AhmednagarJilha Maratha Vidya Prasarak Samaj's
Shri Chhatrapati Shivaji Maharaj College of Engineering, Nepti, Ahmednagar
Survey No. 162 & 163, Nepti, Nagar - Kalyan Road, Ahmednagar - 414005. Maharashtra
Phone No :- 0241 -2568383 Unipune - ID CEGA019270 Fax No: - 0241 -2568384
Email: ajmvps123@gmail.com, scsmcoe.anr@gmail.com, Website: www.scoea.org

Approved by AICTE New Delhi, Govt. of Maharashtra & Affiliated To Savitribai Phule Pune University.

3.2.1 Number of papers published per teacher in the Journals notified on UGC website during the year 2023-24

Index- 3.2.1

AhmednagarJilha Maratha Vidya Prasarak Samaj's
Shri Chhatrapati Shivaji Maharaj College of Engineering, Nepti, Ahmednagar
Survey No. 162 & 163, Nepti, Nagar - Kalyan Road, Ahmednagar - 414005. Maharashtra
Phone No :- 0241 -2568383 Unipune - ID CEGA019270 Fax No: - 0241 -2568384
Email: ajmvps123@gmail.com, scsmcoe.anr@gmail.com, Website: www.scoea.org

Approved by AICTE New Delhi, Govt. of Maharashtra & Affiliated To Savitribai Phule Pune University.

3.2.1 Number of papers published per teacher in the Journals notified on UGC website & Patent during the year 2023-24

List- 3.2.1

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 | Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 3, March 2024 ||

| DOI: 10.15680/IJIRCCE.2024.1203176 |

Survey towards Banking System Transaction with Hybrid Biometric Verification

Prof. Kamini Shirish Bhole

Assistant Professor, Dept. of Electronics and Telecommunication Engineering, Shree Chatrapati Shivaji Maharaj College of Engineering, Ahmednagar, India

ABSTRACT: In this modern world, almost everyone uses online platform which allow people to transfer and with draw cash. This transaction if carried out through biometric authentication of every individual proves to be more secure. Biometric authentication refers to the automatic identification of a person by analyzing their physiological and/or behavioral characteristics or traits. Since many physiological and behavioral characteristics are unique to an individual, biometrics provides a more reliable system of authentication than ID cards, keys, passwords, or other traditional systems. A wide variety of organizations are using automated person authentication systems to improve customer satisfaction, operating efficiency as well as to secure critical resources. Now a day an increasing number of countries including India have decided to adopt biometric systems for national security and identity theft prevention, which makes biometrics an important component in security-related applications such as: logical and physical access control, forensic investigation, IT security, identity fraud protection, and terrorist prevention or detection. Various biometric authentication techniques are available for identifying an individual by measuring fingerprint, hand, face, signature, voice or a combination of these traits. New biometric algorithms and technologies are proposed, tested, reviewed, and implemented every year. The system aims to provide biometric authentication of fingerprint and face recognition for secure transaction for monetary in banks. Fingerprint authentication uses IoT technology for processing while face is scanned with deep learning for security and privacy towards transaction.

KEYWORDS: Face Recognition, Fingerprint , CNN , Banking, Biometric

I. INTRODUCTION

In financial sector, traditional method for transaction was authentication by signature of person . With advance of technology the card-and-PIN system are in use for any transactions, which works well, The cards also serve functions beyond the ATMs, as debit cards and as advertising for the banks. However, companies that make automated teller machines have found budding markets for the fingerprint technology where citizens already are accustomed to the use of fingerprints for general identification, such as ID cards they carry. Biometrics is certainly the most secure form of authentication. It's the hardest to imitate and duplicate. Thus Biometric can be made best choice for identification and authentication of transaction. In modern days, Everyone used to do banking like storing cash and withdrawing cash. The clients will be in line to extract cash from the bank. Traditional method for transaction was authentication by signature of person . The system is prone to fraud as signature of person can be impersonated to make the transaction in Banks. With advance of technology the card-and-PIN system are in use for any transactions, which works well, But carrying card everywhere and losing it becomes more dangerous. Such as may be theft, misplaced, duplicated, or forgotten; passwords may get distributed, unremembered, hacked or seen by some third party. Banks needed a good mechanism to manage protection for the clients to make the transaction in the banks.

II. RELATED WORK

1. Sharma, Risabh. "ATM Management System." (2021)

In this paper, Decision-makers need to value a guaranteed level of security through biometric systems and the potential for change which ensure that voters' thumbs during registration and voting days are properly placed on a fingerprint scanner, to Test verification should be done to verify the file[1].

2. Kadam, Pankaj Anil, Pradnya Pramod Patil, and Supriya Yogesh Naik. "Enhanced ATM Security based on Machine Vision."(2021)

In this paper, The implementation of ATM security by using fingerprint also contains the primary verifying methods, which were inputting customer fingerprint, which is send by the controller and verified properly. The security Features

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 | Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 3, March 2024 ||

| DOI: 10.15680/IJIRCCE.2024.1203176 |

were enhanced largely for the steadiness and reliability of owner recognition. The whole system was built on the fingerprint technology, which makes the system safer, reliable and easy to use. This will be most trusted and secure technology at electronic money transaction.[2].

3. Aldakheel, Eman Abdullah, and Mohammed Zakariah. "MOBILE DEVICES AND CYBERSECURITY ISSUES AUTHENTICATION TECHNIQUES WITH MACHINE LEARNING." (2021)

Cybersecurity is the most important and hot research topic, especially at this time. As people are getting more dependent on digital systems and critical and sensitive information's are stored on these digital devices. There is an advantage of using these devices and gadgets. Still, at the same time, there is a risk of getting attacks on these sensitive files, be it money or essential transaction information for business dealings like customer information for a business. In this study, various security threats have been discussed, mainly for mobile devices. First, the harmful effects of using mobile phones concerning the attacks on these devices have been discussed. After that, authentication techniques are discussed, which show the various methods being applied to safeguard the mobile devices from intruders for malware attacks[3].

4. IYAWE, OG, EI IHAMA, and PCI IGBINIGIE. "THE NEED FOR A BIOMETRIC SYSTEM FOR CLASSROOM ATTENDANCE."(2021)

In this paper we employ a computerized facial recognition attendance monitoring technique which will enable the department to properly ascertain the academic strength of each student in terms of student regularity to classroom lectures and commitment to classroom learning, and generate reliable student attendance report stored in a secured database. The software was developed using Visual Basic.Net which connects the text field to database and MySQL was used for the database design.[4].

5. Tait, Bobby L. "Aspects of Biometric Security in Internet of Things Devices." 2021.

This paper provides detailed insight into the general mechanisms utilized for biometric appli cation in Internet of things devices. The mechanisms and internal working of these biometric technologies presented in this paper are focused specifically on the applicability in IOT devices. IOT devices incorporates various scanners and sensors to allow the IOT device to biometrically interact with a human being. These scanners and sensors were primary designed to facilitate and ease user interaction with the IOT device in an effort to make the day to day usability of the IOT device faster and easier if you may. It must be noted that every biometric technology has certain strengths, but indeed, also certain noteworthy shortcomings. It is often these shortcomings that get exploited in a security subversion attempt. This chapter introduces and discusses the various biometric technologies used in IOT devices. Attention is given to the software and the hardware aspects of each biometric system. The generic working of these biometric technologies is presented. Attention is given to legacy biometric technology implemented on IOT devices, currently used biometric technology implemented on IOT devices, and finally, possible future biometric applications of biometric technology destined for IOT devices. In conclusion practical examples of biometric subversion on IOT devices such as fingerprint, facial and voice biometric subversion and hacking, will be investigated, discussed and evaluated[5].

6. Multi-scale feature extraction for single face recognition.

Single sample face recognition has always been a hot but difficult issue in face recognition. The existing methods solve this issue from selecting robust features or generating virtual samples. By considering selecting robust features and generating virtual samples simultaneously, the paper proposes a multi-scale support vector transformation (MSSVT) based method to generate multi scale virtual samples for single image recognition. The methods to solve problems are divided into two categories. One is to look for and select features that are robust to the number of samples, from the point of view of feature selection, such as PCA and 2DPCA. But when each person has only one face to be trained, the feature information extracted from the feature extraction algorithm will also be very limited, resulting in a bad recognition performance. The other is to generate multiple virtual samples from the point of view of the extended sample, thus reducing the impact of the sample size.

III. PROPOSED ALGORITHM

The system proposes a hybrid approach to use fingerprint and iris scan for authentication. The system applies fingerprint scanner with MFS100 hardware device for authentication for fingers. The system uses deep learning technology for scanning face. Secure authentication for monetary transaction in banks is done with same.

A. Modules

-Account Register

- Account is Created in Bank.
- Biometric is Registered.
- Image is captured .

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 | Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 3, March 2024 ||

| DOI: 10.15680/IJIRCCE.2024.1203176 |

- Fingerprint is Registered.

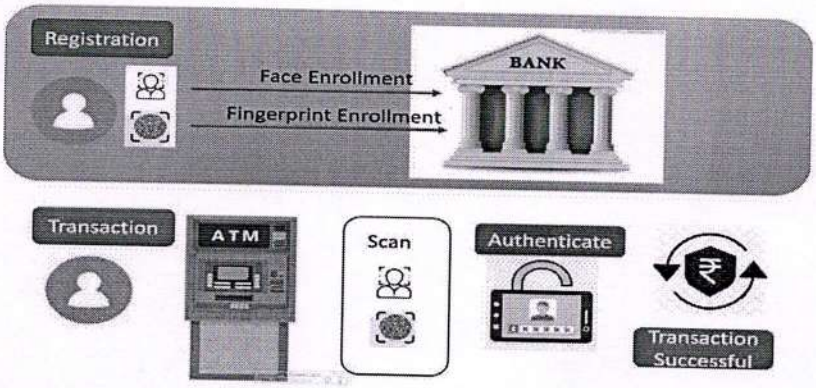
-Request Transaction

- Transaction is Requested.
- Face Detection is detected.
    1. Locate one or more faces in the image and mark with a bounding box.
    2. Face Alignment. Normalize the face to be consistent with the database, such as geometry and photometrics.
    3. Feature Extraction. Extract features from the face that can be used for the recognition task.
    4. Face Recognition. Perform matching of the face against one or more known faces in a prepared database.
- Fingerprint is detected.

-Verify And Authenticate

- Face is Verified and Authenticated.
- Fingerprint is verified authenticated,
- Transaction is Processed

B. System Architecture



. Figure 1 System Architecture

C. Sequence For System :

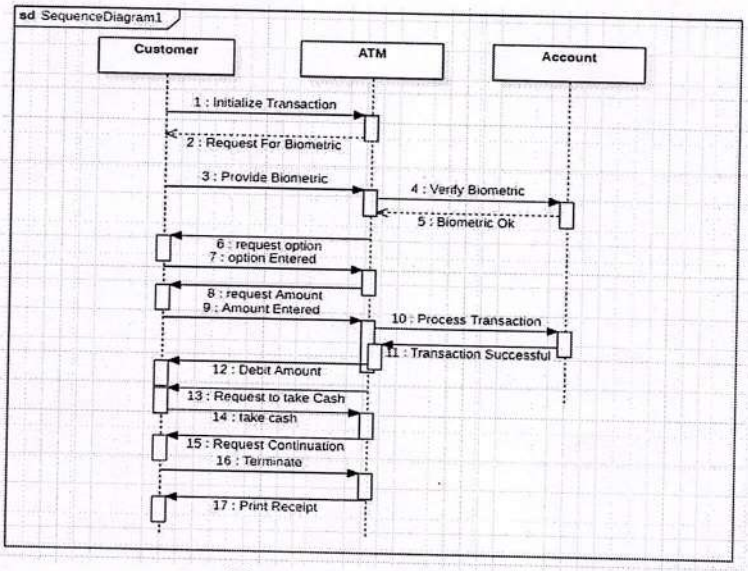


Figure 2 Sequence Diagram

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 | Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 3, March 2024 ||

| DOI: 10.15680/IJIRCCE.2024.1203176 |

IV. CONCLUSION AND FUTURE WORK

The present system for internet banking requires the user to always remember the username and password for all the account that he holds across various branches. If biometric login is used instead, the user does not have to remember the credentials as all the accounts are now being Aadhaar linked. If an unknown person knows the credentials of a user then the wrong use of the account can be done and money can be transferred from the user's account without his/her knowledge. In this system it is never possible as the user needs to give the thumb impression and face recognition while logging . In the system an additional hardware is present i.e. the finger print scanner and camera, which is to be attached to the computer while logging into the system. Moreover the cost of the fingerprint scanner is an additional burden to the user, but if produced in large scale for the users' the cost of the fingerprint scanners' will reduce.

REFERENCES

1. Sharma, Risabh. "ATM Management System." Turkish Journal of Computer and Mathematics Education (TURCOMAT) 12, no. 6 (2021): 5151-5160.
2. Kadam, Pankaj Anil, Pradnya Pramod Patil, and Supriya Yogesh Naik. "Enhanced ATM Security based on Machine Vision."2021
3. Aldakheel, Eman Abdullah, and Mohammed Zakariah. "MOBILE DEVICES AND CYBERSE CURITY ISSUES AUTHENTICATION TECHNIQUES WITH MACHINE LEARNING." Journal of Management Information and Decision Sciences 24 (2021): 1-15.
4. IYAWE, OG, EI IHAMA, and PCI IGBINIGIE. "THE NEED FOR A BIOMETRIC SYSTEM FOR CLASSROOM ATTENDANCE." (2021)
5. Tait, Bobby L. "Aspects of Biometric Security in Internet of Things Devices." In Digital Forensic Investigation of Internet of Things (IoT) Devices, pp. 169-186. Springer, Cham, 2021.
6. X. Xu, L. Zhang and F. Li, "MSSVT: Multi-scale feature extraction for single face recognition,"2018 24th International Conference on Pattern Recognition (ICPR), Beijing, 2018, pp. 1996-2001, doi: 10.1109/ICPR.2018.8545343

Journal of Mines, Metals and Fuels, 71(12): 2747-2750; 2023. DOI: 10.18311/jmmf/2023/41765

Print ISSN : 0022-2755

INFORMATICS JOURNALS

Journal of Mines, Metals and Fuels

Contents available at: www.informaticsjournals.com/index.php/jmmf

Enhancement Mechanical Properties of CI200 Material using Magnetic Field

Mohnesh Dnyaneshwar Mandhre[1] and Sachin Ghalme[2]*

[1]*Research Scholar, Dr. Vithalrao Vikhe Patil College of Engineering, Ahmednagar - 414001, Maharashtra, India; mohneshphdwork@gmail.com*

[2]*Associate Professor, Department of Mechanical Engineering, Sandip Institute of Technology and Research Centre, Nashik - 422213, Maharashtra, India; sachin.ghalme@sitrc.org*

Abstract

The casting method is one of the primogenital methodologies involving squeezing and jolting the green sand used as molding material and further was established with the use of binders such as clay or organic resin. The constant search for innovative molding material leads to the magnetic process parameters i.e. magnetic field. The preliminary trials on one of the process parameter i.e. magnetic field were carried out and the input parameter for the magnetic mold was optimized. In this work CI200 cast iron has been used for the melting casting route using a furnace and the molten metal is poured into a magnetic mold in terms of altering voltage 60 Volts, 100 Volts, and 150 Volts provide to mold. CI200 casting in magnetic mold and also the espousal of magnetic field for boosted mechanical property. The CI200 casting produced from the magnetic mold was subjected to mechanical tests i.e. strength and Percentage elongation and data compared with the casting of the same composition made in sand casting. It observed that the tensile strength of CI 200 was found that 137.2424 MPa without magnetic field and with magnetic field 195.5463 MPa for 60 Volts, 216.3047 MPa for 100 Volts, and 237.3373 MPa for 150 Volts respectively the tensile strength obtained from CI200 casting made in an increasing magnetic field increase tensile strength The result suggests that casting of magnetic mold material will higher properties as compared to conventional sand casting material.

Keywords: *Casting, CI200, Magnetic field, Mechanical Property*

1.0 Introduction

The Casting is one of the elementary methods, but the components produced by the casting process invariably have flaws. Casting is used as a production technique in almost every industry, either directly or indirectly[1]. There is a need in the casting process for reducing casting defects and improving mechanical properties using various methods[2-5]. When considering the casting process, several parameters must be observed, as the material's properties can fluctuate[6-9]. To progress the quality of casting the type of other molds like metal mold, no-bake sand mold, shell mold, etc. are being employed[10,11]. Therefore, the focus should be on assessing the best method that yields the best results in terms of property. There is major potential for modifications in the casting process to adopt new processes and technologies that can increase the mechanical properties of the product[12-14]. Even slight modifications in the casting process can significantly change the properties of the product[15]. In this context, the development of magnetic mold with the application of magnetic field finds popularity. The intensity of the magnetic field depends on the voltage supply so here we are varied voltage for producing a magnetic field which

*Author for correspondence

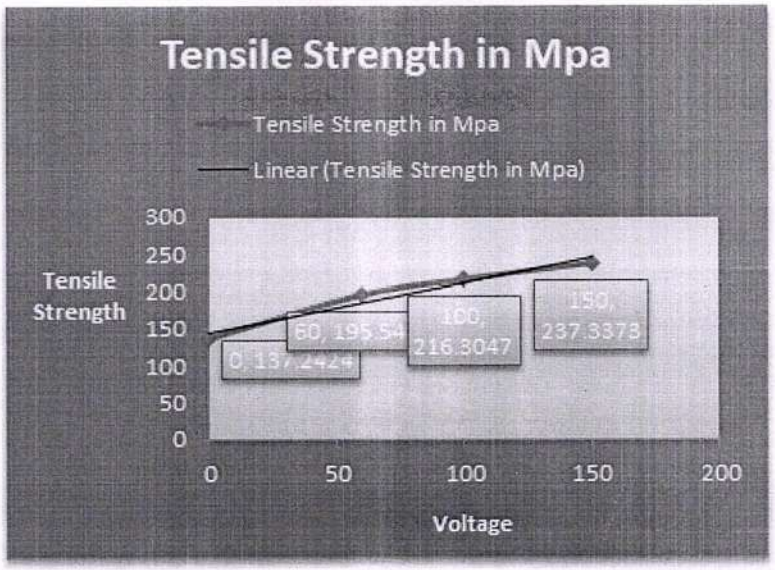


Figure 3. Tensile Strength Vs Voltage.

concluded that increasing magnetic intensity increasing tensile strength

- It was also observed from work that change in magnetic field strength has an effect on the mechanical properties. When the field strength is varied from 60V to 150V tensile strength better over sand casting.

The use of magnetic field to produce casting has shown excessive promises and an attempt may be made obtain these casings in the field more properties in the future.

6.0 Acknowledgment

I would like to thank my supervisors Dr. Sachin Galame for their invaluable advice, continuous support, and patience during my PhD study. Their immense knowledge and plentiful experience have encouraged me in all the time of my academic research and daily life all their help and advice with this PhD. I would also like to thank head of department Prof. R.R. Navthar, whom without this would have not been possible.

7.0 References

1. Basavarajappa VN, Niranjan HB and Manjunatha V. Innovative casting using magnetic materials. International Journal of Engineering Researches and Management Studies. 2017 March; 3(2):82-88.
2. Ranjit JS, Trushar BG. Numerical analysis on the flow of molten steel in the casting cavity in the presence of magnetic field. Elsevier Ltd. 2021; 356-361.
3. Chen L, Li J, Zhao Y, Li M, Li L, Chen L, Hou H. Numerical simulation and optimization of indirect squeeze casting process. Engineered Science Eng. 2021; 13:65-70.
4. Amir HI, Abdel-Hamid IM. Conventional stir casting versus ultrasonic assisted stir casting process: Mechanical and physical characteristics of AMCs. Journal of Alloys and Compounds. 2019.
5. Kumar A, Kumara S. Introduction to magnesium alloy processing technology and development of low-cost stir casting process for magnesium alloy and its composites. 2018 September; 6(3):245-254.
6. Apparaoa K, Birrub AK. Optimization of die casting process based on Taguchi approach. Science Direct Materials. 2017; 4:1852-1859.
7. Kumar A, Singh RC, Chaudhary R. Recent progress in production of metal matrix composites by stir casting process: An overview. International Conference on Mechanical and Energy Technologies Materials. 2019 August; 14:656-668.
8. Vairamuthu J, Stalin B, Sivakumar GD, Fazil DM, Balaji R, Natarajan VA. The effects of process parameters for synthesized copper metal matrix using stir casting process. Materials Today. 2010.

is 60 Volts, 100 Volts, and 150 Volts. The casting has been obtained by melting CI 200 alloy in the furnace. Further casting is produced in die molds. The casting has been characterized for tensile strength which is compared with sand casting which is the conventional method.

2.0 Materials

In this experimental work, we are selecting CI200 material with a composition where carbon varies from 2.95 to 3.45%, silicon ranges from 2.10 to 2.90%, manganese is between 0.55 to 0.75%, sulfur is 0.04%, and phosphorous is 0.10%. The tensile strength of the material is 207 MPa.

3.0 Experimental Procedure

The Hollow cylinder taken in which is surrounded by copper wire winding whose number of turns is fixed which is 15 turns and given voltage to winding is changing like 60 Volts, 100 Volts and 150 Volts by using dimmer.

As per the experimental setup, it consists of copper winding wound around a mold. Dimmers are used to change the voltage, thereby varying the magnetic field. Electric supply is provided to the mold through the copper winding, resulting in the generation of magnetic fields that vary with the dimmer.

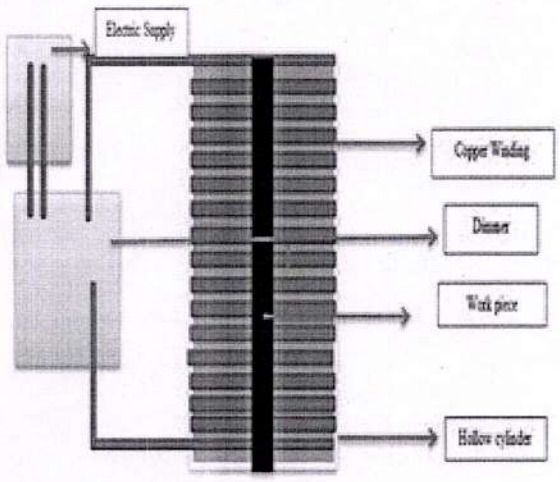


Figure 1. Schematic Diagram of Magnetic Moulding Setup.

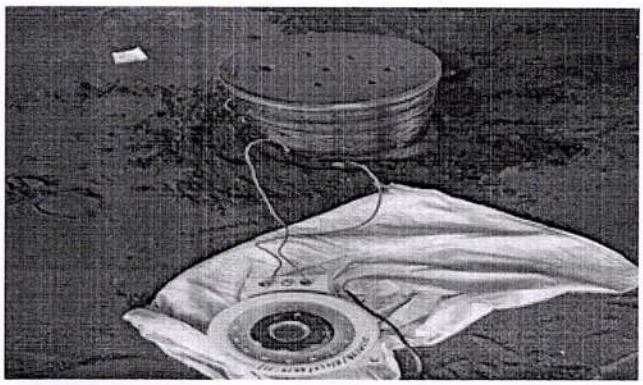


Figure 2. Magnetic Mold with Dimmer.

