND DISCUSSION

After To study some details of the damage process, a Monte Carlo binary collision approximation code, SRIM is used as to determine primary-knock- on atom (PKA) distribution taking into account irradiation spectra and shielding in a more realistic way. The main outcome of this simulation study is the intra-cascade damage which produces vacancies in cell structure. The vacancy concentration is obtained from the ratio of net vacancies created by particular proton energy to the total number of atoms comprising the volume. During TRIM run it is observed that GaAs solar cell shows good tolerance for low energy protons, which also reflects in Fig. 1 It shows that vacancy concentration in GaAs at lower fluence is very less. This indicates radiation resistant property of the solar cell material.



Fig.1. Variation of vacancy concentration with fluence

Solar Cell Electrical Parameters Study

To study the electrical parameters and correlation with base lifetime, the GaAs solar cell is simulated with PD1C simulation tool. The major variation is observed in base lifetime due to insertion of recombination levels. This affects electrical parameters like Isc, Voc, Pmax, and FF of the solar cell performance. Fig. 2 shows current-voltage characteristics of GaAs solar cell modelled with PC1D for various lifetimes. I-V curve shows decreased performance of solar cell with respect to decreased lifetime of the solar cell material. It is also observed that solar cell I-V performance is independent of initial lifetime variation from 100 μ s to 1 μ s. The performance is sensitive during lifetime 0.005 to 0.001 μ s, which indicates possibility of leakage current due to junction damage.



Fig. 2 Current-voltage characteristics of GaAs solar cell for different lifetimes

The Fig. 3 shows variation of electrical parameters of cell as a function of inverse of lifetime and increasing fluence. The values presented are normalized to those corresponding to the initial lifetime. It is observed from the graph, that Isc decay is very high with decrease in minority carrier lifetime. The reason behind this is when a defect resides in a bulk region and electron- hole pair recombines at the defect site, then free minority charge carriers are lost. This causes degradation in short circuit current.



Fig. 3 Normalized electrical parameters vs. $1/\tau$ and fluence

IV. SUMMARY AND OUTLOOK

A theoretical model to evaluate radiation damage in GaAs solar cells based on vacancy concentration is presented. Solar cell performance is independent of higher lifetime. This indicates radiation tolerance of the GaAs solar cell. It becomes sensitive in lifetime range 0.005 to 0.001 μ s. As a result, electrical performance of a modelled solar cell shows fast exponential decay in short circuit current.

REFERENCES

- [1] GM. A. Green, K. Emery, Progress in Photovoltaic Research and Applications 1, 1993, pp. 225.
- [2] S. M. Vernon, S. P. Tobin, V. E. Haven, L. M. Geoffrey, M. M. Sanfacon, Proc. 22nd IEEE PV Specia list Conference (Las Vegas, USA) 1991, pp. 353.
- [3] J. C. Bourgoin, M. Zazoui, Semicond. Sci. Technol. 17, 2002, pp. 453.
- [4] Y. Morita, T. Ohshima, I. Nashiyama, Y. Yamamoto, O. Kawasaki, S. Matsuda, J. Appl. Phys. 81 1997, pp. 6491.

Stylistics as a tool for Enhancing Linguistic and Literary Competence: An Activity Based Teaching

Tulshiram Kudale Department of Engineering Sciences & Humanities Thakur College of Engineering & Technology, Kandivali, Mumbai-400101 India tulshiram.kudale@tcetmumbai.in

Abstract - We in this paper try to prove that stylistics is a significant tool for both teaching literary texts and also the target language and its grammar either in a second or foreign language context. Stylistics is generally to be a means of interpreting literary texts with the help of what is available in them. In short, these are the sounds, words, sentences and other textual properties of literary texts, which aid in conveying what the author tries to express through their work. Literary criticism, as against stylistic or linguistic criticism, differs in the way it puts which aspects of literary as its priority. Hence, literary criticism is bound to be the outer and extra-textual factors that more or less influence the work of literature when it is being written. For literary critics of the tradition line a work of literature is the product of its society and surrounding. Since it is never free from the influence of its surrounding, it must not be interpreted in the deprivation from those extraneous factors. Literature is what is generally understood to be the work originating from society and oriented toward society. For structuralists and deconstructionists, works of literature are what exists in the text in the form of linguistic material and the interaction between the text and reader. However, this material is not free of meaning. But meaning is the product of the interaction between the text and reader. Words might mean differently to different people on the basis of cognition, psychological, individual and social confrontations throughout the course of their life. In fact, with the chalk and talk method students remain silent while teacher interpreting a text as per his knowledge and experience whereas teaching through activity from stylistic perspective students can come up with their own interpretations. Our paper attempts to utilize stylistics in the teaching of both literature and linguistics.