4.0 Result and Discussion

When liquid metal was poured into the magnetic mold, the magnetic flux intensity is generally higher near the coil and gradually decreases towards the center of the coil. When magnetic flux intensity is higher, initial nucleation occurs. As long as the intensity is higher nuclei are broken up into small fragments near the mold wall convection of a higher magnetic field, with magnetic field intensity gradually decreasing towards the center leading to grain growth. When the magnetic flux intensity increased from 60 Volts, 100 Volts, and 150 Volts, the higher intensity, enhances the thermal conductivity and leads to grain growth. The tensile strength of magnetic mold casting is 195.5463 MPa at 60 Volts, 216.3047 MPa at 100 Volts, and 237.3373 MPa at 150 Volts for die casting. The Tensile strength without a magnetic field is 137.2424 so the magnetic mold casting has tensile strength almost 72.93 % times higher than the sand casting. This is due to the refined grain structure of magnetic mold where in the number of grain boundaries inhibit the dislocation movement leading to enhance strength.

5.0 Conclusion

The important finding that from this investigation can be as follows

- The Magnetic mold assembly has been designed and established.
- The CI200 cast produced in the magnetic mould has shown much improved mechanical property over sand casting. Tensile strength was improved by 72 percentages over sand casting. Where we

9. Mehrdad S, Beitallah E, Behzad N. Synthesis of AA_20_24-(SiO_2np+TiO_2np) hybrid nano composite via stir casting process. Materials Science and Engineering. 2019
10. Hortense LF, Florian B, Studart AR. Design of textured multi-layered structures via magnetically assisted slip casting. Soft Matter. 1-19.
11. Hiromi N, Shohei F, Motohiro Y, Tohru SS, Hitoshi O. Fabrication and anisotropic electronic property solid solution by slip casting in a high magnetic field. Elsevier. 2017.
12. Jia Y, Xingrui C, Qichi L, Hang W, Lei B. Macro-physical field of large diameter magnesium alloy billet electromagnetic direct-chill casting: A comparative study. Science Direct Journal of Magnesium and Alloys. 2020; 7(3):716-730.
13. Ambrish M, Rajneesh K, Jha PK. Simulation of electromagnetic field and its effect during electromagnetic stirring in continuous casting mold. Journal of Manufacturing Processes. 2020; 596-607.
14. Niksiar P, Michael BF, Mckittrick J, Michael MP. Microstructural evolution of paramagnetic materials by magnetic freeze casting. Elsevier. 2018.
15. Yonghui J, Xingrui C, Qichi L, Hang W, Weitao J. Numerical study on action of HMF, PMF, DHMF, and DPMF on molten metal during electromagnetic casting. The International Journal of Advanced Manufacturing Technology. 2019.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

STUDY AND OBSERVATION OF HARDNESS OF ALUMINIUM MATERIAL BY END QUENCHING

Mhaske Viraj*1, Gangarde Prafful*2, Garule Somnath*3,
Prof. M.D. Mandhre*4, Prof. S.P. Jatahar*5

*1,2,3BE Mechanical Engineering SCSMCOE Nepti, Ahmednagar, Maharashtra, India.

*4,5Assistant Professor Department Of Mechanical Engineering SCSMCOE Nepti, Ahmednagar, Maharashtra, India.

ABSTRACT

The Jominy end quench test is a common method employed to characterize the hardenability of materials. In this research, an attempt was made to simulate the Jominy test for aluminium material using a specific method. Throughout the study, the quenching process involved varying the temperature of recrystallize temperature where microstructure are changes on which property of material depends. The objective was to investigate and compare the differences in hardness resulting from varying temperature of heating aluminium material in the quenching process.

During the quenching process, cooling curves were determined at different points, taking into account phase conversions and material properties during rapid cooling. Subsequently, the time–temperature-transformation curve of aluminium was employed to derive the function constants (CT) of the curve. Finally, the simulated results were analyzed, and the maximum and minimum hardness of the aluminium were determined.

Keywords: Aluminium, End Quench, Hardness Test, Cooling Curve, Hardenability

I. INTRODUCTION

Heat treatment is important process in industry to change property based on its microstructure by heating material above or below recrystallisation temperature. recrystallisation temperature is temperature were microstructure change with changing temperature. As per requirement of industry and based on application need to increase hardness for that is purpose of quenching process used for to increase hardness of material. Quenching is process were heating a material above a recrystallisation temperature and cooling rate is fast were we can used oil, water, etc by quenching process cooling rate increase and hardness also increase were material transfer ferrite state to martensite state.

II. EXPERIMENTAL PROCEDURE

Quenching process is used to enhance the hardenability of a metal. Aluminium alloys often use other methods to assess their heat treatment response. Firstly prepare aluminium alloy specimens in the form of cylindrical bars. The diameter and length should adhere to standard dimensions for testing, typically around 10 mm in diameter and 30 cm in length where Ensure that the specimens are of uniform composition and free from defects.

Heat the specimens to the recrstyalline temperature suitable for the specific aluminum alloy being tested. This temperature will vary depending on the alloy composition but typically falls within the range of 500°C to 550°C. Hold the specimens at this temperature for a sufficient duration to achieve complete structure changing temperature.

Heating process is completed, remove the specimens from the furnace and quickly mount them onto the test fixture. Position the specimens vertically with one end facing the water quenching jet.

Initiate the water quenching process by turning on the water jet. The water flow rate should be controlled to maintain a consistent and uniform cooling rate across the length of the specimen.

After quenching, remove the specimens from fixture and allow them to cool to room temperature. Once cooled, perform hardness testing along the length of the specimens using a Rockwell or Brinell hardness tester.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

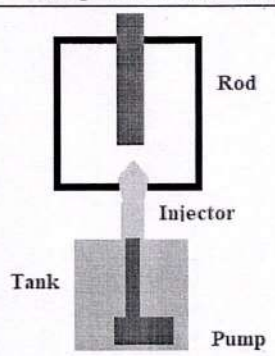


Figure 1: Experiment Set up

Plot the hardness values as a function of distance from the quenched end to create a hardenability curve. Analyze the curve to assess the hardenability characteristics of the aluminum alloy, including the depth to which the alloy can be effectively hardened by quenching.

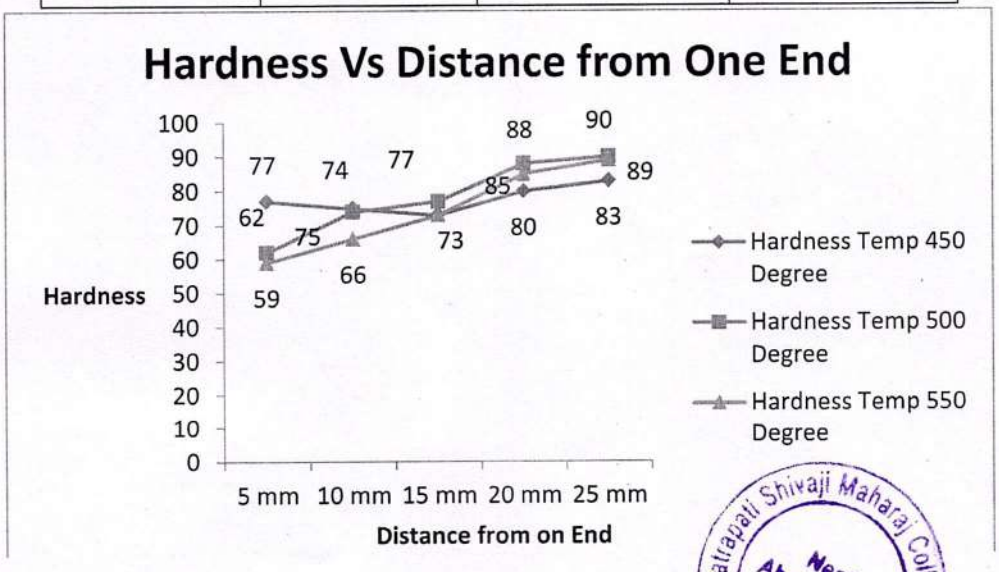
Repeat the experiment for different aluminum alloys or heat treatment conditions to compare their hardenability characteristics. Adjust experimental parameters as necessary to optimize the testing procedure.3

III. RESULTS AND DISCUSSION

As shows the cooling curves of several points on end quench Jominy specimen. As it is shown, increasing of distance from quenched end results in shift of the curve to right and in conclusion causes to decrease hardness of the points. Maximum cooling rates are occurred at the quenched end of specimens and the values decrease with increasing of the distance from the end. On the other hand, the temperature at which the maximum cooling rates occur increases with increasing distance from the quenched end. The minimum cooling rate at the quenched end of Jominy specimen is at 500 degree Celsius.

Table 1. Comparison of Hardness at various tempreture and distance.

Distance from one end (mm)	450 °C in BHN	500 °C in BHN	550 °C in BHN
5	77	62	59
10	74	75	66
15	73	73	73
20	80	88	85
25	83	90	89



e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

IV. CONCLUSION

As per experimental work test is one the most commonly used for evaluating hardenability of aluminium material. By using brinell hardness test determined hardness of aluminium material rod which is fast quenching by water as per result of hardness test and graph of result concluded that with rapidly cooling hardness are increase with respect to distance at one end where cooling by water. When recrystalline temperature changing then it also effect on hardness value by experimental test when recrystalline temperature increasing with same quenching process hardness also increases with increasing recrystalline temperature where at 450 degree Celsius recrystalline temperature hardness is vary from 77 BHN to 83BHN, at 500 degree Celsius hardness is vary from 62 BHN to 90 BHN, at 550 degree Celsius hardness changing from 59 to 89 BHN from comparing testing result at high recrystalline temperature give good hardness.

ACKNOWLEDGEMENTS

We are honored to express our deep sense of gratitude towards my guide Prof. M.D. Mandhare (Assistant Professor) Department of Mechanical Engineering, for his creative suggestions, helpful discussion, unfailing advice, constant encouragement during the project work.

We consider ourselves privileged to have worked under his, as he always shared his vast experience so generously and patiently in spite of his busy schedule. We sincerely appreciate the interactive help, received from him by the way of advice, suggestions.

At the outset, we take this opportunity to express our sincere gratitude to Prof. A. B. Kale Head of Department of Mechanical Engineering and Dr. Y.R. Kharde Principal for giving us an opportunity to pursue our studies for the present work.

V. REFERENCES

[1] Mohnesh Dnyaneshwar Mandhre and Sachin Ghalme "Enhancement Mechanical Properties of CI200 Material using Magnetic field" Journal of Mines, Metal and Fuels, 2023, pp. 2747-2750.

[2] Mandhre M.D. Save "Electric Energy of Heating Coil of Water by Water Treatment", International Conference on Ideas, Impact and Innovation in Mechanical Engineering, 2017, pp. 589-592.

[3] G. P. Dolan,R. J. Flynn,D. A. Tanner, J. S. Robinson, "Quench factor analysis of aluminium alloys using the Jominy end quench technique" Materials Science and Technology, Volume 21, 2005 - Issue 6, Pg.687-692

[4] J.W. Newkirk and D.S. MacKenzie, "The Jominy End Quench for Light-Weight Alloy Development" ASM International, Vol. 9(4) August 2000 – pp. 408-415

[5] LIU Qing-cai , WEI Chun-mei , LU Cun-fang , J.W Newkirk "Progress in effect of Jominy end quench on the microstructure and mechanical properties of cast aluminum alloys" ,Journal of Materials Science and Engineering, Volume 2, No.7 (Serial No.8), Pg.17-23

[6] Barthelemy H "Oxygen fires in aluminum alloy cylinders" Journal of ASTM International, 2006, Pg.3(6): 1-7 (7 pages)

[7] A. Zehtab Yazdi, S.A. Sajjadi, S.M. Zebarjad, S.M. Moosavi Nezhad "Prediction of hardness at different points of Jominy specimen using quench factor analysis method " Volume 199, Issues 1–3, 1 April 2008, Pages 124-129

[8] Bhaskar Chandra Kandpal, Agnay Chutani, Amit Gulia, Harsimran, Chandan Sadanna "A Review On Jominy Test And Determination Of Effect Of Alloying Elements On Hardenability Of Steel Using Jominy End Quench Test" Vol. 1,Issue 3, pp.65-71

[9] L.C.F. Canale, L. Albano, G.E. Totten, L. Meekisho, "Hardenability of Steel" Volume 12, 2014, Pages 39-97

[10] Sujata Panda, Swapnil Dhamnekar, Sharanaprabhu L, "A Comprehensive Analysis of Hardenability for Different Steel Grade" Volume 3 - Issue 5, Sep - Oct 2020

[11] Gojic, M.; Kosec, B.; Anzel, I.; Kosec, L.; Preloscan. A.; Hardenability of steels for oil industry. Journal of achievements in materials and manufacturing engineering. Vol 23 Issue 2 pp23-26 (2007)

[12] Landek, D. Liscic, B.; Filetin, T.; Lubben, T.; Lisjak, D.; Hardenability Testing and Simulation of Gas-

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

SOLAR POWER OPERATED SUGAR CANE LIFTING MACHINE

Jaydeep Fakkad Jadhav*1, Tushar Bhausaheb Parkale*2, Ganesh Bhausaheb Karle*3, Ajay Ashok Sarode*4, Dekhane A.G.*5

*1,2,3,4.Bachelor Of Engineering In Mechanical Department Of Mechanical Engineering Shri Chhatrapati Shivaji Maharaj College Of Engineering Nepti, Ahmednagar, Maharashtra, India.

*5Guide, Department Of Mechanical Engineering Shri Chhatrapati Shivaji Maharaj College Of Engineering Nepti, Ahmednagar, Maharashtra, India.

ABSTRACT

This paper presents the design, fabrication, and testing of a solar power operated sugar cane lifting machine. The machine consists of a solar panel, a battery, a motor, a gearbox, a cutter, and a lifter. The solar energy into electrical energy, which is stored in the battery. The battery supplies power to motor, which drives the gearbox. The gearbox transfers the torque and speed to the cutter, which cuts the sugarcane stalks at the base. The lifter then lifts the cut sugarcane and places it on a cart or a conveyor belt. The machine aims to reduce the manual labor, increase the efficiency, and improve the safety of sugarcane harvesting. The paper describes the working principle, components, specifications, calculations, and performance evaluation of the machine. The results show that the machine can harvest about 1.5 tons of sugarcane per hour, with an average power consumption of 0.8 kW. The paper also discusses the advantages, disadvantages, challenges, and future scope of the machine.

I. INTRODUCTION

Sugarcane is one of the most important crops in India, as it is the main source of sugar and ethanol production. However, harvesting and transporting sugarcane is a challenging task that requires a lot of manual labor, time, and energy. The conventional methods of loading sugarcane to the trolley involve using cranes, hooks, or ropes, which are costly, inefficient, and hazardous to human health and the environment. Moreover, these methods depend on the availability of electricity or fossil fuels, which are not reliable, sustainable, or eco-friendly sources of energy.

II. PROBLEM STATEMENT

The conventional methods of loading sugarcane to the trolley involve manual labor, which is costly, time-consuming, and hazardous to human health due to the dust and debris generated from the sugarcane. Moreover, these methods depend on the availability of electricity or fossil fuels, which are not reliable, sustainable, or eco-friendly sources of energy. Therefore, there is a need for a new mechanism that can load sugarcane to the trolley using solar power, which is abundant, renewable, and clean. Such a mechanism would reduce the labor cost and time, improve the working conditions and safety, and enhance the efficiency and productivity of the sugar industries in India.

Objective of the Project:

1. The main objective of this project is to design and develop of solar-power sugarcane lifting machine. That can load sugarcane to the trolley efficiently and safely. The specific objectives are:
2. To utilize solar energy as the primary source of power for the lifting mechanism, which is renewable, clean, and cost-effective?
3. To reduce the manual labor involved in the loading process, which is prone to health hazards, fatigue, and low productivity?
4. To increase the speed and capacity of the loading process, which can improve the profitability and competitiveness of the sugar industries? To ensure the safety and reliability of the lifting mechanism, which can prevent accidents and damages to the sugarcane and the trolley?

Parts of this project

- Chain and chain sprocket
- Battery

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

- Shaft
- Bearing P204
- Solar Panel
- Supporting frame

Diagram of the Project

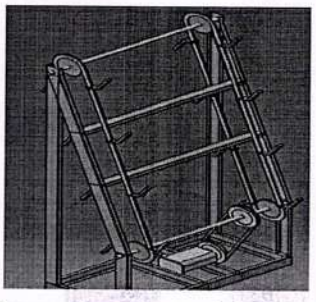


Fig 1: Setup of sugar cane lifting machine

III. COMPONENT USED IN PROJECT

1. PMDC Motor: In a DC motor, an armature rotates inside the magnetic. The basic working principle of DC motor is based on the fact that whenever a current carrying conductor is placed inside a magnetic field, there will be mechanical force experienced by that conductor. All kinds of DC motors work under the principle. Hence for constructing a DC motor, it is essential to establish a magnetic field. The magnetic field is established by using a magnet. You can use different types of magnets – it may be an electromagnet or it can be a permanent magnet. A Permanent Magnet DC motor (PMDC motor) is a type of DC motor that uses a permanent magnet to create the magnetic field required for the operation a DC motor. Thus permanent magnet DC motor is used where there is no need to control the speed the motor (which is usually done by controlling the magnetic field). Small fractional and sub-fractional KW motors are often constructed using a permanent magnet.

Construction of PMDC Motor:

As it is indicated in name permanent magnet DC motor, the field poles this motor are essentially made permanent magnet. A PMDC motor mainly consists a two parts. A stator and rotor. Here the stator which is a steel cylinder. The magnets are mounted in the inner periphery of this cylinder.

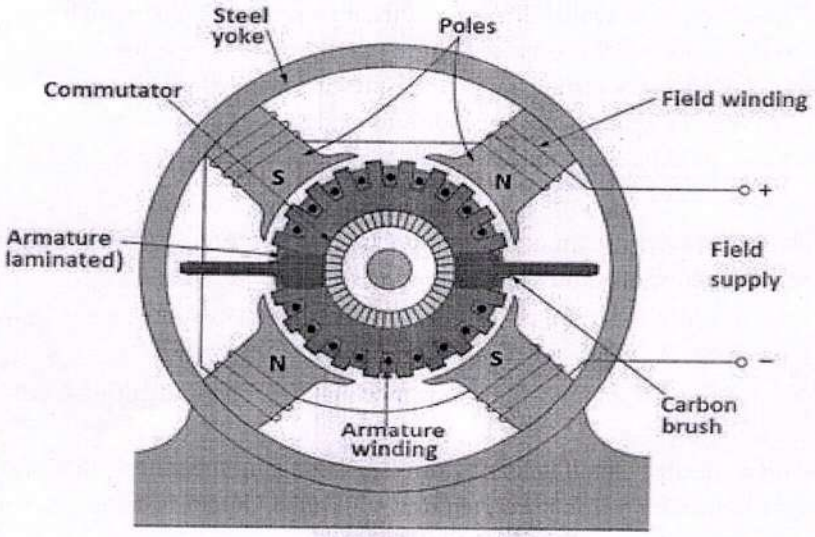


Fig 2: DC Motor

2. On / off switch:

The familiar form switch is a manually operated electromechanical device with one or more sets of electrical

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

contacts are separated and the switch is no conducting. The mechanism actuating the transition between these two states (open or closed) is usually (there are other types of actions) either an "alternate action" (flip the switch for continuous "on" or "off") or "momentary" (push for "on" and release for "off") type.

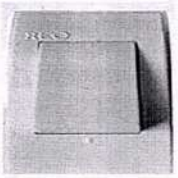


Fig 3: Switch

A switch may be directly used by a human as a control signal to the system, such as a computer keyboard button, or to the control current flow the circuit, such as a light switch. Automatically operated switches used to control the motions of machines, for example, the indicate that a garage door has reached its full open position or that a machine tool is in a position to the accept another work piece. Switches may be operated by process variables such as pressure, temperature, flow, current, voltage, and force, acting as sensors in a process and used to automatically control a system. For example, a thermostat is a temperature-operated switch used to control a heating process. A switch that is operated by another electrical circuit is called a relay. Large switches may be remotely operated by a motor drive mechanism. Some switches are used to isolate electric power from a system, providing a visible point of isolation that can be padlocked if necessary to prevent accidental operation a machine during maintenance, or to prevent electric shock.

An ideal switch would have no voltage drop when closed, and would have no limits on voltage or current rating. It would have zero rise time and fall time during state changes, and would change state without "bouncing" between on and off positions. Practical switches fall short of this ideal; as the result of roughness and oxide films, they exhibit contact resistance, limits on the current and voltage they can handle, finite switching time, etc. The ideal switch is often used in circuit analysis as it greatly simplifies the system of equations to be solved, but this can lead to a less accurate solution. Theoretical treatment of the effects of non-ideal properties is required in the design of large networks of switches, as for example used in telephone exchanges.

3. Wires:

A wire is a single usually cylindrical, flexible strand or rod of metal. Wires are used to bear mechanical loads or electricity and telecommunications signals. Wire is commonly formed by drawing the metal through a hole in a die or draw plate. Wire gauges come in various standard sizes, as expressed in terms of a gauge number. The term 'wire' is also used more loosely to refer to a bundle of such strands, as in "multistranded wire", which is more correctly termed a wire rope in mechanics, or a cable in electricity.

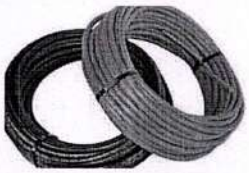


Fig 4: Wire rope

4. Battery:

An electric battery is the source of electric power consisting one more electrochemical cells with external connections for powering electrical devices. When a battery supplying power, its positive terminal is a cathode and It is a negative terminal is a anode. The terminal marked negative source electrons that will flow through an external electric circuit to the positive terminal. When a battery is connected to an external electric load, a redox reaction converts high-energy reactants to lower-energy products, and the free-energy difference is delivered to the external circuit as electrical energy. Historically the term "battery" specifically referred to a device composed multiple cells; however, the usage has evolved to include devices composed of a single cell.

Primary (single-use or "disposable") batteries are used once and discarded, as the electrode materials are irreversibly changed during discharge; a common example is the alkaline battery used for flashlights and a

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

reverse current. Examples include the lead-acid batteries used in vehicles and lithium-ion batteries used for portable electronics such as laptops and mobile phones.

Batteries come in many shapes and sizes, from miniature cells used to power hearing aids and wristwatches to, at the largest extreme, huge battery banks the size rooms that provide standby or emergency power for telephone exchanges and computer data centers.

Batteries have much lower specific energy (energy per unit mass) than common fuels such as gasoline. In automobiles, this is somewhat offset by the higher efficiency of electric motors in converting electrical energy to mechanical work, compared to combustion engines

Batteries convert chemical energy directly to electrical energy. In many cases, the electrical energy released is the difference in the cohesive or bond energies a metals, oxides, or molecules undergoing the electrochemical reaction. For instance, energy can be stored in Zn or Li, which are high-energy metals because they are not stabilized by d-electron bonding, unlike transition metals. Batteries are designed so that the energetically favorable redox reaction can occur only when electrons move through the external part the circuit. A battery consists some number voltaic cells. Each cell consists two half-cells connected in series by a conductive electrolyte containing metal cations. One half-cell includes electrolyte and the negative electrode, the electrode to which anions (negatively charged ions) migrate; the other half-cell includes electrolyte and the positive electrode, to which cations (positively charged ions) migrate. Cations are reduced (electrons are added) at the cathode, while metal atoms are oxidized (electrons are removed) at the anode.[16] Some cells use different electrolytes for each half-cell; then a separator is used to prevent mixing of the electrolytes while allowing ions to flow between half-cells to complete the electrical circuit.

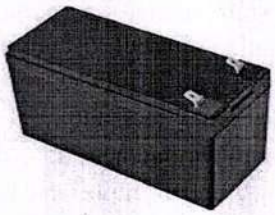


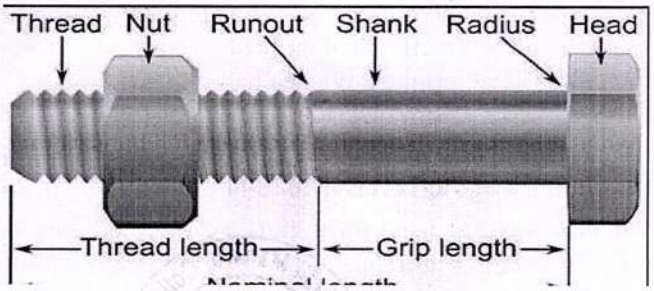
Fig 5: Battery

5. Nut / Bolts:

A nut the type fastaner with a threaded hole. Nuts are almost always used in conjunction with a mating bolt to fasten multiple parts together. The two partners are kept together by a combination their threads' friction (with slight elastic deformation), a slight stretching of the bolt, and compression of the parts to be held together.

In applications where vibration or rotation may work a nut loose, various locking mechanisms may be employed: lock washers, jam nuts, specialist adhesive thread-locking fluid such as Loctite, safety pins (split pins) or lockwire in conjunction with castellated nuts, nylon inserts (nyloc nut), or slightly oval-shaped threads.

Square nuts, as well as bolt heads, were the first shape made and used to be the most common largely because they were much easier to manufacture, especially by hand. While rare today due to the reasons stated below for the preference of hexagonal nuts, they are occasionally used in some situations when a maximum amount a torque and grip is needed for a given size: the greater length each side allows a spanner to be applied with a larger surface area and more leverage at the nut.



e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

6. Chain

Roller chain or bush roller chain is the type chain drive most commonly used for transmission of mechanical power on many kinds domestic, industrial and agricultural machinery, including conveyors, wire- and tube-drawing machines, printing presses, cars, motorcycles, and bicycles. It consists of a series short cylindrical rollers held together by side links. It is driven by a toothed wheel called a sprocket. It is a simple, reliable, and efficient means of power transmission.

There are two types links alternating in the bush roller chain. The first type is inner links, having two inner plates held together by two sleeves or bushings upon which rotate two rollers. Inner links alternate with the second type, the outer links, consisting two outer plates held together by pins passing through the bushings of the inner links. The "bushingless" roller chain is similar in operation though not in construction; instead of separate bushings or sleeves holding the inner plates together, the plate has a tube stamped into it protruding from the hole which serves the same purpose. This has the advantage of removing one step in assembly the chain.

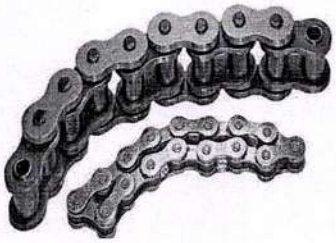


Fig 7a: Chain

The roller chain design reduces friction compared to simpler designs, resulting in higher efficiency and less wear. The original power transmission chain varieties lacked rollers and bushings, with both the inner and outer plates held by pins which directly contacted the sprocket teeth; however this configuration exhibited extremely rapid wear of both the sprocket teeth, and the plates where they pivoted on the pins. This problem was partially solved by the development bushed chains, with the pins holding the outer plates passing through bushings or sleeves connecting the inner plates. This distributed the wear over a greater area; however the teeth the sprockets still wore more rapidly than is desirable, from the sliding friction against the bushings. The addition of rollers surrounding the bushing sleeves the chain and provided rolling contact with the teeth the sprockets resulting in excellent resistance to wear of both sprockets and chain as well. There is even very low friction, as long as the chain is sufficiently lubricated. Continuous, clean, lubrication roller chains is primary importance for efficient operation as well as correct tensioning.

Freewheel

In mechanical or automotive engineering, a freewheel or overrunning clutch is a device in a transmission that disengages the driveshaft from the driven shaft when the driven shaft rotates faster than the driveshaft. An overdrive is sometimes mistakenly called a freewheel, but is otherwise unrelated. The condition of a driven shaft spinning faster than its driveshaft exists in most bicycles when the rider stops pedaling. In a fixed-gear bicycle, without a free wheel, the rear wheel drives the pedals around.

Fig 7b:

An analogous condition exists in an automobile with a manual transmission going downhill, or any situation where the driver takes their foot off the gas pedal, closing the throttle: the wheels drive the engine, possibly at a

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

the pistons can soon seize, causing extensive damage. Saab used a freewheel system in their two-stroke models for this reason and maintained it in the Saab 96 V4 and early Saab 99 for better fuel efficiency.

The simplest freewheel device consists two saw-toothed, spring-loaded discs pressing against each other with the toothed sides together, somewhat like a ratchet. Rotating in one direction, the saw teeth of the drive disc lock with the teeth of the driven disc, making it rotate at the same speed. If the drive disc slows down or stops rotating, the teeth of the driven disc slip over

7. Shaft:

A shaft is a rotating machine element, usually circular in cross section, which is used to transmit power from one part to another, or from a machine which produces power to a machine which absorbs power. Shaft form the important element machines. They support rotating parts like gears and pulleys and are themselves supported by bearings resting in the rigid machine housing.

The shafts perform the function transmitting power from one rotating member to another supported by it or connected to it. Thus, they are subjected to torque due to power transmission and bending moment due to the reactions the members that are supported by them.

Shafts are to be distinguished from axles which also support rotating members but do not transmit power.

Shafts are always made to circular cross-sections and could be either solid or hollow. The shafts are classified as straight, cranked, flexible, or articulated. Straight shafts are the commonest to be used for power transmission. Such shafts are commonly designed as stepped cylindrical bars, that is, they have various diameters along their length, although constant diameter shafts would be easy to produce. The stepped shafts correspond to the magnitude stress which varies along the length. Moreover, the uniform diameter shafts are not compatible with assembly, disassembly, and maintenance such shafts would complicate the fastening the parts fitted to them, particularly the bearings, which have restricted against sliding in an axial direction. While determining the form of the stepped shaft it is borne in mind that the diameter each cross-section should be such that each part fitted onto the shaft has convenient access to its seat.

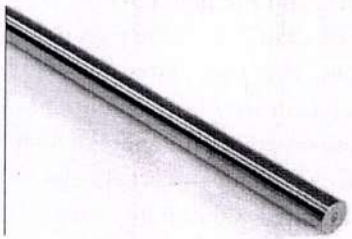


Fig 8: Shaft

Materials

The material used for ordinary shafts is mild steel. When high strength is required, an alloy steel such as nickel, nickel-chromium or chromium-vanadium steel is used. Shafts are generally formed by hot rolling and finished to size by cold drawing or turning and grinding

8. Mild Steel. Pipe

A pipe is tubular section or hollow cylinder, usually but not necessarily circular cross section, used mainly to convey substances which can flow liquids and gases (fluids), slurries, powders and masses small solids. It can also be used for structural applications; hollow pipe is far stiffer per unit weight than solid members.

In common usage the words pipe and tube are usually interchangeable, but in industry and engineering, the terms are uniquely defined. Depending on the applicable standard to which it is manufactured, pipe is generally specified by a nominal diameter with a constant outside diameter (OD) and a schedule that defines the thickness. Tube is most often specified by the OD and wall thickness, but may be specified by any two OD, inside diameter (ID), and wall thickness. Pipe is generally manufactured to one of several international and national industrial standards. While similar standards exist for specific industry application tubing, tube is often made to custom sizes and a broader range diameters and tolerances. Many industrial and government standards exist for the production of pipe and tubing. The term "tube" is also commonly applied to non-

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

cylindrical sections, i.e., square or rectangular tubing. In general, "pipe" is the more common term in most of the world, whereas "tube" is more widely used in the United States.

Both "pipe" and "tube" imply a level of rigidity and permanence, whereas a hose (or hosepipe) is usually portable and flexible. Pipe assemblies are almost always constructed with the use fittings such as elbows, tees, and so on, while tube may be formed or bent into custom configurations. For materials that are inflexible, cannot be formed, or where construction is governed by codes or standards, tube assemblies are also constructed with the use of tube fittings.

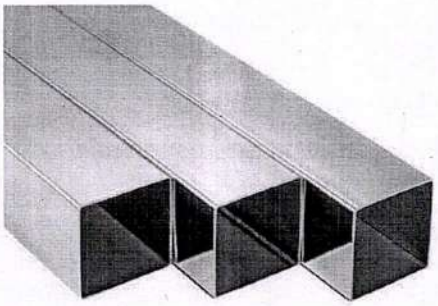


Fig 9: Mild Steel. Pipe

9. Bearing:

A bearing is a machine element that constrains relative motion to only the desired motion, and reduces friction between moving parts. The design the bearing may, for example, provide for free linear movement the moving part or for free rotation around a fixed axis; or, it may prevent a motion by controlling the vectors normal forces that bear on the moving parts. Most bearings facilitate the desired motion by minimizing friction. Bearings are classified broadly according to the type of operation, the motions allowed, or to the directions the loads (forces) applied to the parts.

Rotary bearings hold rotating components such as shafts or axles within mechanical systems, and transfer axial and radial loads from the source the load to the structure supporting it. The simplest form of bearing, the plain bearing, consists a shaft rotating in a hole. Lubrication is used to reduce friction. In the ball bearing and roller bearing, to reduce sliding friction, rolling elements such as rollers or balls with a circular cross-section are located between the races or journals the bearing assembly. A wide variety bearing designs exists to allow the demands the application to be correctly met for maximum efficiency, reliability, durability and performance.

The term "bearing" is derived from the verb "to bear"; a bearing being a machine element that allows one part to bear (i.e., to support) another. The simplest bearings are bearing surfaces, cut or formed into a part, with varying degrees control over the form, size, roughness and location the surface. Other bearings are separate devices installed into a machine or machine part. The most sophisticated bearings for the most demanding applications are very precise devices; their manufacture requires some the highest standards current technology

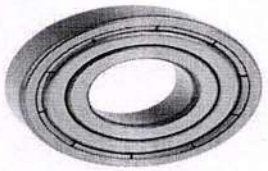


Fig 10: Bearing

Working of the project

The sugar cane lifter machine is designed and manufactured by using gear changing and shaft coupling principle. It consist mainly DC geared motor, shafts, bearings, sprocket and chains. Construction materials are easily available, creates employment (construction and maintenance), simple to construct.

The devices are place across Sugar cane lift so that only sugar cane through lower grids, are lifted by teeth which is connected to chain. This chain is attached by gear driven by motor. When motor runs the chain starts

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

IV. CONCLUSION

Our project is successfully implemented for Automation is a technology concerned with his application of mechanical, electronic and computer based systems to operate and control production. This system is used to operate automatic sugar cane lifting equipment. This project may be developed with the full utilization of men, machines, and materials and money. Also we have followed thoroughly the study of time motion and made our project economical and efficient with the available resources. This system was Designed, Fabricated successfully and also tested. It works satisfactorily. We hope that this will be done among the most versatile and interchangeable one even in future. Thus we can able to obtain to operate automatic sugar cane lifting equipment.

ACKNOWLEDGMET

I would like to express my sincere gratitude to all the people who have supported me in completing this project. First and foremost, I would like to thank my project guide, Prof. A.G. Dekhane, for his valuable guidance, encouragement, and feedback throughout the project. He has been a constant source of inspiration and motivation for me. I am grateful to the staff and technicians of the mechanical engineering department for their assistance and cooperation.I would also like to acknowledge the help and support of my friends and classmates, who have shared their ideas and suggestions with me. They have also helped me in testing and evaluating the prototype of the solar-powered sugarcane lifting machine. I appreciate their teamwork and friendship.Last but not the least, I would like to thank my family, especially my parents, for their unconditional love, support, and blessings. They have always encouraged me to pursue my dreams and goals. They have also provided me with the financial and moral support that I needed for this project.This project would not have been possible without the help and contribution of all these people. I am indebted to them for their kindness and generosity. I hope that this project will serve as a useful and innovative solution for the sugarcane industry in India.

V. REFERENCE

[1] Mr. Santosh Kumar Bawage, Ajinkya Mane, Mayur Patil and Akshay Indore, "Design and Development of Mini Sugar Cane Lifter", IJARIIE, Vol-4, Issue-3, 2018, Pp: 1322-1324

[2] Darshan Kothawade, Bhavesh Nijai, Akshada Gunjal, Shrikant Nehe and Prof. P M Karandikar, "Sugarcane Lifter Mechanism by using Chain Conveyor", International Journal for Scientific Research & Development, Vol. 7, Issue 02, 2019, Pp:395-396

[3] Hipparkar Sachin Pandharinath, Goudanalli Chandrakant Gururaj, Guddewadi Kashinath Shivanand and A. A. Bhawthankar, "Sugarcane Lifting Machine", International Engineering Journal for Research & Development, Vol.3, Issue 1, Pp: 1-4

[4] Prashant N. Chakurkar, Dattatraya P. Dudhal, Kumar B. Mali, Pravin S. Tawate, Aishwarya Kolekar and Prof. Kadam S. J., "Sugarcane Lifting Machine (Harvester)", IJARSE, Vol-7, Issue-1, 2018, Pp: 1013-1018

[5] Waghmode Rohit, Virkar Kiran, Waghmode Kharat and Prof. Adhapure Dipak U, "Sugar Cane Lifting Machine", International Journal of Research in Engineering and Science, Volume 10, Issue 5, 2022, Pp: 01-07

[6] Umesha BC and Prashanth S, "Fabrication of Loading and Unloading Sugarcane Machine", International Research Journal o Modernization in Engineering Technology and Science, Volume: 05, Issue: 11, 2023, Pp: 1187-1191

[7] Lt. Dr. M. Kalil Rahiman, K. Moorthi, R. Prakash and M. Sanjaikumar, "Design and Fabrication of Sugarcane Lifter", International Research Journal of Engineering and Technology, Volume: 06, Issue: 03, 2019, Pp: 1447-14

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:05/May-2024 Impact Factor- 7.868 www.irjmets.com

CASE STUDY ON SMOG FREE CITY

Kulat Gaurav Radhakisan*1, Gandhi Yash Dinesh*2, Murumkar Yash Rajendra*3, Pimpale Abhishek Bansi*4, Prof. S. A. Jagtap*5

*1,2,3,4Student, Department Of civil Engineering, Shri Chhatrapati Shivaji Maharaj College OfEngineering, Ahmednagar, Maharashtra, India.

*5Professor, Department Of civil Engineering, Shri Chhatrapati Shivaji Maharaj College OfEngineering, Ahmednagar, Maharashtra, India.

ABSTRACT

In one of the world's most polluted cities smog pollution in form of gases like CO(carbon mono-oxide) , NO (nitrogen oxide) and hydrocarbon are very harmful for human beings. It is one of the most serious public health concerns in the worldwide. We are in need of oxygen supply that too in pure form. Smog is a kind of visible. Photochemical smog i.e. man-made smog derived from forest and agricultural fires. This may cause health problems like difficulty in breathing and can be dangerous for cancer. So, for reducing the smog from the air there are various structures like Smog free tower. These towers are more effective in most of polluted cities. This study aimed to aware and give some preventive practices of smog pollution and also shows the design of smog free tower

Keywords: smog, pollutions, nitrogen oxide, carbon mono- oxide, nitrogen di-oxide

I. INTRODUCTION

Air pollution is "contamination of the indoor or outdoor environment by any physical, chemical, or biological particlesthat changes the natural behavior of the atmosphere". Smog hitsmost of the regions of the world which includes India, USA, United Kingdom. World Health Organization (WHO) calculatesthat nearly 4.5 million deaths occur from breathing problem dueto environmental problems i.e. smog pollution. Smog forms a photochemical reaction of air pollutants and the sunlight which affects millions of civilians. Which causes critical impact on lifecycle of human. Environment pollution is a state of the environment which due to air, water, or solid, liquid, or gaseous and energy which may affect human health, climate of nature. Recent most dangerous polluting factors are:

- Carbon dioxide (CO2) causes of the greenhouse effect;
- Carbon monoxide (CO);
- Sulphur dioxide and nitrogen dioxide (SO2 and NO2)

At the same time, many risks arise from the cigarette smoke,and oxygen deficiency, polluted drinking water, and food. Air pollution called smog has increased in recent years. It mostly effects human being who lives in large cities where levels of energy consumption are very high. Currently the most impact is done through the transport that may form the photochemical smog in the air. The burning of fossil fuels are the most major causes of global warming. In simple language smog can be defined as the combination of air pollutant sand fog present in the atmosphere. Word "smog "is derived by combination of two words, smoke and fog. This project of smog states problem evolved through smog their solution. Smog can be referred as the type of fog which has various forms of smoke in it. Smog is a yellowish or blackish fog formed mainly by a combination of pollutants in the atmosphere. Air that makes breathing difficult is called smog. Burning of fuels release gases that form smog. When these pollutants react with sunlight and sue to sunlight its heat and smog forms. That time various Photochemical reactions between oxides, nitrogen oxide and Sulphur oxides which release fine particles. To reduce such smog pollution from the air Smog free tower concepts come into picture. This smog free tower is largest air purifier in the world. The structure of Smog free tower is 23 for tall. This tower clean maximum 35,000 cubic meter of air per hour of smog to create smog free city for this process it uses green energy. This tower needs charging for cleaning the nearby air. A single ring can hold pollution equivalent to 1000 cubic meters of city air. The uses very low power i.e. 1400 watts for cleaning the air. Very low power of 1400 watts and creates bubble of clean air. Photochemical smog consisting of it is a modern solution on this growing smog problem.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:05/May-2024 Impact Factor- 7.868 www.irjmets.com

II. RESEARCH METHODOLOGY

2.1 PROBLEM STATEMENT

The major causes of air pollution are result of emissions from a number of sources, industrial and domestic fossil fuel combustion and vehicles emissions. These days increase in the amount of industrial and technical advancement has led to deterioration of the environmental conditions. These pollutants cause severe human health problems, including asthma, pneumonia and irritation of lungs, bronchitis and premature death.

There are various types of smog like Sulfur smog, Photochemical smog and Chemical smog. When ultra violet lights from the sun reacts with nitrogen oxides in the atmosphere it produces photochemical smog. It is consisting of mixture of bad chemicals. This project is related to problems and solution of smog caught in various places an affects human being's health. Smog pollution is mostly produces in cities and it may stay there for long period. Smog can be form faster and be more severe in cold areas.

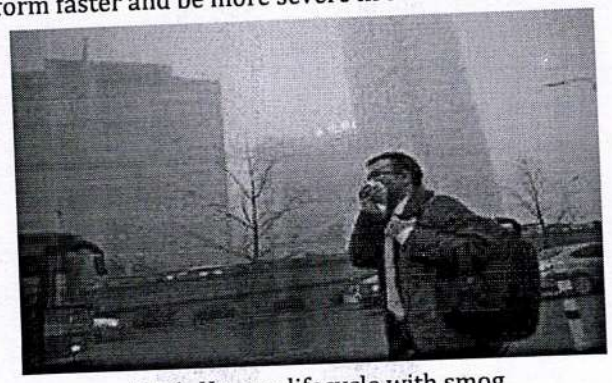


Fig 1. Human lifecycle with smog

2.2 SOURCES OF SMOG.

1. Wood & coal burning for heating homes & cooking.
2. NO (Nitrogen Oxide) & NO2(Nitrogen Di-oxide) .
3. Smoke from suddenly unexpected fire of forest & farm
4. From power stations mainly coal burning plants.
5. Gasoline and diesel run vehicles.
6. Industrial plants and activities & human activities.
7. Heavy traffic in cities.
8. High temperature, sunshine & calm winds.
9. Fog in winter season increase the visibility & effect of smog.

2.3 OPTIMAL METHODS TO SMOG FREE TOWER

1, WET DEPOSIT

In this process artificial rain is apply on the affected city by smog, spreading potassium iodide, liquid propane & silver iodide in existing cloud by help of rocket or plane. These chemicals create ice particles in present cloud that get heavier and fall on the earth in the form of rain. These artificial rain washes the smogover city such as the water molecules collect the toxicparticles and bring them on ground by action of gravity

2. SPRINKLING OF WATER

In this method sprinklers are fixed at the high buildings and water spread on the city but this method has limitations of water and positions of sprinklers also inthis method wastage of water & energy is done

3.APPLYING SMOG RESISTANCE PAINT

In this method paint is applied on the outer side of building. The paint is made up of titanium dioxide which react with the nitrogen dioxide present in smogand convert it into nitric acid which is generally harmless and breakdown the formula of smog. But this

4, SMOG FREE TOWER

The smog free tower collects the smog present in air and arrest smog particles. It runs on electricity. It can be applicable on buildings, public places & workplaces.The smog free tower work independently with the high voltage electricity supply. It does not need any other material and no wastage is obtain in the result

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:05/May-2024 Impact Factor- 7.868 www.irjmets.com

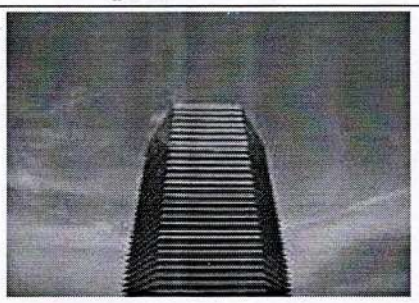
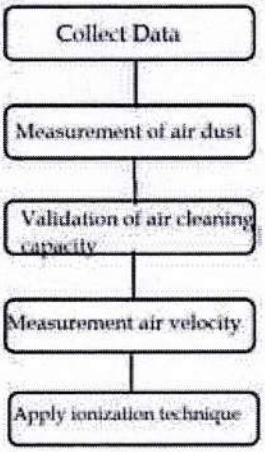


Fig 2. Smog Free tower

2.4 METHODLOGY

Places in cities have more contact with more numbers of people in open area having directly air contact are affected by smog. These smog free towers intakes the smog inside it by action of vacuum and give product as separate carbon and elements. Smog Particles smaller than 10 micro meters in diameter can be arrested in this tower. The Smog Free Tower is designed to allow people to breathe clean air in a city. The highlight of this project is too aware the use of Smog free tower and how to reduce the air pollution due to smog



2.5. COLLECTING DATA

Table 1.1 collection of data

Air Quality Index Particulate Matter	Minimumvalue	Safe Atunder	Maximumvalue
AQI For O3 (Ozone)	29	50	114
AQI For NO2 (Nitrogendioxide)	36	50	81
Humidity	32%	50%	92%

2.6 VALIDATION OF THE AIR CLEANING CAPACITY OF THE AIR PURIFICATION SYSTEMS

Air purification systems were designed and developed for the efficient elimination of fine and ultrafine dust from large volumes of air. To validate the efficiency of the air purificationsystem systems that are located in the SFT, concentrations of fine dust measured in the ingoing and in the outgoing air streams of the individual air purification system systems. By calculatingthe difference between the fine dust concentration in the ingoing versus the outgoing air, the percentage reduction can be calculated. During all measurements, the systems wear operating at full capacity

Table 1.2 Validation of air cleaning capacity

System	Orientation	Reduction(%)
Aufero-1	North	54
Aufero-2	South-East	53
Aufero-3	South-West	52

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:05/May-2024 Impact Factor- 7.868 www.irjmets.com

2.7 MODEL DESIGN

1.The tower works in simple way, it sucks in dirty airlike a giant vacuum cleaner.