Keywords - Stylistics, Literature, Linguistics, Literary Competence, Activity, Teaching Hanmant Ashok Metkari Humanities Department, Sreenidhi Universty, Hyderabad, Telangana, -501301 India hametkari33@gmail.com

I. INTRODUCTION

Literature and linguistics have often been separated on the basis of their focus and objectives. Literature, as Aristotle, describes and directs society in the way most ideal for all the people of society. However, it is not so innocent because literature is also exploited to foreground one particular community's ideology while suppressing or marginalizing the others'. For instance, the literatures of the colonizers and colonized. Language at the same time is the equally important means through which many things are manipulated. Moreover, the languages of the dominant political and social groups, and those of the minority and backward communities. One way in which these two seemingly disparate phenomena overlap is their concern for human life and society. Therefore, literature deals how societies are and how they should be, whereas linguistics concerns itself with human language through which human beings communicate and build healthy social relationships. In linguistics, literature receives an objective attention apart from literary critics where it is simply understood a kind of language use. Unlike literary critics, linguists and stylisticians perceive literature as a way of combining different linguistics to get a particular across the audience. Such a use of language would carry the impression of the creativity of the author. However, writers manipulate of linguistic aspects of a language is appreciable as they succeed in achieving what they want to achieve solely with the use of language. As stylistics treats literary texts as a skilful employment of a language's formal units it studies both the literary aspects of a text and could very well be studied in order to various aspects of the target

Stylistics as a tool for Enhancing Linguistic and Literary Competence: An Activity Based Teaching

language being used in the context of the text. Therefore, stylistics serves a dual function of analyzing and interpreting literary texts with the help of their structural properties and thus is liable to teach language as used in context. Thus, in the present paper we look at the possible ways in which different grammar topics of a language could be effectively using stylistic as a methodological tool for teaching the grammar of the language in question. This particular method has been chosen because of the merits like i) understanding varying usage of different grammatical units of the target language ii) studying language in its actual use iii) studying literature in itself as well. We believe the method would be useful in arousing interest toward a variety of formal aspects of a language, unlike the traditional monotonous way of teaching them. Therefore, under vocabulary synonyms and antonyms, types of sentence, types of tense and so on could be effectively taught using this method.

II. STYLISTICS

Stylistics is the study of literature from the orientation of linguistics. Phonological, lexical, semantic, syntactic and graphology are the levels of stylistic analysis followed and observed generally by different stylisticians. At the level of phonology patterns of sound like assonance, consonance, alliteration, repetition, meter and rhyming words are studied. Lexical level deals with the selection of vocabulary items or words, lexical level is of particular importance in stylistics because words are preferred to sentences in poetry. Next, types of phrases, clauses and sentences are investigated at the syntactic level of stylistic analysis of literary texts. Semantics, further tries to interpret texts with the help of these above aspects like words and sentences of texts.

Additionally, semantic level makes an effort to interpret the uses of figures of speech such as metaphor, parallelism, synecdoche and the like. Finally, graphology pays attention to the textual aspects like the presentation of a poem on the page if they complement the meaning of the text.

All the above levels are finally clubbed together to arrive at a complete interpretation of literary texts in their analysis from stylistic point of view. Stylistics combines both literary criticism and linguistics as it studies literary texts using theories of linguistics and applies to study and interpret literary texts. More importantly, stylistics considers only such aspects that play in giving the meaning of a text and those that are deviant. Hence students could be taught how grammatical rules are violated on purpose by the author to create the effect and meaning he might convey through this deviation which would not have been achieved if not done so.