2.Due to applied potential voltage difference, all the particles get positively charged, and the ground is negatively charged, resulting in downward dragging force on the pollutants in air. This is called as ionization technique.

3.Ionization technique then filters it. The technology issafe and there are no secondary by products causingany pollution

2.8 BASIC WORKING OF TOWER

Smog tower containing a basic work method of vacuum, at thetop of tower polluted air filtered by the action of ionic filtration with the help of high voltage current (1400kw). Dust particles are get positively charged after colliding with positive ions this positive charged dust particles are collected at the grounded electrode which attract that positive dust particles. ionic filters will charge and remove smog particles, blowing fresh air out ofthe tower's vents which are provided in tower.

III. CONCLUSIONS

The smog free tower is way to the new globalization for human. Human are constructing the history at every time with every subject with some drawbacks, but the next generation should be prepared for that drawback to resist them & convert them in history again so in this case the human is constructing the history about this period, which drawback are pollution and their effect in present & future also now days the humans are don't think about environment while they are running his lifecycle not everyone do this but most of people does not take care about environment, this smog free tower is effective solution for this type of problems after completion of their rule. The Smog Free Project aims to raise awareness about the global problem of air pollution and serves as an inspiration for a clean future. The Smog Free Tower is used to actively purify city air and may therefore contribute to solve the fine dust problem in cities worldwide. The awareness of states, cities, and even the public allows for the introduction of new, feasible, and usable solutions. Buildings, facilities, and infrastructure alone will not bring about complete clean-up. Changes in other areas are also needed. It is not enough to build anti-smog buildings to reduce smog. Nor is it enough to change heating systems. It is also necessary to phase out cars that produce a large amount of pollution and switch to hybrid and electric cars. Renewable energy sources should be used, waste should be reused, and filters should be installed on chimneys. We should begin to eliminate the causes of pollution, which to a large extent include low emissions.

IV. REFERENCES

[1] Ir Pollution Informtion Related with Pune City is obtain through The Mpcb(Maharashtra Pollutin Control Board) Office. Atjog Centre, Wakdeadi, Pune - Mubai Road Pune-411003.

[2] DR. Roosegaarde smog free tower Experements result form DR. Roosegaarde laboratory.

[3] Effects of photochemical air pollution on the human eyeconcerning eyeirrtation tear lysozyme and tephnoriaki okawada, isao mizoguchi and tear lysozyme and tephnoriaki okawada, isao mizoguchi 1 and tatsukichi ishiguro2.

[4] Department ofophthalmology nagoya ofmedicine, nagoya university school (director: prof. hiroshi ichikawa)

[5] Pratibha kabade, Manisha Nimje, Pratiksha Thorat, Komal Suryawanshi, "A Smart Cost Effective and Eco-friendly Solution for Reduction of Photochemical Smog" August 2020 , International Research Journal of Engineering and Technology(IRJET), Volume: 07 , p-ISSN: 2395-0072 , ISO 9001:2008

[6] Dr. Guido Jenniskens (ENS Technology)," Case study: Smog Free Tower (measurements in an urban environment)" ,May 2021

[7] Chair of Building Materials Engineering, Faculty of Civil Engineering, PK Cracow University of Technology "Anti-Smog Building and Civil Engineering Structures" , August 2021, DOI: 10.3390/pr9081446

[8] Dr. Guido Jenniskens (ENS Technology)," Case study: Smog Free Tower (measurements in an urban environment)" ,May 2021.

[9] P. Bachler , T.K. Müller , T. Warth , T. Yildiz , A. Dittler, "Impact of ambient air filters on PM concentration levels at an urban traffic hotspot " , Institute of Mechanical Process Engineering Germany, July 2022,DOI : 10.1016/j.apr.2021.101059.

[10] Rein André ROOS RE(C)ENTRE, Quintessence Innovation La Pichotière, 61340 Nocé, France. rein.andre.roos@gmail.com, "The Smog Free Tower «Solution» of Daan Roosegaarde", August 2018 , DOI: © 2015, Rein André ROOS.

[11] Vadgave Hrishikesh R,Wagh Sagar R,Wagh Shardul S,Umap Ganesh T,Mandore Shailendra,"Air pollution controller by using smog tower" march 2019 , JETIR , ISSN-2349-5162.

[12] Boruah Aishree, Bhuyan Rimpi, Hassan Eqbal, Zaman Nekibur, ,Baglari Dipjyoti Department of Civil Engineering, JIST, India,"

[13] Efficacy of Smog Free Tower in Air Pollution Control ",Feb 2019, International Journal of Engineering Research ISSN:2319- 6890 (online),2347-5013(print) Volume No.8,

[14] David Hu1, Juyuan Jiang, Blue Valley Southwest High School, Overland Park, Kansas, USA; 2 School of Automation Engineering, Tianjin University of Technology, Tianjin, China."

[15] 8. A Study of Smog Issues and PM2.5 Pollutant Control Strategies in China " ,July 2013, Journal of Environmental Protection.

[16] Zikria Saleem, Hamid Saeed, Mahrukh Yousaf, Usama Asif, Furqan Khurshid Hashmi, Muhammad Salman & Mohamed Azmi Hassali "Evaluating smog awareness and preventive practices among Pakistani general population: a crosssectional survey" , 2019, International Journal of Health Promotion and Education , DOI: 10.1080/14635240.2019.1576535 Google erth for better understanding for location.

[17] Location visit at dr.hegdewar chauk pune maharashtra 411030.

[18] DR. Richard foust, professor of chemistry and environmental science northern arizoa university (for smog details), working of car ionizer.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

ECO-FRIENDLY GRAINS STORING STRUCTURE WITH OPTIMUM USE OF BAMBOO CROSS-SECTION

Nimase Harshawardhan*1, Shelke Prasanna*2, Rahinj Pooja*3, Sapre Shradhha*4, Prof. A.S. Kamble*5

*1,2,3,4Student, Department Of Civil Engineering, Shri Chatrapati Shivaji Maharaj College Of Engineering, Nepti, Ahmednagar, Maharashtra, India.

*5Professor, Department Of Civil Engineering, Shri Chatrapati Shivaji Maharaj College Of Engineering, Nepti, Ahmednagar, Maharashtra, India.

ABSTRACT

Storage implies preservating. This work focused on selecting various shapes of bamboos and selecting its various placing direction not only to improve storage capacity, but also improve natural ventilation capacity, by using same quantity of bamboos. Here concepts of applied mechanics, i.e., Moment of inertia, bending moment are used to improve overall capacity of conventional bamboo storage structure. Instead of using whole round bamboo for construction of storage structure, it can be cut cross-section wise in two, three or four pieces and by orienting in proper direction we can increase storage capacity by using minimum bamboo. Here the principle of engineering mechanics is used to optimize the use bamboo to construct cost effective storage structure. This will not only give solution to onion etc. storage problem, but also provide sufficient employment opportunities in rural area.

Keywords: Traditional Grain Storage Methods, Requirement Of Grains Storage, Study Of Different Cross-Section Of Bamboo, Properties Of Bamboo, Important IS Related To Bamboo.

I. INTRODUCTION

There are reportedly 1,566,866 sq. km of land under bamboo cultivation in India, due to low water requirement and ability to be grown anywhere. Presently Bamboo utilization is limited to handicrafts and in some part of construction. Still considerable amount of bamboo needs effective utilization and hence there is a lot of space to innovation in this area. While crops like potatoes and onions are produced over the course of a few months each year, they must be stored properly in order to be available for daily consumption throughout the whole year. Currently, the only option for preserving such crops for an extended period of time is cold storage, but it is more expensive, energy-intensive, and harmful to the environment. According to bamboo's purported engineering qualities, it is roughly as strong as steel and can be utilized to build storage structures for such veggies that are both environmentally benign and economically efficient. According to bamboo's purported engineering qualities, it is roughly as strong as steel and can be utilized to build storage structures for such veggies that are both environmentally benign and economically efficient.

II. METHODOLOGY

Study of different cross section of bamboo

↓

Proper orientation above cross section

↓

Load testing on bamboo structure with different orientation

↓

Load comparison & Cost comparison

↓

Conclusion & Recommendation

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

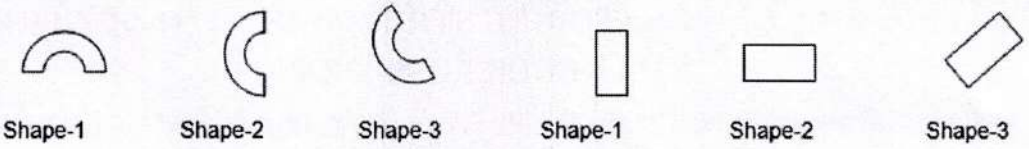


Figure 1: Study of different cross-section of bamboo

Load carrying capacity of cross-sectional Shape 2 & 3 is about 30 to 40 % more than Shape 1. By applying such Engineering mechanics concept use can not only improve the storage capacity but also can improve natural ventilation capacity too, by using same quantity of Bamboos. Such optimize use of bamboo to construct onion storage structure not only reduce the cost , but also promote the employment opportunities in rural area and hence enhance the life style of rural India.

Properties of bamboo

1. **Tensile Strength:** Bamboo is able to resist more tension than compression. The fibers of bamboo run axial. In the outer zone are highly elastic vascular bundle that have a high tensile strength. The tensile strength of these fibers is higher than that of steel, but ibex calculable to construct connections that can transfer this tensile strength. Slimmer tubes are superior in this aspect too. Inside the silicate outer skin, axial parallel elastically fibers with a tensile strength up to 400 N/mm2 can be found. As a comparison, extremely strong wood fibers can resist a tension up to 50 N /mm2.
2. **Compression strength:** Compared to the bigger tubes, slimmer ones have got, in relation to their cross-section, a higher compressive strength value. The slimmer tubes possess better material properties due to the fact that bigger tubes have got a minor part of the outer skin, which is very resistant in tension. The portion of lignin inside the culms affects compressive strength, whereas the high portion of cellulose influences the buckling and the tensile strength as it represents the building substance of the bamboo fibers.
3. **Fire resistance:** The fire resistance is very good because of the high content of silicate acid. Filled up with water, it can stand a temperature of 400° C while the water cooks inside
4. **Anisotropic properties:** Bamboo is an anisotropic material. Properties in the longitudinal direction are completely different from those in the transversal direction. There are cellulose fibers in the longitudinal direction, which is strong and stiff and in the transverse direction there is lignin, which is soft and brittle.
5. **Shrinkage:** Bamboo shrinks more than wood when it loses water. Bamboo shrinks in a cross section of 10-16 % and a wall thickness of 15-17 %.Therefore it is necessary to take measures to prevent water loss when used as a building material.

III. MODELING AND DESIGNING

Photographs of testing

Figure 2: Load testing Machine

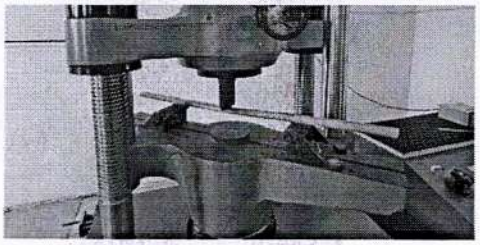


Figure 3: Load testing on full bamboo (O section)

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

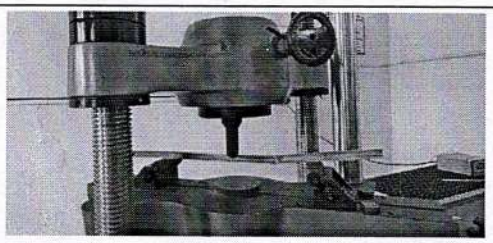


Figure 4: Load testing on Inverted U Section Bamboo

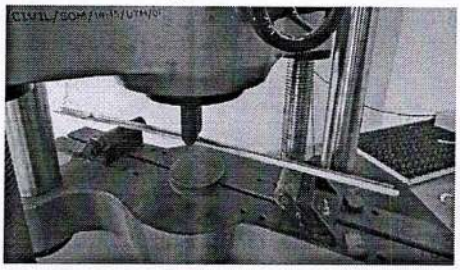
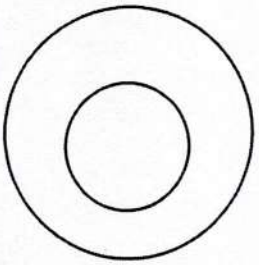
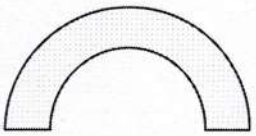
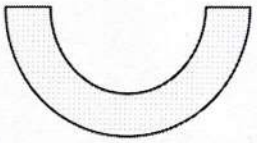
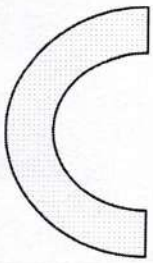


Figure 5: Load testing on U section Bamboo

Practical values of different cross-section

Table 1: Practical values of different cross section

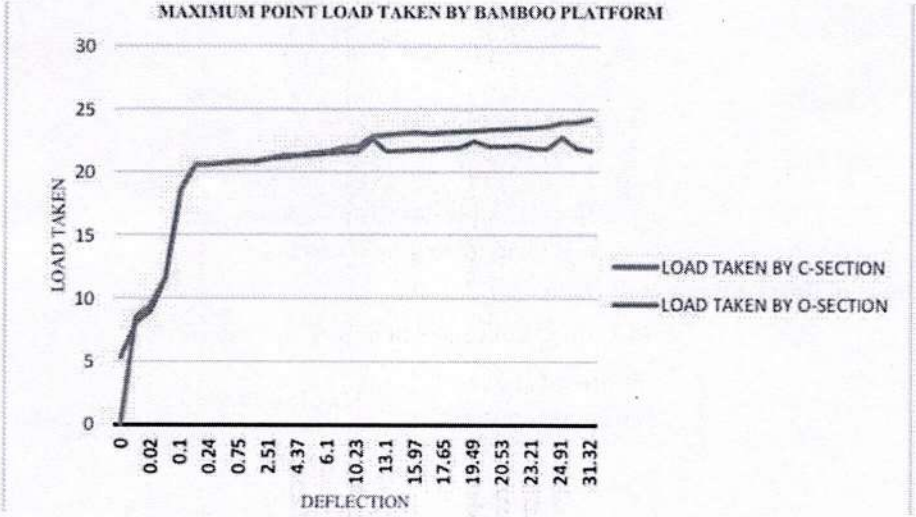
Shape of cross section of bamboo	Max.load taken
	24 KN
	21.65 KN
	21.85 KN
	22.5 KN

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

IV. RESULT AND DISCUSSION

Proper design of the storage is not only to restrain and properly hold the material but also to minimize the damage to the grain due to moisture condensation or excess temperatures. The storage unit must be so designed as to with stand the change in pressures during loading and unloading. The several aspects to be considered in a storage design are types and quantities of grain to be stored, location, size and number of bins, handling equipment and methods, structural requirements, conditioning methods and requirements and plans for future use and expansion.

Graphical representation of result



Graph 1: Load taken by C or O section

Graph 2: Load taken by O section or U section

Pre-harvest/Preliminary Storage Parameters

Curing

Curing is a drying process carried out to remove excess moisture from the outer skins, roots and neck tissues of harvested onion bulbs. It improves the keeping quality of onion bulbs and reduces the chance of infection by disease causing organisms during storage. The term "curing" is preferred because the removal of moisture is only from the outer scale, rather than from throughout the bulb. An onion bulb is a series of concentric swollen leaves attached to a short stem. Curing surface scales provides a dry barrier around the onion bulb and a sealing against water loss. Curing increases hardness of the bulb and helps to develop color of cured bulb. Onion curing can be done in the field with natural convection of air or with forced circulation of hot air using

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

artificial curing chambers. In traditional small-scale operations, onion drying is carried out in the field by a process called windrowing. It involves harvesting the mature bulbs and laying them on their sides (in windrows) on the surface of the soil to dry. During curing process, cover the bulbs with onion leaves to prevent sun burn. Field curing for 2-3 days in windrow method by covering with leaves, removal of foliage leaving 2-3 cm neck and then shade curing for 10 to 15 days to remove the field heat and excess moisture from the surface of bulbs is recommended for improving the storage quality of bulbs. Extra short necks increase the likelihood of disease infestation. Field curing has limitations due to unexpected rains during harvesting time, lack of proper security and other socioeconomic reasons. If dry conditions prevail during the harvesting season, the bulbs can be cured well in the field and in the on-farm store. During wet weather, the bulbs can take longer time to dry and may develop higher levels of rots during storage. Artificial curing could be beneficial during wet weather. Through artificial curing, we can have the control on the temperature and time of curing. Onion curing by artificial means may help to reduce post-harvest losses during wet harvesting seasons, but the economics and feasibility of such operations may preclude their application.

Sr.No	Parameters	Freshly Harvested Value	Permissible value After 6 Month Storage
1	Density (Onion Bulbs)	900 kg/m³	800-850 kg/m³
2	Moisture Content	90 % (w/w)	85 % (w/w Min)
3	RH	~ 50 %	40 - 45 %
4	Light/Illumination	25,000 – 30,000 Lux	2000 - 2500 Lux (Dark room)
5	Air Velocity	Natural, Seasonal Value	0.1 - 0.2 m/s (Air velocity across storage)
6	Pressure	-	0.1 - 0.2 kg/cm²
7	Direction of Bulb storage	Un symmetric	Symmetric (Shoot facing top and germinating end to bottom)
8	Storage Period	2 - 3 months	6 - 8 Months
9	Cost of Storage	Rs 0.5 - 1 /kg/Month	Rs 0.25 - 0.5 /kg/Month
Storage inside the soil (Replication of soil conditions)			
1	Direction of Bulb storage	Un symmetric	Symmetric (Shoot facing top and germinating end to bottom)
2	Pressure	-	0.1 - 0.2 kg/cm²
3	Light/Illumination	25,000 – 30,000 Lux	2000 - 2500 Lux (Dark room)

V. CONCLUSION

The proper grain storage is also important for household purposes in cities crops like potatoes, onion and any other food we cannot be stored in that a fridge that's why we decided to a make a ecofriendly storage structure with optimum use of bamboo cross section. We taking a load test on bamboo also to check its strength on any section of bamboo like cross section, circular section,u-shape, c-shape .The grain production has been on the rise with better facilities in terms of seeds, technology, fertilizers, pesticides and irrigation but associated is the loss of grains which has also increased. Around Rs 50,000 crores every year are lost due to improper storage of food grains. Naturally of food grains is greatly influenced by environmental factors such as type of storage

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

structure, temperature, pH, moisture, etc. At any given time 60-70% of grains is stored on the farm in traditional structures like Kanaja, Kothi, Sanduka, earthern pots, Gummi and Kacheri.

VI. REFERENCES

[1] Basave Gowda, Different Types of Grain Storage Structures for the Betterment of Livelihood of Indian Farmers, Department of Seed Science and Technology, UAS, Raichur-584104, 28.08.2018

[2] Digvir S. Jayas, Storing Grains for Food Security and Sustainability, National Academy of Agricultural Sciences, 19 January 2012.

[3] Uma Shankar, Integrated Pest Management in Stored Grains, Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu, July 2012

[4] Greeley, M., Recent Indian experience with farm-level food grain storage research. Food Policy, 39-49 (1978).

[5] Mickal, A. M. and Oza, T. P., Agriculture Engineering, Volume-I.

[6] Sahay, K. M. and Singh, K. K., A text book unit operations of agricultural processing.

[7] Sashidhar, R. B., Ramakrishna, Y. and Bhat, R.V., Moulds and mycotoxins in sorghum stored in traditional containers in India. *J.* Stored Products Res., 28(4): 257260 (1992).

[8] Singh, P. K. A decentralized and holistic approach for grain management in India. Current Sci., 99(9): 1179-1180 (2010).

[9] Sinha, R. N. and Muir, Grain storage: part of a system. Avi Publisher.

[10] Sinha, A. K. and Sinha, K. K., Insect pests, Aspergillus flavus and aflatoxin contamination in stored wheat: a survey at north Bihar (India).

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

COMPARING LAND USE AND LAND COVER CHANGE DETECTION USING REMOTE SENSING AND GIS IN THE NEPTI VILLAGE OF MAHARASHTRA STATE

Bhujbal Trupti N*1, Lodhe Ganesh*2, Aher Ajay*3, Jagtap Sunny A*4

*1,2,3Student-Dept. of Civil Engineering, Shri Chhatrapati Shivaji Maharaj College Of Engineering, Nepti, Ahmednagar, Affiliated To Savitribai Phule Pune University, Pune, Maharashtra, India.

*4Assistant- Professor, Dept. of Civil Engineering, Shri Chhatrapati Shivaji Maharaj College Of Engineering, Nepti, Ahmednagar, Affiliated To Savitribai Phule Pune University, Pune, Maharashtra, India.

DOI : https://www.doi.org/10.56726/IRJMETS54350

ABSTRACT

Use of Land Analyzing changes in land cover has been helpful in determining how an event has affected a particular area. With LULC change detection analysis, changes brought about by urbanization, deforestation, or natural disasters can be simply evaluated. Both short- and long-term biodiversity and LULC changes in an area have been studied using remote sensing and geographic information system (GIS) technologies. We propose a case study on the 2011 and 2023 years for the finding change detection using supervise classification of LISS-4 IRS images. This study area is categorized in to 5 major classes; Agriculture, Bare Soil, Barren Land, Settlement, Waterbody. The LULC maps are analyses to significant changes in Agriculture, Waterbody and barren land.

Keywords: LULC, GIS, Remote Sensing, Change Detection, LISS

I. INTRODUCTION

Land use and land cover change detection are important aspects of environmental monitoring and management. Remote sensing and Geographic Information Systems play a critical role in understanding these changes and their implications. By analyzing data captured from satellites and other remote sensing technologies, we can gain insights into how human activities and natural processes are altering the Earth's surface. Remote sensing involves the use of sensors on satellites or aircraft to capture images and other data about the Earth's surface. Remote sensing allows us to collect information about the Earth's surface without direct physical contact. Various sensors onboard satellites and aircraft capture data about different land features, such as vegetation, water bodies, and urban areas. This data can then be analyzed to assess changes in land use and land cover over time. GIS enables us to store, analyze, and visualize spatial data related to land use and land cover. By overlaying different datasets and performing spatial analysis, we can identify patterns and trends related to changes in land use and land cover. GIS also helps in integrating remote sensing data with other geospatial information, providing a comprehensive understanding of the Earth's surface dynamics.