III. ANALYSIS

A Stylistic Analysis of Sonnet 29

SONNET 29

1. "When, in disgrace with fortune and men's eyes,

2. I all alone beweep my outcast state,

3. And trouble deaf heaven with my bootless cries,

4. And look upon myself, and curse my fate,

5. Wishing me like to one more rich in hope,

6. Featured like him, like him with friends possessed,

7. Desiring this man's art and that man's scope,

8. With what I most enjoy contented least;

9. Yet in these thoughts myself almost despising,

10. Haply I think on thee, and then my state,

11. Like to the lark at break of day arising

12. From sullen earth, sings hymns at heaven's gate;13. For thy sweet love remembered such wealth brings

14. That then I scorn to change my state with kings."

a) Activities for teaching vocabulary-

Various vocabulary concepts like antonyms could be taught in classroom with the help of this poem. Hence, students could be asked to find out synonyms and antonyms for the words like disgrace, fortune, trouble, beweep, bootless, curse, fate, hope, despising, scorn. Additionally, students would be made attentive to the choices made by the author among these words and the likely effect achieved through them. In short, different sheds of meanings could be paid attention to make them careful towards using various words in speaking and writing in different contexts.

Next, apart from building the storage of vocabulary they could be taught the features of different grammatical categories of words like nouns, adjectives verbs, and adverbs and so on. Therefore, the words like hope would be defined as abstract noun according to meaning and asked to find other words of the same or different types. Sweet as an adjective could be defined as modifying nouns and find out other with the same distribution from the poem.

b) Activities for teaching types of sentence and clause-

When, in disgrace with fortune and men's eyes, I all alone beweep my outcast state, And trouble deaf heaven with my bootless cries, And look upon myself, and curse my fate is a compound sentence where I alone beweep my outcast state, trouble deaf heaven with my bootless cries, look upon myself, curse my fate are all dependent clauses in the sentence. Therefore, students could be taught compound sentences as part how the poet has order his thoughts in an ascending order. Hence, they would expect to understand the structure and functional importance of compound sentences like these when teaching writing and grammar. From sullen earth could be used to teach the structure of a prepositional phrase so from would a preposition as the main word of the phrase so labelled as a pp, next sullen is an adjective modifying the noun earth and making it a noun phrase because of the main word earth, which is a noun. Students would further be asked find other types of phrases in the text and understand them.

c) Activities for teaching tense-

Clauses like When, in disgrace with fortune and men's eyes, I all alone beweep my outcast state, And trouble deaf heaven with my bootless cries, And look upon myself, and curse my fate are useful in terms of introducing students different types of tense in the English language. specifically, they would be used to teach how simple present tense is understood and produced to convey the regularity and continuity of certain actions using appropriate form of the verb in accordance with its subject either first, second or third person. I all alone beweep my outcast state is a clause with simple present tense as it has the main verb 'beweep' in its simple present tense and since I is the subject of the clause this form of the verb is correct. Students would be asked to identify such more sentences from the text.

d) Activities for teaching Figures of Speech-

Figures of speech are one of the distinctive features of poetic language in particular and most of the literary writings in general. Like to the lark at break of day arising, From sullen earth, sings hymns at heaven's gate is a clause with the use of simile. So the expression Like to the lark at break of day arising, From sullen earth, sings hymns at heaven's gate has been used by the poet to construct a sense of comparison between his and Lark's love for someone and something. In this context, this sentence can be understood as an example of oxymoron because the word sullen the quality of speaking less on the contrary the word sings means producing words continuously in rhythmic manner. So as the Lark sings in the early morning at the gate of heaven, the poet too, like Lark, prays for his love. Therefore, a sense of similarity of dedication of the Lark's and the poet's love for someone is being conveyed through this comparison in the context of meaning of the present poem. This could be taught to students both to understand how the poet forms comparison between his and the Lark's for someone with the help of simile and oxymoron. Similarly, other comparative constructions like metaphor could be taught and in the activity section they would be asked to the poem carefully and identify and interpret such constructions.

IV. CONCLUSION

The paper has thus far concerned with how stylistics could be a strong and effective tool for teaching language through literature. Although we accept that it is neither the only nor the best approach to teach language, it is pertinent to say that it is of high importance when teaching language through literature. In addition, if it is learned with enjoyment i.e. through activity, it can help students enhance their literary as well as linguistic competence. Moreover, this approach towards literature will enable students to read between the lines understand the contextual meaning. Other aspects of a language like reading and writing could also be successfully taught through this approach of stylistics.