Any transformation in science requires highly qualified professionals in the subject area, as well as in the field of informational technology, capable of collecting, analyzing, completing and processing all incoming data, materials, indicators based on a comprehensive analysis of information for their entry into the digital space. An important factor in DLM is the object of land management, that is - land as a spatial basis and natural resource [1]. These technologies provide a cost-effective and efficient solution for monitoring land changes at various scales, from local to global [2]. Knowledge about land use/land cover has become important to overcome the problem of biogeochemical cycles, loss of productive ecosystems, biodiversity, deterioration of environmental quality, loss of agricultural lands, destruction of wetlands, and loss of fish and wildlife habitat. The main reason behind the LU/LC changes includes rapid population growth, rural-to-urban migration, reclassification of rural areas as urban areas, lack of valuation of ecological services, poverty, ignorance of biophysical limitations, and use of ecologically incompatible technologies [3]. Application of satellite and GIS technologies for land-cover and land-use mapping at the rural-urban fringe is very useful to planners [4]. The main cause for urban growth is the increase in population. In India, rapid urbanization is witnessed due to an increase in the population, continuous development has affected the existence of natural resources. Therefore observing and monitoring the natural resources (land use) plays an important role. To analyze changed detection use remote sensing data [5]. land-cover and land-use classification technique using a microcomputer-based image

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

analysis and geographic information system. Results obtained with this technique suggest that the integration of GIS capabilities and image analysis techniques can improve significantly the conventional multispectral classification procedure [6]. Maximum Likelihood classifier was used in the supervised classification method in this particular study. Many literatures reviewed for the selection of the appropriate and best classification method. [7]

researcher's use remote sensing data.

The study area Nepti Village Ahmednagar of Maharashtra state. It is located within 19.100 North Latitude and 74.660 East Longitude. The total geographical area of village is 1634.15 hectares. Figures 1 and 2 depicting showing the location of study area.

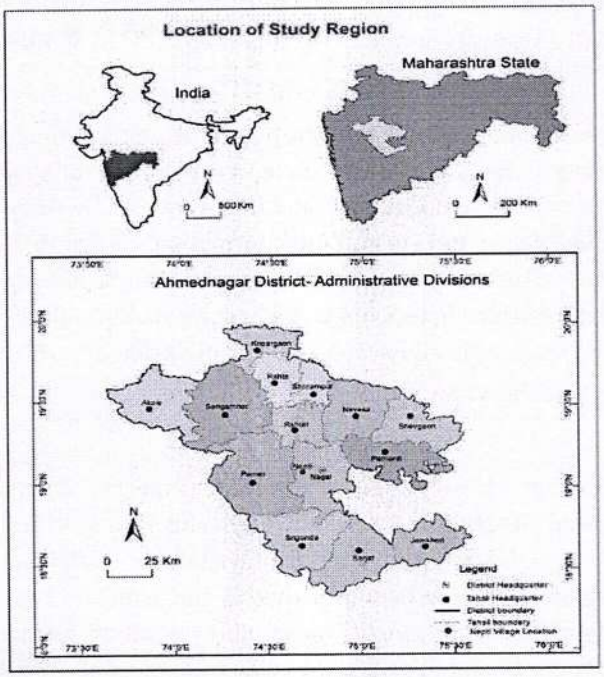


Figure 1: Location Map of Nepti Village

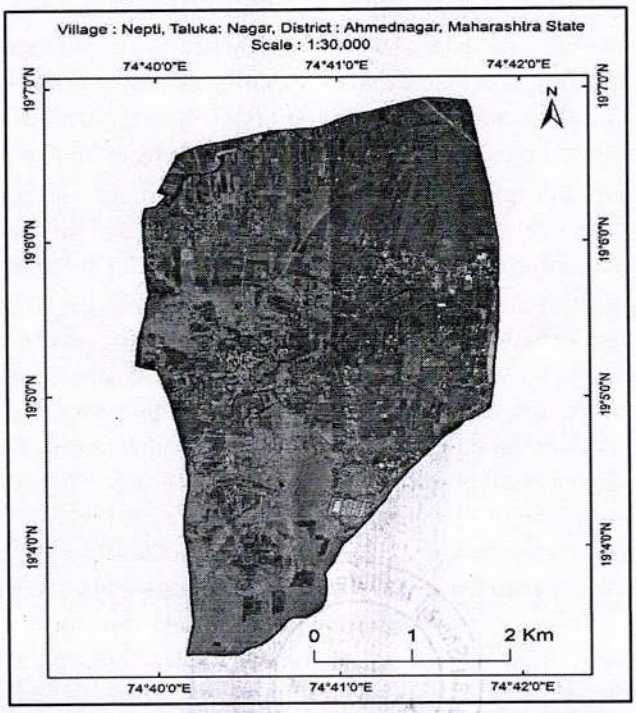


Figure 2 : Nepti Village Location with satellite image

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

II. METHODOLOGY

LISS -4 Satellite free data is use for the analysis and find out the land use and land cover change detection. LISS-4 is a high-resolution multi-spectral camera with three spectral bands and having a resolution of 5.8 m and swath of 23 Km from 817 Km altitude. The panchromatic mode provides a swath of 70 Km and 5-day revisit. This data was captured by ISRO using Resourcesat-1 sensor. LISS- 4 satellite images of the study area had acquired for the periods of 2011, and 2023 years. Consequently, this study aims to analyze land use and land cover (LULC) changes during these periods utilizing LISS-4 imagery.

III. MODELING AND ANALYSIS

Model and Material which are used is presented in this section. Table and model should be in prescribed format.

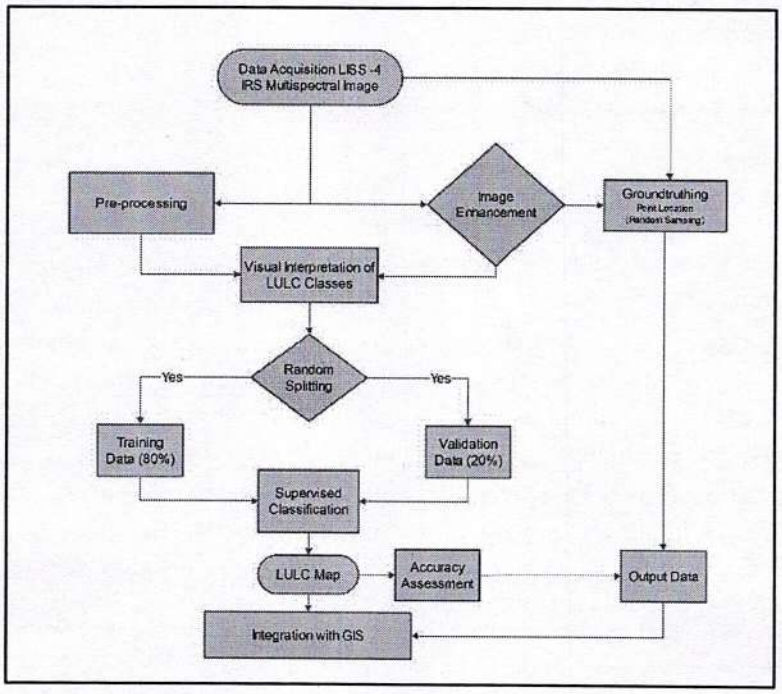


Figure 3 Flowchart of Image Classification

A. Supervised image classification

During this procedure, we pick pixels that show patterns that we are aware of or that we could figure out with the assistance of information from other sources (like Google Earth). We had to know the target classes, the data, and the algorithms before we could start choosing training examples. We have overseen the classification of pixels as they were given to a class value by giving these classes priorities.

B. Classifier Design

To obtain LULC maps, the picture dataset that was prepared and preprocessed in the previous part is classified. ArcMap10.8 Desktop version, open source cross-platform, free, open-source desktop GIS that employs Python and its libraries to categorize portions of photos, is utilized for this purpose. As outlined in the summary, the training data is produced by allocating multispectral signatures and classifying the input image's regions into five groups: waterbody, agriculture area, settlements, bare soil, and barren land. In order to do picture classification, the raw data needs to be appropriately preprocessed and prepared in order to account for errors caused by atmospheric, radiometric, and earth geometry factors. Preprocessing procedures often involve the following: radiometric calibration, atmospheric correction, topographic correction, geometric rectification or picture registration, poor line restoration and detection, and radiometric calibration.

To validate the precision of the acquired photo data, a classification assessment was carried out. Ensuring the accuracy of individual classed images is vital for effectively employing change detection methods on the imagery. Error matrices serve as a means to juxtapose the classification outcomes with reference data, facilitating the evaluation of accuracy.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

1. Producer's accuracy

The accuracy with which the characteristics found in the actual map are accurately categorized in the classification map is known as the producer's accuracy. It's the likelihood that a LULC feature will be categorized according to how it appears on the map (or on the ground).

2. User's accuracy

The accuracy with which the features categorized on the classification map correspond to the actual map is represented by the term "user's accuracy. A LULC feature's percentage represents its portion of the overall area it occupies in the classification.

3. Overall accuracy

Out of all the samples that are present, overall accuracy is a measure of how well the system recognizes correctly classified samples.

H. Kappa Accuracy

A measure of agreement between two parties classifying the same feature is kappa accuracy. Equation is used to calculate it.

$$K = \frac{P(A) - P(E)}{1 - P(E)} \dots\dots\dots$$

In this case, the agreement by chance is P (E), whereas the observed agreement is P (A).

4. Change Detection

Research on land use and cover change (LUCC), natural resource management, and environmental monitoring and protection has extensively utilized remote sensing imagery for land use and land cover change detection Using ERDAS Imagine Software that integrated with Arc GIS, the percentage area of each land cover class was obtained from supervised classed photos for each year independently.

The two-way cross matrix overlay approach and change-detection techniques are used to analyze the LULC maps. Techniques for post-classification have made it possible to isolate and recognize the kinds and frequencies of changes that occur throughout time. When defining the primary alterations to certain pixels inside the image, the two-way cross matrix comes in quite handy.

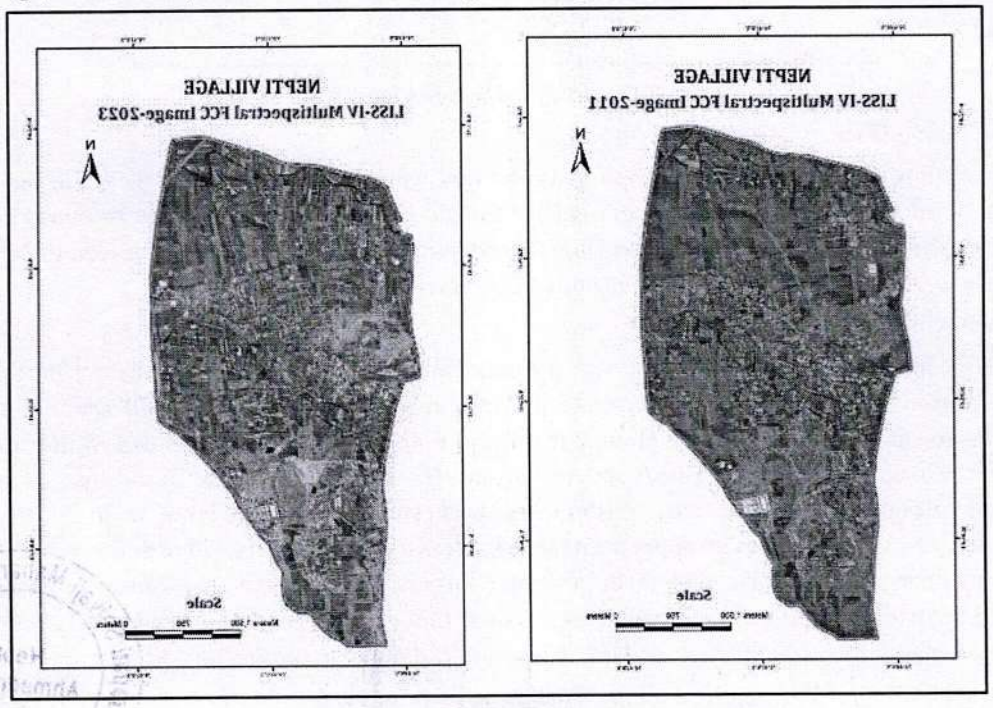


Figure 4 : LISS-4 FCC Images

The photos are analyzed pixel by pixel, and a cross-tabulation is created to show which pixels have changed from one land cover class to another.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

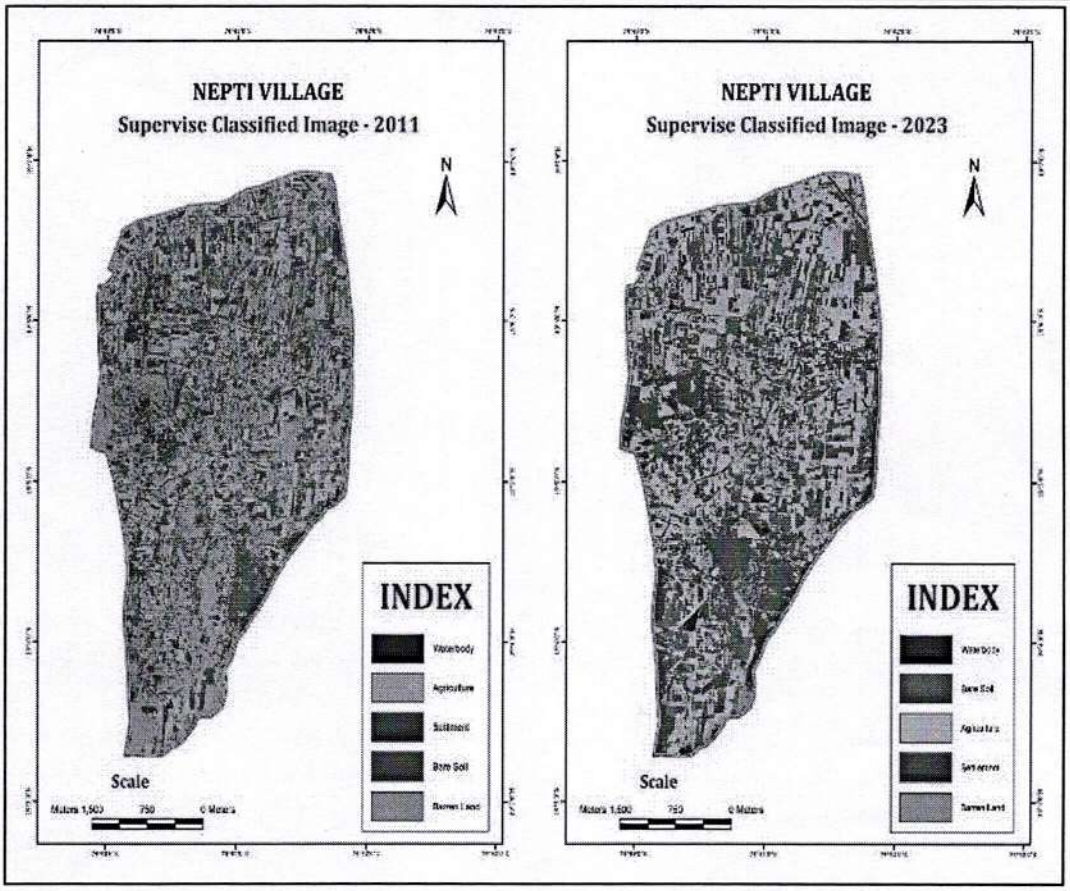


Figure 5: Supervise Classification of LISS -4 Images

IV. RESULTS AND DISCUSSION

This section describes the changes with the help of designed LULC map of Nepti Village. Figure 4 and 5 show final classified LULC maps of the Nepti.

Table 1 is summarizing values of LULC classes in percentage and areas in hector. There was a significant increase in agricultural land, growing by 209.54 hectares, which is an increase of 12.82% from 2011 to 2023. This suggests a trend towards more land being used for agricultural purposes. Bare soil also increased by 118.14 hectares, which is a 7.23% increase. This could indicate a loss of vegetation or could be due to construction and development activities exposing the soil. Barren land saw a dramatic decrease of 401 hectares, a 24.54% decrease. This might suggest successful land rehabilitation efforts or a reclassification of land use, potentially due to development or natural reclamation processes. Settlement areas increased by 65.34 hectares, up by 4%. This increase is consistent with urban expansion and growth in residential or commercial development. There was an increase of 8 hectares in waterbody areas, which is a 0.49% rise. This change could be due to natural factors affecting water bodies or man-made changes like the creation of new reservoirs or lakes.

Table 1.: Land use and Land Cover Classes and area in hector with difference in percentage

Sr. No.	Class Name	2023_Area (Hect.)	Area 2023 in %	Area 2011 (Hect.)	Area in %	Difference in (Hect.)	Differen in %
1	Agriculture	575.43	35.21	365.89	22.39	209.54	12.82
2	Bare Soil	327.17	20.02	209.03	12.79	118.14	7.23
3	Barren Land	218.92	13.40	619.92	37.94	-401.00	-24.54
4	Settlement	485.84	29.73	420.50	25.73	65.34	4.00
5	Waterbody	26.78	1.64	18.78	1.15	8.00	0.49

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

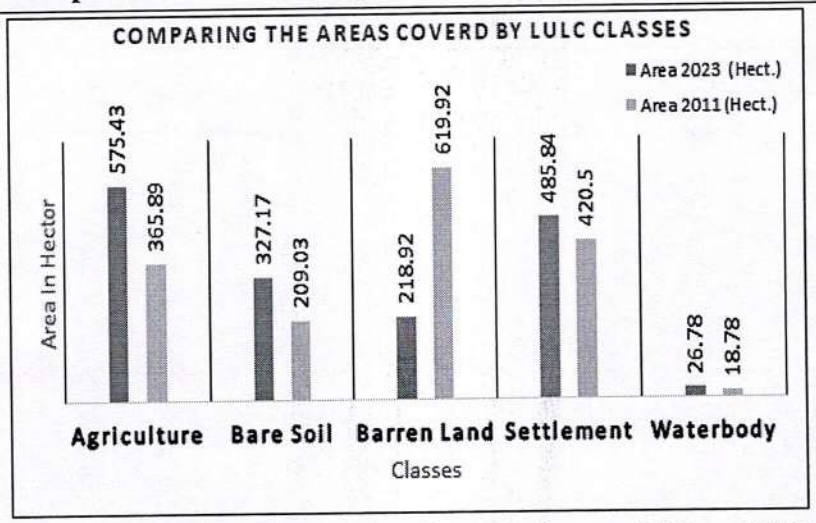


Fig. 6: Visualization of changes per classes during year 2011 and 2023

V. CONCLUSION

It may conclude that the considerable changes to the LULC maps of the Nepti Village. Our study's framework and basis are provided by the LULC maps we created, which offer a general overview of the area both 2011 and 2023 years.

We can conclude that the farmers are aware of the farming business and its impact on the area, and thus it is important to consider the options that could very well change the overall LULC of the region. The increase in agriculture area (12.18%) is considered to have some positive significance for the land cover of the area. On the other hand, barren land is significantly decreasing (-24.54%). It is a positive sign for development. But there is a slight increase in settlement (4%).

This study has meticulously examined the dynamics of land use and land cover (LULC) changes in Nepti Village, Maharashtra, employing a robust methodological framework that integrates remote sensing and GIS technologies. Our findings reveal significant alterations in the landscape over the study period, underscored by a marked decrease in agricultural land and corresponding increases in built-up areas. These changes reflect the broader trends of urbanization and land use pressure experienced in many parts of India.

Through the comparative analysis, the strengths and limitations of using remote sensing and GIS for LULC change detection have been clearly delineated. Remote sensing provided invaluable temporal data and a macroscopic view of land cover changes over time, while GIS facilitated detailed spatial analysis and the integration of various data types to understand the patterns and drivers behind these changes.

The study not only contributes to our understanding of the local environmental and socio-economic impacts of LULC changes in Nepti Village but also demonstrates the potential of these technologies for monitoring, planning, and managing land resources more effectively. It emphasizes the need for sustainable land use policies that can balance development objectives with environmental conservation.

Future research should focus on refining these methodologies for greater accuracy, exploring the socio-economic factors driving these changes in more detail, and evaluating the impacts of land use change on local biodiversity and ecosystem services. Additionally, there is a significant opportunity to apply similar frameworks to other regions, providing a comparative perspective on LULC changes across different ecological and cultural contexts.

In conclusion, the study underscores the critical role of advanced geospatial technologies in understanding and managing the rapidly changing landscapes of the 21st century. As we continue to witness unprecedented levels of land use change, the insights gained from studies like this are vital in guiding policy and conservation efforts, ensuring that development progresses in harmony with the natural environment.

ACKNOWLEDGEMENTS

The authors are thankful to Principal, HOD, Civil Department and Management for guidance and providing facilities to complete this work.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:04/April-2024 Impact Factor- 7.868 www.irjmets.com

VI. REFERENCES

[1] Ganesh Kumar and P.Vasanth Sena, "Novel Artificial Neural Networks and Logistic Approach for Detecting Credit Card Deceit," International Journal of Computer Science and Network Security, Vol. 15, issue 9, Sep. 2015, pp. 222-234

[2] Reddy, G. O., "Geospatial technologies in land resources mapping, monitoring, and management: An overview," Springer International Publishing (pp. 1-18), 2018.Chengwei Liu, Yixiang Chan, Syed Hasnain Alam Kazmi, Hao Fu, "Financial Fraud Detection Model: Based on Random Forest," International Journal of Economics and Finance, Vol. 7, Issue. 7, pp. 178-188, 2015.

[3] P. K. &. S. R. J. R. Mallupattu, "Analysis of land use/land cover changes using remote sensing data and GIS at an Urban Area, Tirupati, India.," The Scientific World Journal (pg.no 15-17), Tirupati, 2013.

[4] P. M. H. P. J. &. G. P. Treitz, "Application of satellite and GIS technologies for land-cover and land-use mapping at the rural-urban fringe: a case study.," Photogrammetric Engineering & Remote Sensing, 1992.

[5] S. O. J. Ashoka Vanjare, "Satellite Image Processing for Land Use and Land Cover Mapping," IJIGSP, vol.6, no.10, pp.18-28,DOI: 10.5815/ijigsp.2014.10.03, 2014

[6] K. A. M. Tin-Seong, "Integrating GIS and remote sensing techniques for urban land-cover and land-use analysis," Geocarto International, 10(1), 39-49, 1995.

[7] H. A. K. &. I. Sopan, "Land Use Land Cover Classification and Change," Journal of Environment, Vol. 01, Issue 04, pp. 146-152 , 2012.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:05/May-2024 Impact Factor- 7.868 www.irjmets.com

PARTIAL REPLACEMENT OF COURSE AGGREGATE WITH COCONUT SHELL

Abhishek Chobhe*1, Vedant Kadam*2, Sumit Deharekar*3, Umesh Kotkar*4, Amol Pardeshi*5

*1,2,3,4Student, Department Of Civil Engineering, Shri Chhatrapati Shivaji Maharaj College Of Engineering, Ahmednagar, Maharashtra, India.

*5Assistant Professor, Department Of Civil Engineering, Shri Chhatrapati Shivaji Maharaj College Of Engineering, Ahmednagar, Maharashtra, India.

DOI : https://www.doi.org/10.56726/IRJMETS57554

ABSTRACT

The high cost of conventional construction material affects economy of structure. The possibility of utilizing recycled coconut shell aggregates in concrete as coarse aggregate is examined in the present study. An optimum percentage replacement of coarse aggregate with coconut shell aggregate is determined from the study. Coconut shell is a light weight material thus producing light weight concrete. The replacement of coarse aggregate of coconut shell by 5%, 10%, 15%, 20% , .Design mix used is M30 grade and testing of specimens are conducted after 3, 7 and 28 days of curing .The compressive strength of concrete are tests. The main objective is to encourage the use of these waste products as construction materials in low cost housing.