REFERENCES

- Chomsky, N. (1965). Aspects of the Theory of Syntax. Massachusetts: M.I.T. Press.
- [2] Leech, G., Deuchar, M. & Hoogenraad, R. (1982). English Grammar for Today. London: Macmillan.
- [3] Quirk, R. & Greenbaum, S. (1973). A University Grammar of English. Harlow Essex: Longman.
- [4] Wales, K. (1989). A Dictionary of Stylistics. London: Longman.
- [5] Abrams, M. (1981). A Glossary of Literary Terms. New York: Holt, Renehart and Winston.
- [6] Widdowson, H. (1975). Stylistics and the Teaching of Literature. Hong Kong: Longman.
- [7] Nowottny, W. (1965). The Language Poets Use. London: Anthlone.
- [8] Bush, Douglas and Alfred Harbage, eds. Shakespeare's Sonnets. Baltimore: Penguin Books Inc., 1967.
- [9] G.N. Leech (1969), A Linguistics Guide to English poetry, London: Longman
Why Inclusive Growth is Top **Priority of Nations**

Shiv Kumar Shrivastava Mahant Laxminarayan Das College, Raipur, India

Abstract — Financial exclusion is known as lack access to appropriate and affordable financial services and products by individuals. There is various opinions of causes of financial exclusion but the result is one that it exists due to unbanked conditions persist in the society which make them unable to utilize services of banks, formal savings and access to a moderate amount of credit. The financial exclusion is harmful for the society, because at each stages of life finance is required but when there is non-availability of formal finance facility, the person turns to informal sources of finance, which are available on unethical and illegal terms, exceptionally higher rate of interest etc. Informal finance is known as Private Lending, Sahukari Lendings etc. and these types of lending does governs with any rule and regulation but it depends on cleverness of lender to grab the property and other assets of debtors. From this stages many types of inequalities take shapes in the society, out of which a great evil is Bonded Laoubur. Under the circumstances, the UNO, after various thoughts and discussion floated concept of financial inclusion and asked its member countries to adopt is for the betterment of their citizens.

I. INTRODUCTION

Financial inclusion is an attempt to redress problems of vulnerable groups of society with reference to their access, availability and usage of basic financial services which are available in formal service centers in the form of savings, loans and insurance. It is also an endeavor of the government to ensure that access to such facilities i.e. financial products and services be at fair and an affordable cost to the weaker section by maintain a transparency by the players of supply side. It is a process of ensuring access to appropriate financial products and services needed by all sections of the society in general and vulnerable groups such as weaker sections and low income groups in particular at an affordable cost in a fair and transparent manner by mainstream institutional players thus it may be defined as a systematic delivery of banking and other financial services to under privileged sections of society who are unaware of their civic right which can be achieved and enjoyed by use of banking channels available in the country. The new Government realizes that objectives of financial inclusion cannot be achieved only by opening of new bank branches but it has be undertaken as a movement by all sections of the society in committing themselves in achieving objectives of the Prime Ministers Jan Dhan Yajana.

The World Bank has recently issued the following guidance on financial exclusion:

Financial inclusion is crucial for reducing poverty and boosting shared prosperity. The poor benefit greatly from basic payments, savings, and insurance services;

Financial systems are far from inclusive. Half of the world's adults have no bank account;

Policy should focus on fixing market and government failures, not on promoting inclusion for inclusion's sake; and

Policy makers should provide an environment of strong laws and regulations, good information, and healthy competition.

In the world position of Access to a bank account can be reviewed with following table:

Country	Access %	Country	Access %	Country	Access
Australia	98.8	Bangladesh	36.6	Brazil	53.4
Canada	94.3	China	53.4	France	94.9
Germany	96.6	India	32.8	Indonesia	19.5
Italy	69.2	Japan	92.1	Kenya	40.5
Malaysia	62.7	Netherlands	98.1	New Zealand	98.7
Pakistan	10.2	Poland	67.9	Russia	45.9
South Africa	52.5	Sweden	98.9	Uganda	20.1
United Kingdom	96.9	USA	86.9		

TABLE 1: COUNTRYWIDE ACCESS PERCENTAGE OF BANKING FACILITY

[Source: 1 The Inclusive Growth and Development Report 2015]

Access to bank accounts tracks reasonably closely against the economic status and stage of development in each country. A group of 10 high income countries (based on Gross National Income (GNI) per capita) have access rates in the 80 to 100% range. A group of six countries have access rates below 41%, falling to just 10.2% in Pakistan. These six countries are all in the World Bank low income or lowermiddle income bands. Between these two extremes there is a much wider variety of countries, including upper-middle income countries like China (53.4%) and high income countries like Italy (69.2%) that might be expected to have a greater level of access to a bank account.

After introduction of Pradhan Mantri Jan Dhan Yojana in India position of India has improved many folds as many more population were brough in the bank net, which is first conditions of financial inclusion system. A brief detail of converting unbanked population into bank facility holder through Pradhan Mantri Jan Dhan Yojana is as under:

Bank Name	RURAL	URBAN	TOTAL	NO OF RUPAY CARDS	AADHAAR SEEDED	BALANCE IN ACCOUNTS	% OF ZERO- BALANCE- ACCOUNTS
Public Sector Bank	9.08	7.20	16.28	13.94	7.62	25591.34	29.64
Regional Rural Bank	3.16	0.52	3.68	2.64	1.08	5568.78	25.29
Private Banks	0.45	0.30	0.75	0.71	0.25	1218.64	39.23
Total	12.69	8.02	20.72	17.29	8.95	32378.76	29.22

TABLE 2: PROGRESS UNDER PRADHAN MANTRI JAN DHAN YOJANA(ACCOUNTS OPENED AS ON 03.02.2016) (ALL FIGURES IN CRORES)

[Source: 1 Date of Government of India]

The progress and performance of India under Pradhan Mantri Jan Dhan Yojana has been apprises by various contries around the globe.

Some other data of financial exclusion is presented as under to understand necessity of inclusive growth under financial inclusion.

TABLE 3: LEVELS OF FINANCIAL EXCLUSION

COUNTRY	FORMAL SAVINGS (%)	FORMAL LENDING (%)
Australia	61.9	17.0
Bangladesh	16.6	23.3
Brazil	10.3	6.3
Canada	53.2	20.3
China	32.1	7.3
France	49.5	18.6
Germany	55.9	12.5
India	11.6	7.7
Indonesia	15.3	8.5
Italy	15.5	4.6
Japan	51.3	6.1
Kenya	23.3	9.7
Malaysia	35.4	11.2
Netherlands	57.8	12.6
New Zealand	60.4	26.6
Pakistan	1.4	1.6
Poland	18.0	9.6
Russia	10.9	7.7
South Africa	22.1	8.9
Sweden	63.6	23.4
Uganda	16.3	8.9
United Kingdom	43.8	11.8
USA	50.4	20.1

[Source: ¹ The Inclusive Growth and Development Report 2015]

Access to formal savings also aligns with the economic status and stage of development in each country, although not as closely as access to banking. A group of nine high income countries have access rates in the 50% to 65% range. Likewise, The formal lending data diverges from the (strong) pattern we have seen for access to banking and the (weaker) pattern for access to savings. A much smaller group of just seven nations have high rates of access to formal lending, in a tight range between 17% to 27%.

II. INCLUSIVE GROWTH

Inclusive growth is a concept that advances equitable opportunities for economic participants during economic growth with benefits incurred by every section of society. The definition of inclusive growth implies direct links between the macroeconomic and microeconomic determinants of the economy and economic growth. The microeconomic dimension captures the importance of structural transformation for economic diversification and competition, while the macro dimension refers to changes in economic aggregates such as the country's gross national product (GNP) or gross domestic product (GDP), total factor productivity, and aggregate factor inputs.[4]

K.C.Chakrabarty, Deputy Governor of RBI in this speech clarifies the meaning of inclusive growth.

Inclusive growth as the literal meaning of the two words refers to both the pace and the pattern of the economic growth. The literature on the subject draws fine distinction between direct income redistribution or shared growth and inclusive growth. The inclusive growth approach takes a longer term perspective as the focus is on productive employment rather than on direct income redistribution, as a means of increasing incomes for excluded groups. Inclusive growth is, therefore, supposed to be inherently sustainable as distinct from income distribution schemes which can in the short run reduce the disparities, between the poorest and the rest, which may have arisen on account of policies intended to jumpstart growth. While income distribution schemes can allow people, to benefit from economic growth in the short run, inclusive growth allows people to "contribute to and benefit from economic growth".

What is inclusive growth?

The 'inclusive growth' as a strategy of economic development received attention owing to a rising concern that the benefits of economic growth have not been equitably shared. Growth is inclusive when it creates economic opportunities along with ensuring equal access to them. Apart from addressing the issue of inequality, the inclusive growth may also make the poverty reduction efforts more effective by explicitly creating productive economic opportunities for the poor and vulnerable sections of the society. The inclusive growth by encompassing the hitherto excluded population can bring in several other benefits as well to the economy. The concept "Inclusion" should be seen as a process of including the excluded as agents whose participation is essential in the very design of the development process, and not simply as welfare targets of development programmes (Planning Commission, 2007).