Keywords: Coconut Shells, Ecofriendly Concrete, Conventional, Light Weight Concrete, Design Mix.

I. INTRODUCTION

Concrete is the vital civil engineering material. Its manufacturing involves utilization of ingredients like cement, sand, aggregates and water .With the development of world, there are some negative impacts of more production of concrete like continuous extensive extraction of aggregate from natural resources will lead to its depletion and ecological imbalance. The construction field also developed. Now a day different types of waste materials used in construction. As an alternative solution, the agricultural waste is the best way to reduce the raw material used in construction industry and thus helping to reduce pollution caused by disposal of agricultural waste.

Coconut grown in over 86 countries worldwide. India is a divine land and in every occasion perhaps coconut is the main item of worshipping. So India produces a huge amount of waste from coconut. With the use of coconut shell as a replacement material in the construction history, indirectly reduce the costs production of concrete and the disposal of waste. Coconut shell is often used as a composite in concrete because of the characteristics found in it better than material that commonly used in production of concrete.

Besides, coconut shell is potential material for the development of new composite material in concrete mix design because of their high strength and modulus properties. The aim of this work is to spread awareness of using coconut shell as partial replacement of coarse aggregate in concrete and determining its compressive strength. It also provide more data on the strength of concrete with coconut shell at different percentage coconut shell used. Further-more, in this study the workability of concrete with coconut shell are also investigate.

II. METHODOLOGY

The present study requires preliminary investigations in a systematic manner:

- Selection of type of grade of mix, mix design by an appropriate method, trial mixes, final mix proportions. Estimating quantity of cement, fine aggregate, coarse aggregate, coconut shells required for the project work.
- Testing of properties of cement, fine aggregate, coarse aggregate
- Preparing the concrete cubes with coconut shells and gravel.
- Testing those cubes in compression testing machine.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:05/May-2024 Impact Factor- 7.868 www.irjmets.com

Cement

In this experimental work cement used is OrdinaryPortland Cement 53 grade.

- Fine aggregates
- River sand was used as the fine aggregate.
- Coarse aggregates
- Coarse aggregate of size upto 20 mm used in this experimental work.

EXPERIMENTAL WORK

Mix design was done according to IS 10262:2009 and IS456:2000. For M30 grade concrete mix proportion was 1:0.75:1.5. Coconut shell replaced by 5% ,10% ,15% and 20% replacement of coarse aggregate with coconut shells.

TEST CONDUCTED ON CONCRETE

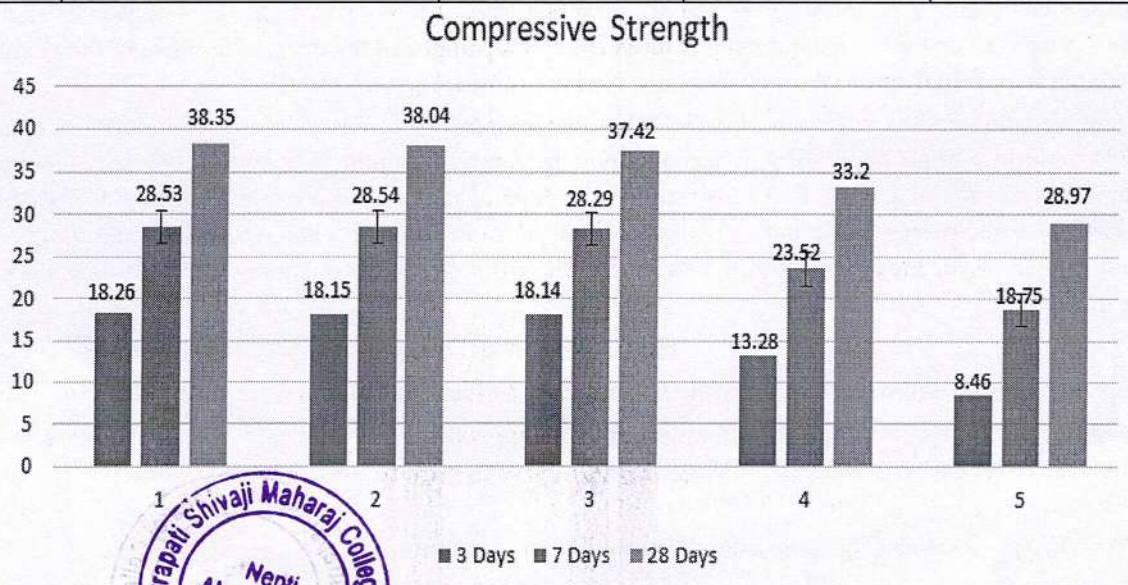
Cubes were prepared for test. Concrete were poured in to the mould by three layer and each layer compacted 25 times using tamping rod. After 24 hours of casting the specimens were demould and immersed in curing tank containing fresh water. Curing period was 3, 7 and 28 days for cube. Compression test was conducted for cube on compression testing machine of capacity 2000 KN.

III. RESULTS AND DISCUSSION

The graph 1, 2 and 3 shows as the percentage of coconut shells are increasing the compressive strength decreases for 3, 7 and 28 day. Also the graph shows the compressive strength values for three, seven and twenty eight days.

Table 1: Compression test result for 3, 7 and 28 days

Sr.No	Replacement by Coconut shell	Compressive Strength 3 Days	Compressive Strength 7 Days	Compressive Strength 28 Days
1	0%	18.26	28.53	38.35
2	5%	18.15	28.54	38.04
3	10%	18.14	28.29	37.42
4	15%	13.28	23.52	33.20
5	20%	8.46	18.75	28.97



Graph 1:

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:05/May-2024 Impact Factor- 7.868 www.irjmets.com

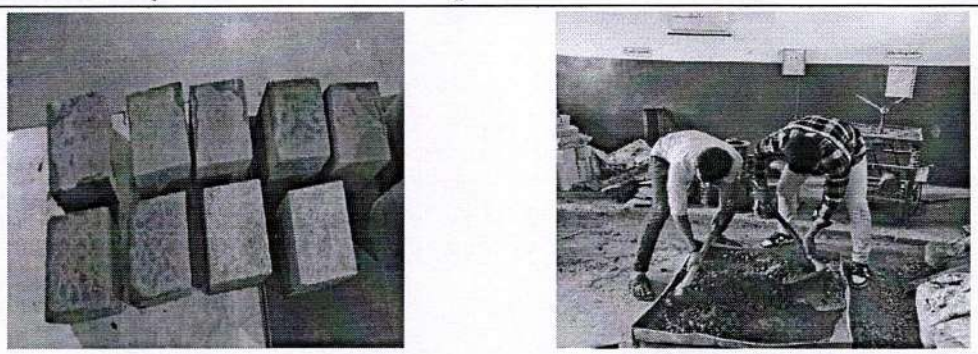


Figure 1: Mixing and Casting of concrete cubes

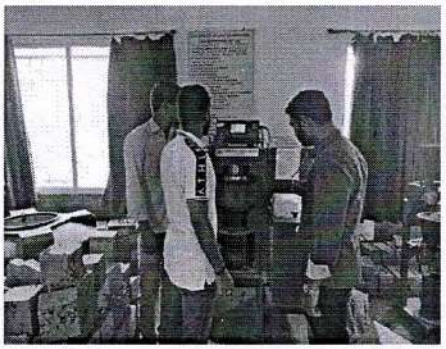


Figure 2: Testing of concrete cubes

IV. CONCLUSION

On the basis of the experimental studies carried out on m30 grade concrete as as partial replacement of course aggregate with coconut shell the following conclusion are drawn,

From the above study we conclude that the compressive strength of the concrete cubes has gradually decreased from addition of 5% of coconut shell whereas comparing to traditional concrete compressive strength of 5% of coconut shell increased. Hence the economical view 5% preferable and in perspective of compressive strength 5% is suggested.

V. REFERENCES

[1] Kajal bansal, Pooja meena, Mr.Navneet anand, A Study on Partial Replacement of Coarse Aggregate with Coconut shells :JETIR.ORG, Volume 8, Issue 8, Aug 2021,pp 2349-5162

[2] Ubair Mukhtyar, Chitranjan Kumar , Use Of Coconut Shells As A Partial Replacement Of Coarse Aggregates, Volume 5, Issue 11, July-2018 pp 2347-4718

[3] Ramkumar.K, Anusha.S, Venkatesh.B, Arunprasath.R, Experimental Investigation On Replacement Of Coarse Aggregate By Coconut Shell And Bamboo In Concrete, Volume: 08 Issue: 03 Mar 2021 Pp 2395-0072

[4] Gurikini Lalitha, Dr. C. Krishna Raju, Experimental Study on Performance of Concrete M30 with Partial Replacement of Coarse Aggregate with Sea Shells and Coconut Shells, Vol. 4, Issue 8(Version 3), August 2014, pp.148-151

[5] Veeresh B, Sunil B S, A Study on Partial Replacement of Coarse Aggregate with Coconut Shells and full replacement of Natural Sand with Robo Sand, Volume 9 Issue 7 ǁ 2021 ǁ PP. 16-22

[6] Kalyana Chakravarthy P, Janani, Ilango, Dharani, Properties of Concrete partially replaced with Coconut Shell as Coarse aggregate and Steel fibres in addition to its Concrete volume, IOP Conf. Series: Materials Science and Engineering 183 (2017) 012028

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:05/May-2024 Impact Factor- 7.868 www.irjmets.com

PARTIAL REPLACEMENT OF FINE AGGREGATES WITH THE CRUSHED GLASS

Athare Akanksha*1, Chaudhari Shailesh*2, Sakhre Komal*3, Thombare Avantika*4, Amol Pardeshi*5

*1,2,3,4Student, Department Of Civil Engineering, Shri Chhatrapati Shivaji Maharaj College Of Engineering, Ahmednagar, Maharashtra, India.

*5Assistant Professor, Department Of Civil Engineering, Shri Chhatrapati Shivaji Maharaj College Of Engineering, Ahmednagar, Maharashtra, India.

ABSTRACT

This paper examines the partial replacement of fine aggregates with glass powder in concrete with different percentages ranging from 0%, 8%, 10%, 12% & 15% weight for M-30 mix. The concrete specimens will be tested for compressive strength at 3, 7 and 28 days respectively and also the results obtained will be compared with those of traditional concrete. Compressive strength up to 28 days respectively will be compared with those of control mix created with natural sand. It studies the likelihood of utilization of Glass powder in fine mixture replacement in concrete. The recycling of waste glass as a component in concrete makes waste glass a sustainable alternative to land filling and so makes it economically viable.

Keywords: Waste Glass Powder, Partial Replacement Of Fine Aggregates, Compressive Strength, Recycling Of Waste.

I. INTRODUCTION

A massive amount of waste glass is generated all round the world. In India, 0.7% of total urban waste generated includes of glass. GBP produces over 4 million heaps of waste glass annually. The crushed glass in non-biodegradable and cannot be disposed of, also causes several environmental effects. The report summarizes the behavior of concrete involving replacement of fine aggregates by waste glass as 0%, 8% and 10%, 12 % & 15% by weight which may help to reduce the disposal problems of waste glass and enhance properties of concrete.

II. MATERIAL

1. Cement:

Cement is a binding agent due to its ability to form a strong bond with other materials when mixed with water. The ordinary Portland cement of 53 grades Ultra Tech cement is carefully selected for its optimal performance, providing the necessary strength and cohesion to bond various construction materials together effectively.

2. Fine aggregate:

Fine aggregates in concrete are small particles that are smaller than 4.75 mm but larger than 0.075 mm. It plays a crucial role in concrete by filling the voids between larger aggregates particles, enhancing workability, and durability of the concrete mixture.

3. Coarse aggregate:

Coarse aggregates are larger particles of crushed stone, gravel or recycled concrete with sizes larger than 4.75 mm in sizes, but smaller than 3 inches. Coarse aggregates help to distribute the load evenly throughout the concrete mixture and improve workability of the concrete.

4. Crushed glass:

Crushed glass refers to glass that has been broken into small pieces. We collected waste glass consisting of waste window glasses, glass bottles etc. It was pulverized in Los Angeles abrasion apparatus and then sieved through 1.18mm IS sieve. Then we replaced these crushed glass with concrete at different percentages.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:05/May-2024 Impact Factor- 7.868 www.irjmets.com

Figure 1: Cement

Figure 2: Fine Aggregate

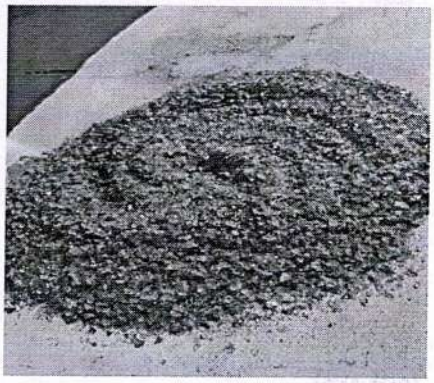


Figure 3: Coarse Aggregate

Figure 4: Crushed Glass.

III. METHODOLOGY

A. Compressive strength

The strength of the hardened concrete gives the measure of the concrete's ability to resist compressive loads. The strength of concrete below which not more than 5% of the test results are expected to fall. As per IS – 456: 2000, it can be found by testing standard-sized concrete cubes (15 x 15 x 15) cm under a compression testing machine after 7 and 28 days taking an average of three samples. Concrete is graded based on its characteristic compressive strength of a 150 mm size cube at 28 days expressed in N/mm2.

F= P/A

Where,

F is the compressive strength of the specimen in Mega Pascal

P is the maximum applied load by Newton,

A is the cross-sectional area estimated in mm2

B. Split Tensile strength test:

The split tensile strength of hardened concrete measures its ability to resist tensile loads. As per IS – 456: 2000, this strength is determined by testing standard-sized cylindrical concrete specimens (150 mm diameter x 300 mm height) under a split tensile testing machine after specific curing periods, typically 7 and 28 days, and taking an average of three samples.The characteristic split tensile strength of concrete at 28 days is expressed in Mega Pascals (MPa).

F spt MPa = 2 P / π D L

Where,

P is applied force (N),

D is the diameter of a specimen (mm),

L is the length of specimen (mm).

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:05/May-2024 Impact Factor- 7.868 www.irjmets.com

Table 1: Split Tensile Strength test result for 3, 7 and 28 days

Sr.No	Replacement by Crushed Glass	Compressive Strength 3 Days	Compressive Strength 7 Days	Compressive Strength 28 Days
1	0%	2.87	3.64	4.48
2	8%	3.04	3.48	4.15
3	10%	3.66	3.93	4.39
4	12%	3.56	3.81	4.50
5	15%	2.89	3.31	3.99

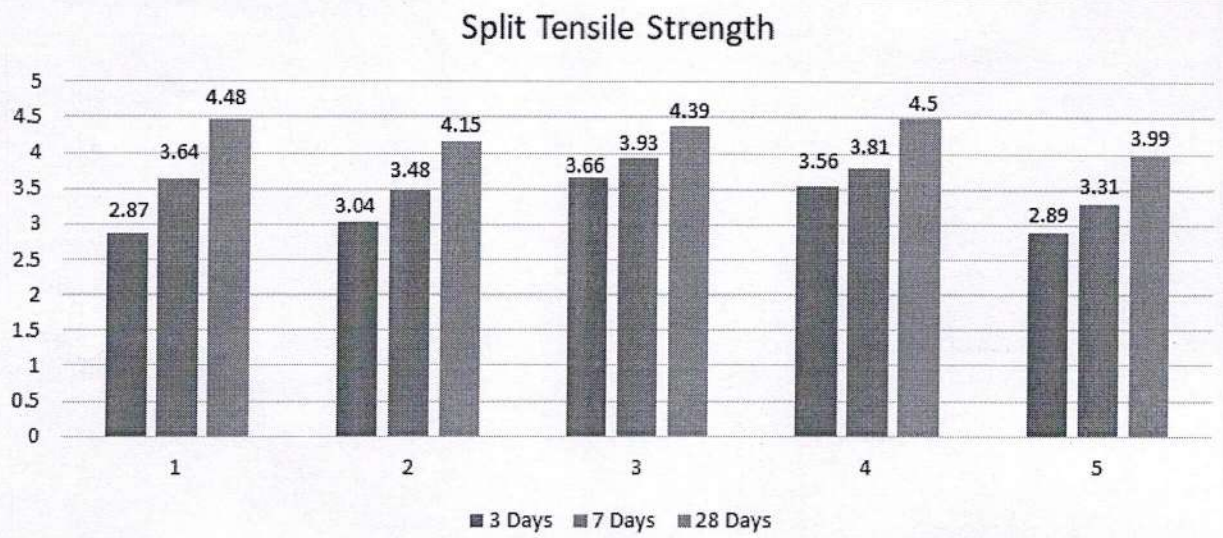


Figure 9:

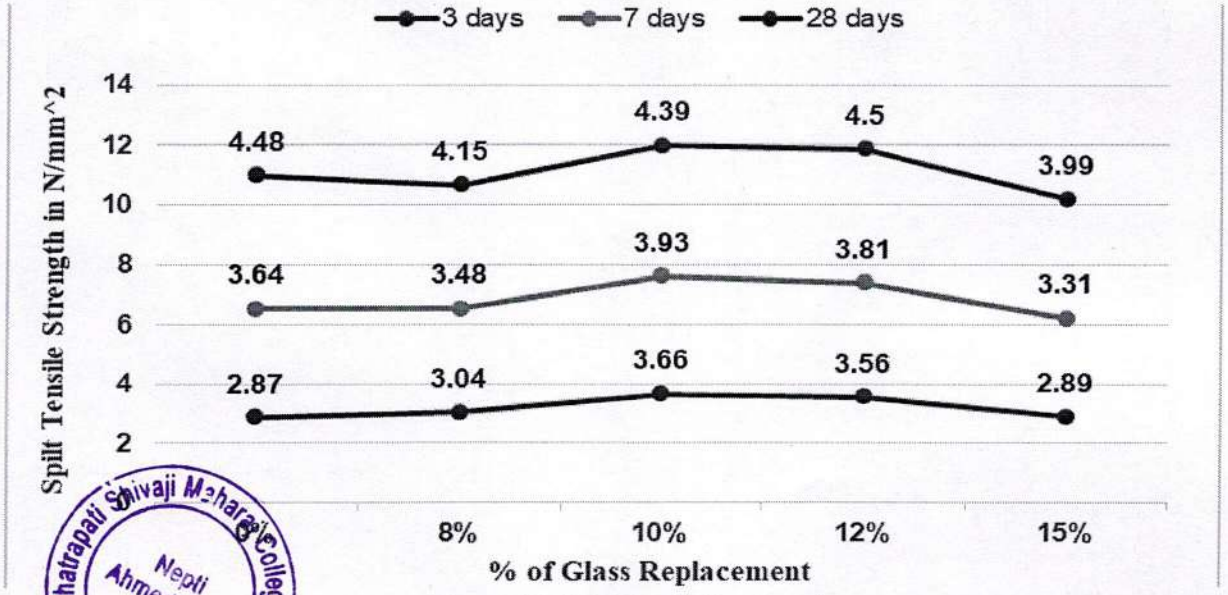


Figure 10: Split Tensile Test Results

IV. CONCLUSION

In Conclusion with the experiment the replacement of fine aggregate with glass powder in concrete mixture offers several advantages. Replacement is done in concrete with crushed waste glass in fine aggregate with different percentages of 0%, 8%, 12%, 10% and 15% respectively. The 12% replacement of fine aggregates by waste glass powder showed maximum increase in compression strength. Use of waste glass in concrete can

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:05/May-2024 Impact Factor- 7.868 www.irjmets.com

Figure 5: Compressive Strength Test

Figure 6: Split Tensile Strength Test

Table 1: Compression test result for 3, 7 and 28 days

Sr.No	Replacement by Crushed Glass	Compressive Strength 3 Days	Compressive Strength 7 Days	Compressive Strength 28 Days
1	0%	16.83	27.08	41.06
2	8%	18.88	24.73	35.10
3	10%	27.30	31.48	39.46
4	12%	24.87	29.57	41.38
5	15%	17.07	22.31	32.59

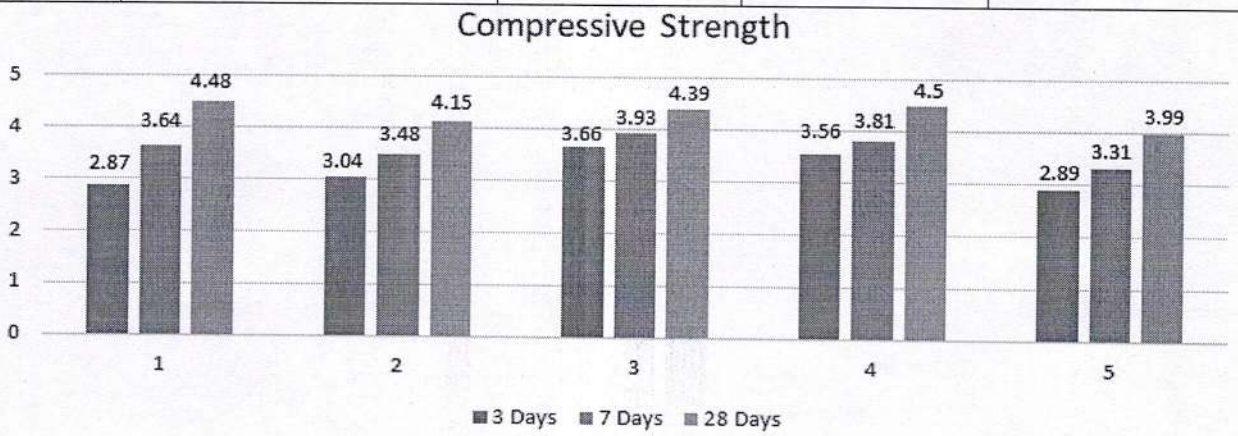


Figure 7:

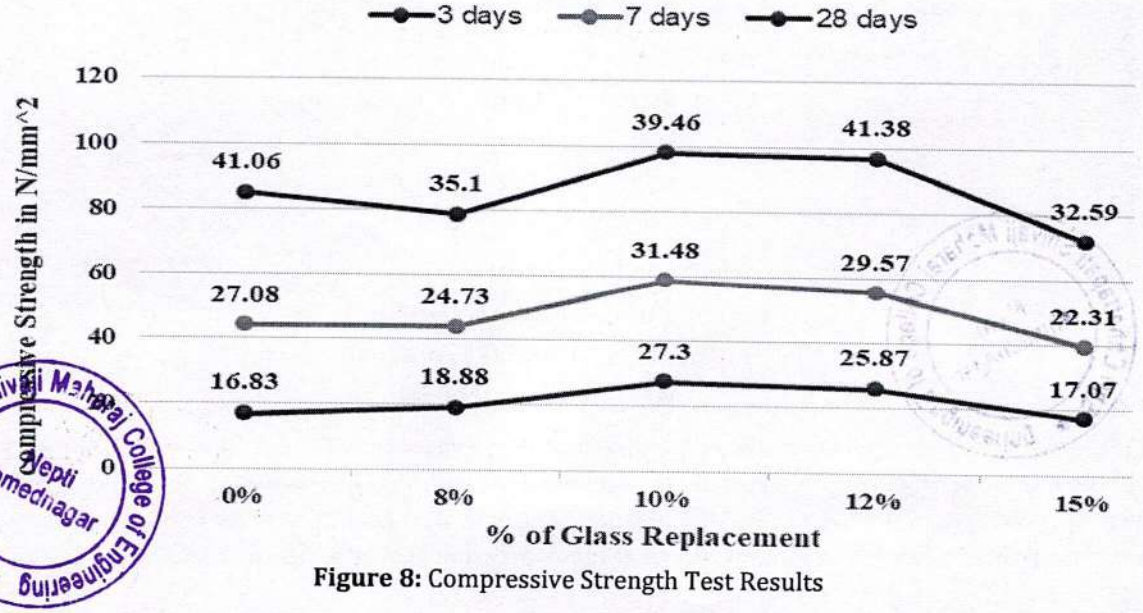


Figure 8: Compressive Strength Test Results

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:05/May-2024 Impact Factor- 7.868 www.irjmets.com

prove to be economical as it is non useful waste and free of cost. Use of waste glass in concrete will reduce the disposal problems of waste glass and is environment friendly.