I Inclusion is one of the most important words spoken with regard to diversity. But the most frequent spoken word among them could be inclusive growth. Inclusive growth basically means making sure everyone is included in growth, regardless of their economic class, gender, sex, disability and religion. Inclusive growth approach takes on long term perspective and the focus is on productive employment rather than merely direct income redistribution as a means of increasing income for excluded groups. Thus inclusive growth approach took a long term perspective of development.



Figure 1 Inclusive Growth and Development Framework

r Share d'income is used for Adramed Economies and Share of the Middle Classics used for Upper Middle Income, Lower Middle In

According to World Bank, the growth said to be inclusive when the growth to be sustainable in long run and it should be broad based across the sector and inclusive of large part of countries labour force. Inclusiveness should understand in the sense and focusing on equality of opportunity in terms access to markets, resources and unbiased regulatory environment for business and individual. Sustainable economic growth requires inclusive growth. Maintaining this is sometimes difficult because economic growth may give rise to negative externalities, such as a rise incorruption, which is a major problem in developing countries. Nonetheless, an emphasis on inclusivenessespecially on equality of opportunity in terms of access to resources, and an unbiased markets, regulatory environment—is an essential ingredient of successful growth. The inclusive growth approach takes a longer-term perspective, as the focus is on productive employment as a means of increasing the incomes of poor and excluded groups and raising their standards of living.

The International Monetary Fund's Examination of Inequality, Redistribution, and Growth Economists are increasingly focusing on the links between rising inequality, the role of redistribution, and the fragility of growth. The emerging consensus is that inequality leads both to lower and sustainable-growth. more fragile-less The macroeconomic effects of redistributive policies will reflect a balance between the components of the fiscal package, and it is an empirical question whether redistribution is pro- or anti-growth in practice. Lower net inequality is robustly correlated with faster and more durable levels of growth, controlling for the extent of redistribution. Redistribution itself appears generally benign in terms of its impact on growth - for the average country, it reduces inequality, which has protective effects both for the level and the sustainability of economic growth.

The World Bank recently adopted the "twin goals" of reducing extreme poverty to 3 percent or less globally by 2030, and boosting "shared prosperity" – defined as growth in the income of the bottom 40% in every country. Economic growth will be fundamental to achieving these goals, but growth alone will not be enough. If growth over the last 10 years is extrapolated to 2030, without changes in inequality, extreme poverty would decline to only 5.6% from 14.5% today. Analysis of growth in developing countries over the second half of the last decade shows that the bottom 40% grew faster than the country average in more than 70% of the cases for which data is available – but this growth was very low in a significant minority of these countries. In some high-growth countries, shared prosperity was often spured by social transfers, which may not be sustainable going forward.

III. CONCLUSION

Inclusive growth with stability is not possible without achieving universal Financial Inclusion. Thus, financial inclusion is no longer a policy choice today but a policy compulsion, so, the task of achieving financial inclusion for inclusive growth becomes top priority of nations. India must take further action to ensure that the growth process is broadbased in order to expand a small middle class and reduce the share of the population living on less than \$2 a day (many of them in poverty despite being employed). Educational enrollment rates are relatively low across all levels, and quality varies greatly, leading to notable differences in educational performance among students from different socioeconomic backgrounds. Why Inclusive Growth is Top Priority of Nations



Figure 2 Inclusive Growth and Development Framework

While unemployment is not as high as in some other countries, the labor force participation rate is low, the informal economy is large, and many workers are in vulnerable employment situations with little room for social mobility. India under-exploits the use of fiscal transfers. Its income tax is regressive and social spending remains low, which limits accessibility of healthcare and other basic services. Sanitation continues to be a problem across the board. India scores well in terms of access to finance for business development and real economy investment, yet new business creation continues to be held back by the large administrative burden of starting and running companies, corruption, and underdeveloped infrastructure.

REFERENCES

- E. Ianchovichina and S. Lundstrom Gable, "What Is Inclusive Growth?" in Commodity Prices and Inclusive Growth in Low-Income Countries, eds. R. Arezki, C. Pattillo, M. Quintyn, and M. Zhu (International Monetary Fund, 2012): 147-60.
- [2] Singh and R. Dhumale, "Globalization, Technology, and Income Inequality: A Critical Analysis," World Institute for Development Economic Research, Working Paper no. 210 (2000),acprof-9780199271412-chapter-6; for the change in labor shares, see B. Neiman and L. Karabarbounis, "The Global Decline of the Labor Share," The Quarterly Journal of Economics, Volume 129, No. 1 (2013): 61-103.
- [3] The Inclusive Growth and Development Report 2015
- [4] Berg and Ostry, 2011 Wikipedia.
- [5] A Measured Approach to Ending Poverty and Boosting Shared Prosperity: Data, Concepts, and the Twin Goals," DECRG Policy Research Report (World Bank, 2014).