V. REFERENCES

[1] Norfaniza Mokhtar and Nurul Atikah Jalani 2021 "performance of waste glass as partial replacement of fine aggregate" (2021)

[2] Shivangi Mishra & Dr. (Mrs.) Vandana Tare "Partial replacement of fine aggregate with waste glass" (Nov 2021)

[3] G.Lalitha, C.Sashidhar, C.Ramachandrudu, " Experimental research on strength properties of concrete partially fine aggregate replace with waste crushed glass" (4 November 2021)

[4] Sudarshan Upreti & Dr Bharat Mandal, "Waste glass as a partial replacement for fine aggregate in concrete"(February 2021)

[5] Sathyakumar Natarajan (1), Nagavishwanath Ravichandran(2) , Nafeez Ahamed Shathik Basha(2) , Naveen Ponnusamy "Partial replacement of fine aggregate by using glass powder" (4 September 2020)

Materials Today: Proceedings 93 (2023) 5–11

Contents lists available at ScienceDirect

Materials Today: Proceedings

journal homepage: www.elsevier.com/locate/matpr

Effect of SCBA and GGBFS on mechanical properties and microstructure of concrete under elevated temperature

Satish M. Palaskar *, Gaurang R. Vesmawala

Sardar Vallabhbhai National Institute of Technology, Surat 395007, India

ARTICLE INFO

Article history:
Available online 12 June 2023

Keywords:
SCBA
GGBGS
Mechanical properties
Microstructure
Elevated temperature

ABSTRACT

Concrete is a naturally occurring mixture of fine and coarse material bonded together by water-based cement. The use of waste material as cement replacement is regarded as one of the most well-linked improvements in the construction sector. Sugarcane bagasse ash (SCBA) which is an agricultural waste, whereas ground granulated blast furnace slag (GGBFS) is an industrial by-product that is used as a cement substitute. Concrete is vulnerable to damage when exposed to temperatures that are substantially greater than room temperature. In this investigation, M25 grade of concrete with replacement of cement by SCBA and GGBFS at 15%, 20%, 25% and 30% with regulated curing was employed. This investigation examined strength in compression, mass loss ratio, ultrasonic pulse velocity (UPV), physical behavior, and microstructure in terms of scanning electron microscope (SEM) under elevated temperature. The specimen is held at a temperature of 200 °C, 400 °C, 600 °C, & 800 °C for two hours following a 28 days curing period. It was reported that strength in compression improves up to 400 °C before it starts to decline. At higher temperatures, color change and cracking were seen in addition to a fall in UPV value and mass loss.

Selection and peer-review under responsibility of the scientific committee of the UKIERI Concrete Congress – Sustainable Concrete Infrastructure.

1. Introduction

Concrete is one important building material that plays a significant part in creating a commercial entity. By 2050, it's anticipated that the annual demand for concrete will increase to almost 18 million tonnes. Every tonne of cement produced resulted in an estimated CO_2 output of between 0.7 and 1.1 tonne [1]. To reduce CO_2 production, some waste material from other industries can be used to partially replace cement. SCBA and GGBFS are the waste product of the agriculture and steel industries, respectively. During the entire service life, many engineering constructions are prone to fire risk. It's essential to understand the various characteristics of concrete at elevated temperatures because it is a key building material.

Numerous investigations have revealed that the strength, elastic modulus, and other mechanical characteristics of concrete material are all negatively impacted by high temperatures [2]. T. Rajah Surya et al. studied the compressive strength property of self-compacting concrete at 200 °C, 400 °C, 600 °C, and 800 °C and found that there is a reduction in strength in compression with a temperature rise. At 600 °C and 800 °C, strength significantly decreased. The specimen surface color had changed at all temperatures [3]. Sayed Safdar Raza et al. used carbon and steel fiber in concrete at elevated temperatures. They found that carbon fiber reactive powder concrete will have 85–90% potential compared to steel fiber reactive powder concrete [4]. There will be pozzolanic activity and microstructure establishment when metakaolin is used in high-strength concrete at higher temperatures [5]. Anupam Krishna et al. studied strength in compression, tensile strength, and stress–strain response in a concrete specimen subjected to temperatures from 100 °C to 1000 °C. The experimentally established model for strength in compression and tensile of concrete at higher temperatures strongly correlates with the literature [6]. Ayush Meena et al. used polypropylene fiber in concrete to study various mechanical characteristics at a higher temperature. Results revealed that by addition of these fibers improved the properties at 200 °C as compared with the conventional concrete [7]. Tran Ming Tung et al. studied the performance of concrete at elevated temperatures using GGBFS and recycled aggregate. The result shows that using GGBFS as cementitious material; there is the prevention

* Corresponding author.
E-mail address: satishpalaskar@gmail.com (S.M. Palaskar).

https://doi.org/10.1016/j.matpr.2023.06.029
2214-7853/
Selection and peer-review under responsibility of the scientific committee of the UKIERI Concrete Congress – Sustainable Concrete Infrastructure.

of residual mechanical strength deterioration. Microstructural analysis shows the development of cracks and the breakdown of the hydrated product [8]. Mounira Chadli et al. studied the effect of higher temperatures on reactive powder concrete. Mechanical characteristics and physical behavior were studied. Results revealed that up to 200 °C, there is improvement in mechanical characteristics. At 400 °C mechanical characteristics were decreased as compared with room temperature. SEM images show major morphological changes [9]. Mohaned A Saif et al. used silica fume, metakaolin, and limestone powder as cement substitutes. Strength in compression, UPV, sorptivity, absorption, and tensile strength was found out at room as well as 200 °C and 300 °C. Results indicate increased strength in compression, whereas sorptivity and absorption decrease [10]. Yao Zang et al. found enhancement in strength in compression as well as prevention in the occurrence of cracks when multiscale fibers are used in concrete at elevated temperatures [11]. Seyed Esmaeil Mohammadan- Yasouj et al. used nano-alumina to replace cement. Strength in compression and modulus of elasticity were determined at room temperature as well as up to 600 °C in various intervals. Results show improvement in strength in compression up to 200 °C. Due to nano-alumina, there is a degradation of the E-value [12]. Venkata et al. determined the strength reduction factor for concrete exposed to temperatures from 20 °C to 300 °C. At high temperatures, a significant loss of strength and microstructure change was observed [13]. Le Haung et al. found superior higher temperature performance for clinkerless alkali-activated slag-based ultra-high strength concrete [14]. Sedegh Mehdipour et al. used metakaolin and steel fiber in concrete and studied the various properties and microstructure at elevated temperatures by SEM and X-ray diffraction analysis. Results reveal that a combination of metakaolin and steel fibers improves mechanical properties at elevated temperatures [15]. Josef Novak et al. determined the mechanical characteristics of the material by adding fibers at room temperature and elevated temperature. Results show that with an increase in temperature, mass density decreases. Strength in compression-containing fibers decreases rapidly at higher temperatures [16]. Kasali Adebayo Mujedu et al. used palm oil fuel ash to substitute cement partially. Results show that with an increase in temperature, the specimen mass continuously decreases. Strength in compression is severely reduced when heated at 600 °C. The results of microstructure revealed that calcium-silicate-hydrate changed into separate phases [17]. Md. Nuruzzaman et al. used ferronickel slag in concrete and studied various properties of concrete at elevated temperature. At various temperatures for various mixtures, SEM analysis and XRD data revealed the differential morphological changes that were correlated with compressive strength data [18].

The research articles under consideration are of great use to scientific investigations in determining the appropriateness of binary and ternary concrete containing SCBA and GGBFS at high temperatures. The different tests for binary and ternary concrete were decided using literature reviews. The analyzed research paper helped to define the temperature range and time duration for which samples are to be kept. Examining the effects of agriculture waste (SCBA) and industrial waste (GGBFS) inclusion on the residual characteristics of binary and ternary concrete and its microstructure at high temperatures is the central goal of the current investigation.

2. Material and methodology

In this investigation, ordinary Portland cement of grade 43 according to IS 12269:1987 [27], was employed. Sugarcane bagasse ash obtained from a local sugar factory. The collected ash was heated over two hours at 700 °C in a muffle furnace. After heating, cooled at ambient temperature, then it was fined by grinding (having fineness 80% particle retained on 45μ sieve and all particles are passing 90μ sieve). GGBFS was taken from Gujarat(having fineness 4.12% particle retained on 45μ sieve and 0.8% retained on 90μ sieve). Table 1 illustrates the chemical composition of SCBA and GGBFS.

Fine aggregates with a maximum size of 4.75 mm were obtained from a local river. Coarse aggregate with 20 mm and 12.5 mm was utilized in a 60:40 ratio. In accordance with the requirement of IS 383: 1970 [28] coarse aggregate, as well as fine aggregate, were used. Mix proportions for binary and ternary were computed in accordance with IS 456:2000 [29]. Table 2 shows the mix proportion for the M25 grade with the ratio of 1:1.83:2.99 (cement: sand: aggregate) was designed consuming water-cement ratio (w/c) of 0.5. Strength in compression was tested at 28 days before being subjected to elevated temperature as a part of preliminary investigations. Strength in compression, mass loss, and UPV value was evaluated. The specimens were heated for 200 °C, 400 °C, 600 °C, and 800 °C for two hours. Visual examination was considered for the observation of surface color as well as thermal fractures. On a few samples, SEM analysis has been performed to validate the findings of the test.

3. Result and discussion

3.1. Visual inspection

Visual examination of spalling, cracking, and color changes on the concrete surface is usually the first step in evaluating concrete subjected to high temperatures. Fig. 1 displays the surface appearance of various samples subjected to high temperatures. The extent of heat exposure changes affects the color change of concrete at high temperatures. The color of the concrete specimen was grey at room temperature. At 200 °C temperature, all sample retained their flawless edges. When the exposure temperature reaches 600 °C, cracks are observed on the surface of the concrete specimen. At 600 °C, the reference specimen somewhat transforms from its initial grey shade to about a partly reddish tint. The development of cracks with color change, as seen in Fig. 1, demonstrates the occurrence of damage within the interfacial transition zone; similar behavior was reported by N. V. S. Kumar et al. [19]. Specimen with GGBFS turn white at a higher temperature. Iron oxidation of slag particles on burning at higher temperatures is the cause of this color change [20]. Specimen with SCBA turns light brown at 800 °C, which is related to a significant amount of silica in SCBA [21].

3.2. Compressive strength

The strength in compression for various specimens made of SCBA and GGBFS at higher temperatures is shown in Fig. 2. Strength in compression of concrete with SCBA up to 15% shows higher values as compared with control specimens at room temperature.

Table 1
Typical chemical characteristics of SCBA and GGBFS.

Parameters	SCBA	GGBFS
SiO_2	82.53	34.12
Al_2O_3	12.60	18.95
Fe_2O_3	0.60	0.23
CaO	2.34	35.46
MgO	1.04	8.2
SO_3	0.001	0.45

Table 2
Concrete mix proportion of binary and ternary concrete.

Mix Designation	Cement (kg/m^3)	SCBA %	GGBFS %	SCBA (kg/m^3)	GGBFS (kg/m^3)	Fine Aggregate (kg/m^3)	Coarse Aggregate (kg/m^3)
P	394.32	0	0	0	0	721.45	1181.29
B15	368.69	15	0	65.06	0	721.45	1181.29
B20	347.00	20	0	86.75	0	721.45	1181.29
B25	325.31	25	0	108.44	0	721.45	1181.29
B30	303.62	30	0	130.13	0	721.45	1181.29
G15	368.69	0	15	0	65.06	721.45	1181.29
G20	347.00	0	20	0	86.75	721.45	1181.29
G25	325.31	0	25	0	108.44	721.45	1181.29
G30	303.62	0	30	0	130.13	721.45	1181.29
B10G05	368.69	10	05	43.38	21.69	721.45	1181.29
B10G10	347.00	10	10	43.38	43.38	721.45	1181.29
B10G15	325.31	10	15	43.38	65.06	721.45	1181.29
B10G20	303.62	10	20	43.38	86.75	721.45	1181.29
B15G05	347.00	15	05	65.06	21.69	721.45	1181.29
B15G10	325.31	15	10	65.06	43.38	721.45	1181.29
B15G15	303.62	15	15	65.06	65.06	721.45	1181.29
B20G05	325.31	20	05	86.75	21.69	721.45	1181.29
B20G10	303.62	20	10	86.75	43.38	721.45	1181.29

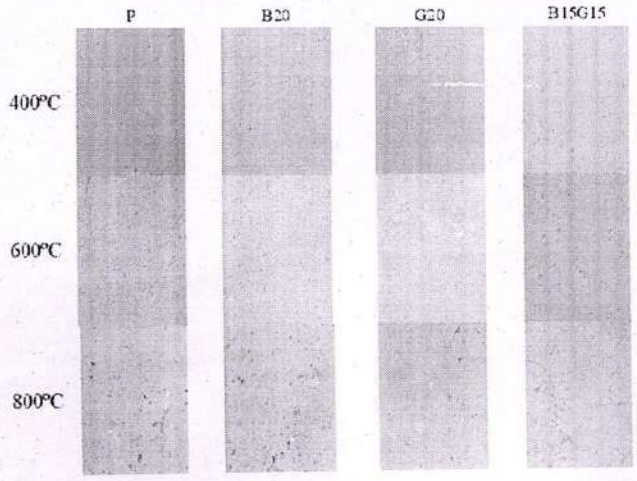


Fig. 1. Surface crack images of various binary and ternary concrete mix at elevated temperature.

Strength in compression is more up to 20% for concrete containing GGBFS as compared with the control specimen at room temperature. In ternary concrete, strength in compression is more for B10G05(10% SCBA & 05% GGBFS) and B15G05(15% SCBA & 05% GGBFS) as compared with the controlled specimen at room temperature. When concrete samples are heated to 200 °C temperature, there will be an increase in strength in compression for all samples. This increase in strength in compression is continued till 400 °C temperature. The mechanism of hydration may have accelerated, causing the gain in strength. Similar behavior was reported by previous researcher [22]. Drzymala et al. noted a rise in strength to 300 °C and a fall in strength at 450 °C [23]. It was also seen that for all temperature strength in compression for the B15 mix is more as compared with the respective strength of the control specimen at all temperatures. When we observe binary concrete containing GGBFS, the strength drops rapidly when the temperature rises. In ternary concrete for B10G05, mix strength is more at all temperatures. Concrete containing GGBFS will have less rate of gain of strength with the rise in temperature as compared with the controlled specimen. From the strength result of ternary concrete, it was noted that the specimen with a higher amount of slag with a change in temperature up to 400 °C shows better results as compared with the control specimen. For 800 °C, temperature strength is much less as compared to strength at room temperature. The physical degradation of cohesiveness in aggregate and cementitious material due to higher temperatures causes a reduction in the strength of concrete [19]. Fig. 3 shows residual strength for various binary and ternary mixes of SCBA and GGBFS for elevated temperature. From the figure, it is seen that for 600 °C and 800 °C, temperature strength decreases rapidly. Calcium hydroxide, which is one of the valuable compounds in cement paste, dissociates at around 400 to 600 °C causing shrinkage of concrete and affecting a more significant reduction in strength [24].

3.3. Microstructural analysis

In this study, the microstructure of the tested cube is analyzed. Fig. 4 represents SEM images of various mixes with SCBA and GGBFS subjected to a temperature of 400 °C and 800 °C. From the figure, it is evident that concrete at room temperature will have a dense internal structure for both binary as well as ternary concrete. In this specimen, C-S-H gel is present in kind of unbroken blocks [25]. This is responsible for higher strength in compression. Concrete specimens exposed to 400 °C will have the same structure as stated earlier. Only tiny pores were observed. The quantity of pores is more in mixes containing SCBA and GGBFS. Previous researcher also observed the same structure [26]. When concrete is exposed to 800 °C temperature, water is lost from pores and absorbed water. Due to the loss of this water, the amount of pores increases, thereby reducing strength in compression.

3.4. Mass loss and ultrasonic pulse velocity (UPV)

The mass loss of the specimen subjected to higher temperatures is shown in Fig. 5. The mass loss of the specimen decreased from 3% to 10.96% for various Mixes at elevated temperatures. This mass loss occurs due to the escalation of water due to heating. This removal of water creates voids, thereby decreasing strength in compression. Up to 400 °C, the percentage mass loss is less as compared with the percentage mass loss at 800 °C. This is because up to 400 °C only capillary water and pore water evaporated from samples. Beyond 400 °C temperature, the disintegration of C-S-H gel takes place. The weight loss observed at 800 °C exceeds the amount that can be accounted by water alone and is likely caused by the decomposition of aggregates and cement hydration products. The hydrated water is removed, thereby resulting in higher

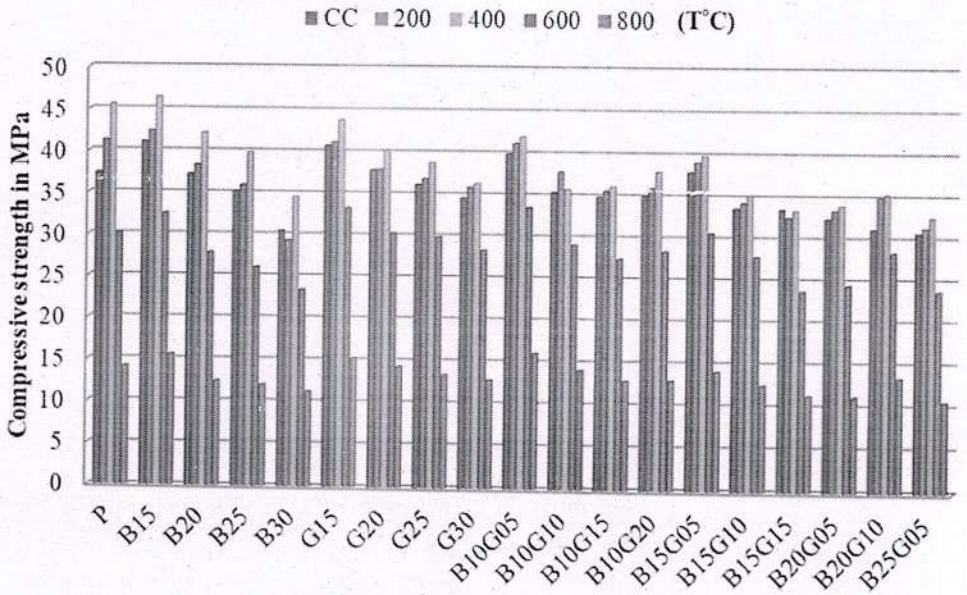


Fig. 2. Strength in compression of various binary and ternary mixes of concrete at elevated temperature.

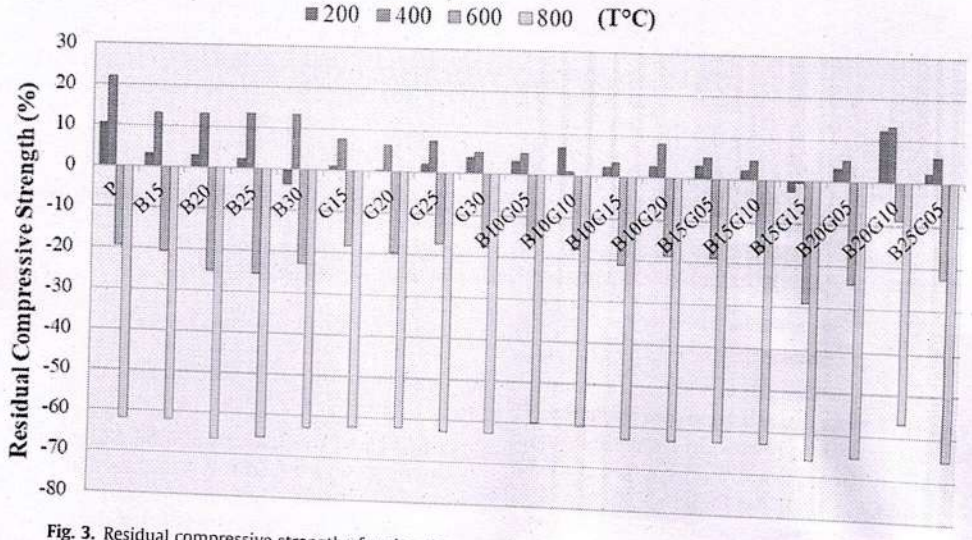


Fig. 3. Residual compressive strength of various binary and ternary mixes of concrete at elevated temperature.

mass loss. This will also reduce strength in compression, which is correlated with the disintegration of ITZ between aggregate and cement paste. Fig. 6 shows UPV values of various binary and ternary mixes at a higher temperature. Concrete quality grading is done as per IS 13311(part 1) 1992 [30]. All combinations at room temperature and 200 °C falls under the good/excellent category. When concrete is heated to 400 °C, only the B15 mix falls under the good category. Binary mixes with 15%, 20%, and 25% SCBA fall under the medium category for 400 °C temperature. All remaining mixes of 400 °C, 600 °C, and 800 °C come under the doubtful category. We can strongly correlate these observations with strength in compression and microstructure of concrete. Cracks are developed at 600 °C, where velocity is also reduced. Reduction in velocity from 600 °C to 800 °C can be attributed to the formation of cracks, which mainly increase the time required to propagate the specific distance. Similar behavior was reported in previous work [21].

This work can benefit practical engineering by improving the amount of consumption of agriculture and industrial by-product. Also enhance the weightage of alternative material for special industrial functions such as concrete structure near furnaces, ovens, and steel plants.

4. Concluding remarks

The findings of this study offer new information on the fire behavior of concrete blended with agriculture and industrial waste. SCBA and GGBFS were used as agriculture and industrial waste, respectively. Following are the conclusions which are based on test results.

- B15 mix showed superior compressive strength with respect to all mixes. It will have 9.14% more compressive strength at room temperature whereas 9.39% more strength at 800 °C temperature. All types of concrete mix are done much better for compressive strength when exposed up to 400 °C.
- The mass loss of all mixes rises with a temperature rise, maximum mass loss of 10.96% was observed for B15G10 mix.