Author Index

Α			
Aafiya Siddiqui	55 - 57	Meghna Talpade	123 - 125
Achala Khandelwal	78 - 82	Minal Bhoir	70 - 73
Amol Joglekar	88 - 92	Mitali Harmalkar	126 - 128
Ansari Abdul Wadood	132 - 133	Ν	
Anshul D Sinha	111 - 118	Neha Mishra	27 - 29
Anup Chavhan	65 - 69	Neha Mishra	30 - 32
Archana Kulkarni	83 - 87	Р	
Archana Kulkarni	99 - 103	Prajakta Kamble	48 - 54
Arundha Nagargoje	126 - 128	Priyanka Pehelke	114 - 120
Arya Mishra	4-10	Pooja Mehta	119 - 122
Ashish Richhariya	33 - 36	R	
Ashwin Pathak	8 - 10	Radha Sonvadekar	74 - 77
Ashwin Pathak	27 - 29	Rajni Bahuguna	4 - 10
Ayushi Singh	123 - 125	Rajesh Kenny	11 - 13
B		Rohan Sharma	4 - 10
Bhakti Godambe	111 - 118	Rohitkumar singh	30 - 32
Bhumika Malhotra	24 - 26	Rohitkumar singh	41 - 43
Bindu Gopalakrishnan	129 – 131	S	
Brijesh Gupta	33 - 36	Sainath Bhaysar	1 - 3
Brijesh Gupta	93 - 95	SajjanLal Kumar	14 - 17
D		SajjanLal Kumar	25 - 30
Daniel D'souza.	108 - 110	Sanjay Rukhande	14 - 17
Dhruvin Soni	108 - 110	Sarika Awasthi	58 - 60
Ε		Satish Kumar	18 - 23
Ekta Desai	83 - 87	Siddhesh mane	61 - 64
Ekta Desai	99 - 103	Shivani Singh	96 - 98
Ela Agarkar	8 - 10	Shiv Kumar Shrivastava	137 - 140
Ela Agarkar	27 - 29	Shivram Poojari	44 - 47
Ela Agarkar	30 - 32	Shruti Deshpande	121 - 124
Esa Shaikh	108 - 110	Shrikrishna Sonawane	24 - 26
Н		Smit Goghari	111 - 118
Hanmant Ashok	134 - 136	Sneha Khandait	93 - 95
Hardika Jain	4-10	Soma Karmokar	41 - 43
Harikumar Pallathadka		Sonal Gaikwad	93 - 95
J		Sonali Singh	31 - 34
Jitendra Patil	11 - 13	Subham Mishra	129 - 131
Jyoti Vanawe	58 - 60	Sunita Pachori	1-3
ĸ		Sunita Pachori	48 - 52
Karishma Bhandari	41 - 43	Suraj Singh	61 - 64
Karthik Sankararaman	44 - 47	Saylee Soundalgekar	104 - 107
Karuna Nikum	37 - 40	T	
Karuna Nikum	48 - 52	Tulshiram Kudale	134 - 136
Karuna Nikum	53 - 56	V	
Kashi Vishwanath	132 - 133	V.R. Gaval	14 - 17
Kasturi Pradhan	119 - 122	Vibhuti Mhatre	126 - 128
Kiran Sanap	27 - 29	Vikas Nagve	41 - 43
Kiran Sanap	30 - 32	Vinita Agarwal	4-7
Kshama Shukla	37 - 40	Y	
Μ		Yogita Sagare	48 - 54
Manjiri Dorati	55 - 57	- •	
Meghna Singh	33 - 36		

Location Plan



A - Block, Thakur Educational Campus, Shyamnarayan Thakur Marg, Thakur Village, Kandivali (East), Mumbai - 400 101 Tel.: 022-6730 8000 / 8106 / 8107 Telefax: 022-2846 1890 • Email: tcet@thakureducation.org

• Website: www.tcetmumbai.in www.thakureducation.org