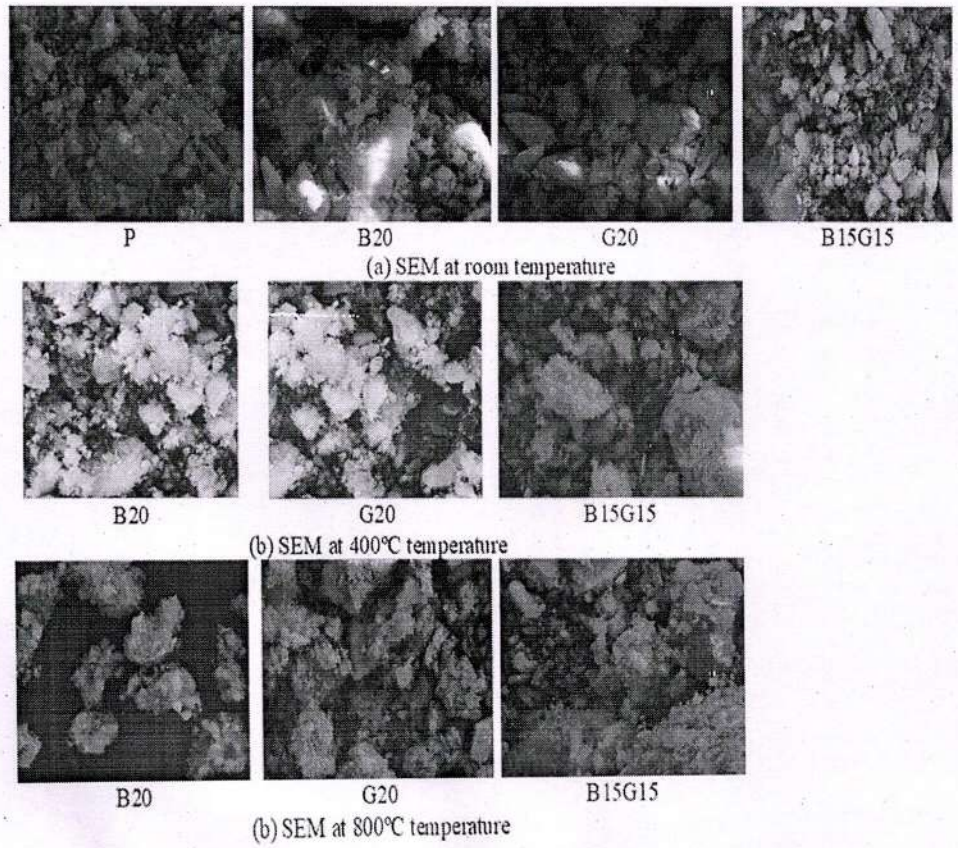


Fig. 4. SEM evaluation of concrete specimen.

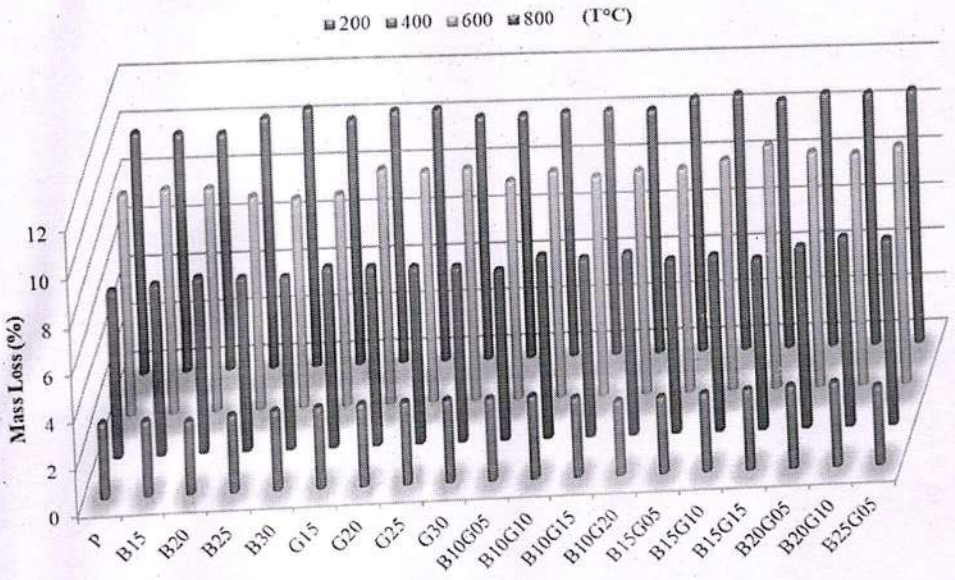


Fig. 5. Mass loss of various binary and ternary mixes of concrete at elevated temperature.

- At temperatures, more than 600 °C, cracks developed in all specimens, but the development of cracks increases as the amount of GGBFS increases.
- From SEM micrographs, it is clear that beyond 400 °C temperature number of pores increases and strength decreases. At these temperatures, all specimens showed less UPV value, minimum value of UPV was observed for G30 mix which is 0.78 km/s.
- In short, concrete containing SCBA and GGBFS showed better fire resistance as compared to concrete without SCBA and GGBFS.

Data availability

No data was used for the research described in the article.

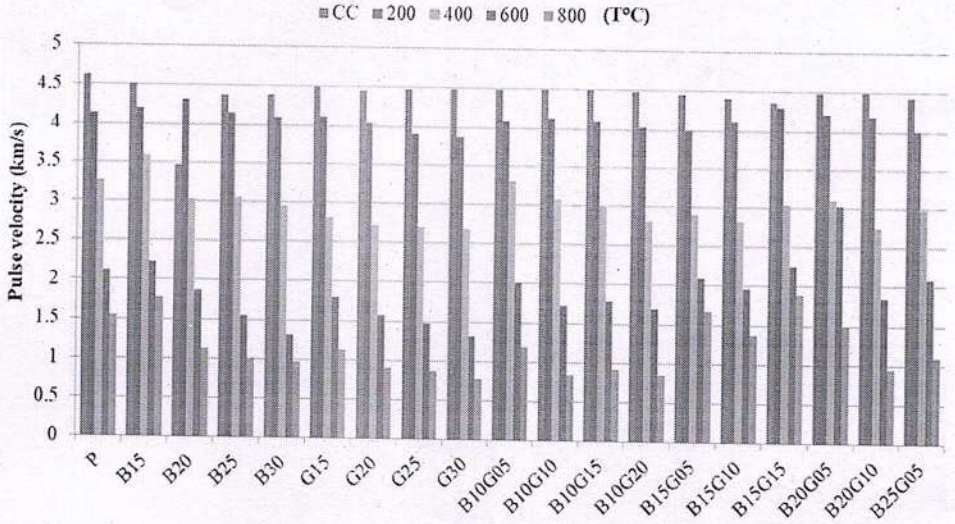


Fig. 6. Pulse velocity of various binary and ternary mixes of concrete at elevated temperature.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

[1] A.M. Rashad, An investigation of high-volume fly ash concrete blended with slag subjected to elevated temperatures, J. Clean. Prod. 93 (2015) 47–55, https://doi.org/10.1016/j.jclepro.2015.01.031.

[2] Y. Tang, W. Feng, W. Feng, J. Chen, D. Bao, L. Li, Compressive properties of rubber-modified recycled aggregate concrete subjected to elevated temperatures, Constr. Build. Mater. 268 (2021), https://doi.org/10.1016/j.conbuildmat.2020.121181.

[3] T.R. Surya, M. Prakash, K.S. Satyanarayanan, A.K. Celestine, N. Parthasarathi, Compressive strength of self compacting concrete under elevated temperature, Mater. Today Proc. 40 (2020) S83–S87, https://doi.org/10.1016/j.matpr.2020.03.746.

[4] S.S. Raza, L.A. Qureshi, Effect of carbon fiber on mechanical properties of reactive powder concrete exposed to elevated temperatures, J. Build. Eng. 42 (2021), https://doi.org/10.1016/j.jobe.2021.102503.

[5] N. Abdelmelek, N.S. Alimrani, N. Krelias, E. Lubloy, Effect of elevated temperatures on microstructure of high strength concrete based-metakaolin, J. King Saud Univ. - Eng. Sci. (2021), https://doi.org/10.1016/j.jksues.2021.08.001.

[6] D. Anupama Krishna, R.S. Priyadarsini, S. Narayanan, Effect of elevated temperatures on the mechanical properties of concrete, Procedia Struct. Integr. 14 (2019) 384–394, https://doi.org/10.1016/j.prostr.2019.05.047.

[7] A. Meena, P.V. Ramana, Evaluation of mechanical characteristics of polypropylene fiber reinforced concrete at elevated temperature, Mater. Today Proc. 65 (2022) 3328–3332, https://doi.org/10.1016/j.matpr.2022.05.407.

[8] T.M. Tung, O.E. Babalola, D. Le, Experimental investigation of the performance of ground granulated blast furnace slag blended recycled aggregate concrete exposed to elevated temperatures, Clean. Waste Syst. 4 (2023), https://doi.org/10.1016/j.clwas.2022.100069.

[9] M. Chadli, N. Tebbal, M. Mellas, Impact of elevated temperatures on the behavior and microstructure of reactive powder concrete, Constr. Build. Mater. 300 (2021), https://doi.org/10.1016/j.conbuildmat.2021.124031.

[10] M.S. Saif, A.S. Shanour, G.E. Abdelaziz, H.I. Elsayad, I.G. Shaaban, B.A. Tayeh, M. S. Hammad, Case studies in construction materials influence of blended powders on properties of ultra-high strength fibre reinforced self compacting concrete subjected to elevated temperatures, Case Stud. Constr. Mater. 18 (2023) e01793.

[11] Y. Zhang, S. Zhang, W. Zhao, X. Jiang, Y. Chen, Influence of multi-scale fiber on residual compressive properties of a novel rubberized concrete subjected to elevated temperatures, J. Build. Eng. 65 (2023), https://doi.org/10.1016/j.jobe.2022.105750.

[12] S.E. Mohammadyan-Yasouj, N. Heidari, H. Shokravi, Influence of waste alumina powder on self-compacting concrete resistance under elevated temperature, J. Build. Eng. 41 (2021), https://doi.org/10.1016/j.jobe.2021.102360.

[13] V.S. Pallapu, B.J.N. Satish, K.H.K. Reddy, Mechanical and micro structural properties of concrete subjected to elevated temperature, Mater. Today Proc. 33 (2020) 626–631, https://doi.org/10.1016/j.matpr.2020.05.606.

[14] L. Huang, J.C. Liu, R. Cai, H. Ye, Mechanical degradation of ultra-high strength alkali-activated concrete subjected to repeated loading and elevated temperatures, Cem. Concr. Compos. 121 (2021), https://doi.org/10.1016/j.cemconcomp.2021.104083.

[15] S. Mehdipour, I.M. Nikbin, S. Dezhampanah, R. Mohebbi, H.H. Moghadam, S. Charkhtab, A. Moradi, Mechanical properties, durability and environmental evaluation of rubberized concrete incorporating steel fiber and metakaolin at elevated temperatures, J. Clean. Prod. 254 (2020), https://doi.org/10.1016/j.jclepro.2020.120126.

[16] J. Novak, A. Kohoutkova, Mechanical properties of concrete composites subject to elevated temperature, Fire Saf. J. 95 (2018) 66–76, https://doi.org/10.1016/j.firesaf.2017.10.010.

[17] K.A. Mujedu, M.A. Ab-Kadir, N.N. Sarbini, M. Ismail, Microstructure and compressive strength of self-compacting concrete incorporating palm oil fuel ash exposed to elevated temperatures, Constr. Build. Mater. 274 (2021), https://doi.org/10.1016/j.conbuildmat.2020.122025.

[18] M. Nuruzzaman, S. Majhi, P.K. Sarker, A. Mukherjee, Microstructure and residual properties of raw and ground ferronickel slag incorporated self-compacting concrete exposed to elevated temperatures, Constr. Build. Mater. 362 (2023), https://doi.org/10.1016/j.conbuildmat.2022.129707.

[19] N.V.S. Kumar, K.S.S. Ram, Performance of concrete at elevated temperatures made with crushed rock dust as filler material, Mater. Today Proc. 18 (2019) 2270–2278, https://doi.org/10.1016/j.matpr.2019.07.009.

[20] F.U.A. Shaikh, Effects of slag content on the residual mechanical properties of ambient air-cured geopolymers exposed to elevated temperatures, J. Asian Ceram. Soc. 6 (2018) 342–358, https://doi.org/10.1080/21870764.2018.1529013.

[21] A.K. Sahani, A.K. Samantaa, D.K.S. Roy, Influence of mineral by-products on compressive strength and microstructure of concrete at high temperature, Adv. Concr. Constr. 7 (2019) 263–275, https://doi.org/10.12989/acc.2019.7.4.263.

[22] M.S. Khan, H. Abbas, Performance of concrete subjected to elevated temperature, Eur. J. Environ. Civ. Eng. 20 (2016) 532–543, https://doi.org/10.1080/19648189.2015.1053152.

[23] T. Drzymała, W. Jackiewicz-rek, J. Gałaj, R. Šukys, Assessment of Mechanical Properties of High Strength Concrete (Hsc) after exposure to high temperature, J. Civ. Eng. Manage. 24 (2018) 138–144, https://doi.org/10.3846/jcem.2018.457.

[24] Zi Wei Huon Lo, K. Hai Tan, K. Leung Su, High strength concrete tests under elevated temperature, Athens J. Technol. Eng. 6 (2019) 141–162, https://doi.org/10.30958/ajte.6-3-1.

[25] W. Zheng, H. Li, Y. Wang, Compressive behaviour of hybrid fiber-reinforced reactive powder concrete after high temperature, Mater. Des. 41 (2012) 403–409, https://doi.org/10.1016/j.matdes.2012.05.026.

[26] Y.S. Tai, H.H. Pan, Y.N. Kung, Mechanical properties of steel fiber reinforced reactive powder concrete following exposure to high temperature reaching 800 °C, Nucl. Eng. Des. 241 (2011) 2416–2424, https://doi.org/10.1016/j.nucengdes.2011.04.008.
[27] IS 12269-1987, Specification for ordinary Portland cement, Bureau of Indian Standards, New Delhi, India.
[28] IS, Specification for coarse and fine aggregates from natural sources for concrete, Bureau of Indian Standards, New Delhi, India, 1970.
[29] IS, Code of practice for plain and reinforced concrete, Bureau of Indian Standards, New Delhi, India, 2000.
[30] IS 13311(Part I)-, *Non-destructive testing of concrete-Methods of test for Ultrasonic pulse velocity*, Bureau of Indian Standards, New Delhi, India, 1992.

IJCSPUB.ORG ISSN : 2250-1770

INTERNATIONAL JOURNAL OF CURRENT SCIENCE (IJCSPUB)

IJCS PUBLICATION (IJCSPUB.ORG) An International Open Access, Peer-reviewed, Refereed Journal

WELLNEST: NURTURING WELL-BEING WITH ARTIFICIAL INTELLIGENCE

[1]Jay Kulkarni, [2]Aniket Kamlapurkar, [3] Omkar Shinde , [4] Prathamesh Jadhav, [5] Prof. Jagtap Vidya

[1,2,3,4]Student,Shri Chhatrapati Shivaji Maharaj College of Engineering,
[5]Prof, Shri Chhatrapati Shivaji Maharaj College of Engineering,
[1]Department Of Computer Engineering,
[1] Shri Chhatrapati Shivaji Maharaj College of Engineering, Ahmednagar, India

Abstract: Many people face various challenges and difficulties in maintaining their mental health and well-being, such as stress, anxiety, depression, loneliness, low self-esteem, lack of motivation, and so on. These challenges can negatively impact their personal and professional lives, as well as their physical health. Moreover, many people do not have access to adequate and affordable mental health care services, or they may face stigma and discrimination when seeking help. Therefore, there is a need for an innovative and accessible solution that can nurture the mental health and well-being of users by providing them with clinical, educational, decisional, and skill development support. WellNest is a web application that aims to nurture the mental health and well-being of users by leveraging artificial intelligence (AI) techniques. WellNest provides various features. WellNest aims to create a positive and supportive environment for the user, where they can interact with the chatbots as their virtual friends and mentors. WellNest also allows the user to track their progress, set their goals, and share their achievements with other users. WellNest is designed to be user-friendly, accessible, and engaging for the user.

Keywords: AI, ML, Companion, Mental Health Companion, Chatbot application, Digital Well-Being, Wellness.

I. INTRODUCTION

Mental health and well-being are essential aspects of human life that affect our happiness, productivity, and relationships. However, many people struggle with various mental health challenges, such as stress, anxiety, depression, loneliness, and low self-esteem. These challenges can have a negative impact on their personal and professional lives, as well as their physical health. Unfortunately, many people do not have access to adequate and affordable mental health care services, or they may face stigma and discrimination when seeking help. Therefore, there is a need for an innovative and accessible solution that can nurture the mental health and well-being of users by providing them with clinical, educational, decisional, and skill development support. WellNest is a web application that aims to nurture the mental health and well-being of users by leveraging artificial intelligence (AI) techniques. WellNest offers different chatbots that can interact with the user in a natural and empathetic way. The chatbots can provide the user with clinical support, such as psychotherapy, cognitive behavioral therapy, mindfulness, and relaxation techniques. The chatbots can also provide the user with educational support, such as information about mental health topics, tips for coping with stress, and resources for further learning. The chatbots can also provide the user with decisional support, such as helping them make choices that are beneficial for their mental health and well-being. The chatbots can also provide the user with skill development support, such as teaching them communication skills, problem-solving skills, and emotional regulation skills.

II. OBJECTIVE

1. To develop a web application that uses artificial intelligence techniques to provide various forms of support for the users' mental health and well-being, such as clinical, educational, decisional, and skill development support.
2. To create a positive and supportive environment for the users, where they can interact with the chatbots as their virtual friends and mentors.
3. To empower the users to take charge of their own mental health and well-being by providing them with tools and resources that can help them improve their quality of life.
4. To evaluate the effectiveness and usability of the web application and the chatbots in terms of improving the users' mental health and well-being outcomes, such as mood, stress level, sleep quality, self-esteem, motivation, and satisfaction.

III. RELATED WORK

In recent years, there has been a growing interest in developing and evaluating digital mental health applications that use AI techniques to provide various forms of support for users with mental health problems. These applications can be classified into different categories based on their functions, such as diagnosis, assessment, intervention, prevention, and monitoring. Some examples of digital mental health applications that use AI techniques are Chatbots, Novel Monitoring Systems, and Social Media Platforms.

Chatbots are conversational agents that can interact with users through text or voice, using natural language processing and machine learning. Chatbots can provide users with information, guidance, feedback, motivation, and emotional support. For instance, Woebot is a chatbot that uses cognitive behavioral therapy principles to help users cope with depression and anxiety.

Novel Monitoring Systems are systems that use sensors, wearable devices, smartphones, or video cameras to collect and analyze various data from users, such as physiological, behavioral, or environmental data. These systems can provide users with personalized feedback, alerts, or interventions based on their data. For example, Mindstrong is a smartphone app that uses keyboard dynamics to measure users' cognitive and emotional states and provide them with insights and coaching.

Social Media Platforms are platforms that use natural language processing, machine learning, or deep learning to analyze users' online posts, comments, or messages on social media platforms, such as Facebook, Twitter, or Instagram. These platforms can provide users with mental health screening, risk assessment, or referral services. For example, Crisis Text Line is a text-based service that uses natural language processing to identify and prioritize users who are in crisis and connect them with trained counselors.

IV. RESEARCH METHODOLOGY

A. Natural Language Processing:

This is a technique that enables the chatbots to understand and respond to the user's input in a natural and empathetic way. Some of the possible algorithms that can be used for natural language processing are Lemmatization, Stemming, Topic Modelling, Keyword Extraction, Words Cloud and Bag of Words.

B. Data Collection and Data Preprocessing:

Data from the internet forms a huge source of information these days. We have an overwhelming amount of data available, which includes text, audio, and videos. Text information forms a major source of information amongst these. Natural language processing includes the task of analyzing, modifying, and deriving conclusions from text data.

These text or speech data are completely unstructured and messy. A great amount of effort is required to process and manipulate these data. Nevertheless thanks to the Natural Language Toolkit(NLTK) written in Python language, which makes these cumbersome tasks a smooth one. It is a Python package used for Natural language processing.

C. Emotion Recognition

A human can express his emotions in any form, such as face, gestures, speech and text. The detection of text emotions is a content-based classification problem. In machine learning, the detection of textual emotions is the problem of content-based classification, which is the task of natural language processing. Detecting a person's emotions is a difficult task, but detecting the emotions using text written by a person is even more difficult as a human can express his emotions in any form. Usually, emotions are expressed as joy, sadness, anger, surprise, hate, fear, etc. Recognizing this type of emotion from a text written by a person plays an important role in applications such as chatbots, customer support forums, customer reviews etc. In the section below, I will take you through a machine learning project on Text Emotions Detection using Python where I will build a machine learning model to classify the emotions of a text.

Emotion recognition using text is a natural language processing task that aims to identify and classify the emotions expressed by the author of a text. Emotions are complex and subjective phenomena that can be expressed in various ways, such as words, phrases, punctuation, emoticons, etc. Emotion recognition using text can have various applications, such as sentiment analysis, customer feedback, chatbots, social media analysis, etc.

There are different approaches to emotion recognition using text, such as keyword-based, lexicon-based, machine learning-based, and deep learning-based. Keyword-based approaches rely on predefined lists of words or phrases that are associated with certain emotions, such as "happy", "sad", "angry", etc.

Machine learning-based approaches use supervised or unsupervised learning algorithms to train classifiers or clusters based on features extracted from the text, such as bag-of-words, n-grams, part-of-speech tags, etc. Deep learning-based approaches use neural networks, such as convolutional neural networks (CNNs), recurrent neural networks (RNNs), or transformers, to learn high-level representations of the text and capture the semantic and contextual information.

D. Implementation Basics:

The user types or speaks a message to the chatbot through the user interface. The user interface can be a website, an app, a voice assistant, or any other platform that supports chatbot interaction. The chatbot engine receives the user input and uses NLP techniques to analyze it. NLP can perform tasks such as tokenization, stemming, lemmatization, part-of-speech tagging, named entity recognition, sentiment analysis, etc.

Based on the NLP analysis, the chatbot engine identifies the intent and the entities in the user input. The intent is the goal or the purpose of the user's message, such as booking a flight, ordering a pizza, or asking a question. The entities are the relevant pieces of information that are needed to fulfill the intent, such as the destination, the toppings, or the topic. Based on the intent and the entities, the chatbot engine generates a response for the user. The response can be a text, a voice, an image, a video, or any other type of media that can be displayed on the user interface. The response can also include a call to action, such as asking for more information, confirming a booking, or providing a link.

The decision maker engine evaluates the response and decides whether it is appropriate and satisfactory for the user. The decision maker engine can use various criteria, such as the confidence score, the user feedback, the context, the tone, the emotion, etc. The decision maker engine can also modify the response.

The UML sequence diagram shows the interaction between an actor and a chatbot engine. The actor is the user who is interacting with the chatbot. The chatbot engine is the software that is responsible for processing the user's input and providing a response. The database is where the chatbot engine stores and retrieves information. The user interface is the visual representation of the chatbot that the user interacts with. The actor initiates the interaction by logging in to the chatbot. The chatbot engine verifies the actor's credentials and sends a message to the user interface to display the login status. If the login is successful, the chatbot engine sends a message to the user interface to display a welcome message. The welcome message can be a greeting, an introduction, or an instruction for the actor. If the login fails, the chatbot engine sends a message to the user interface to display an error message.

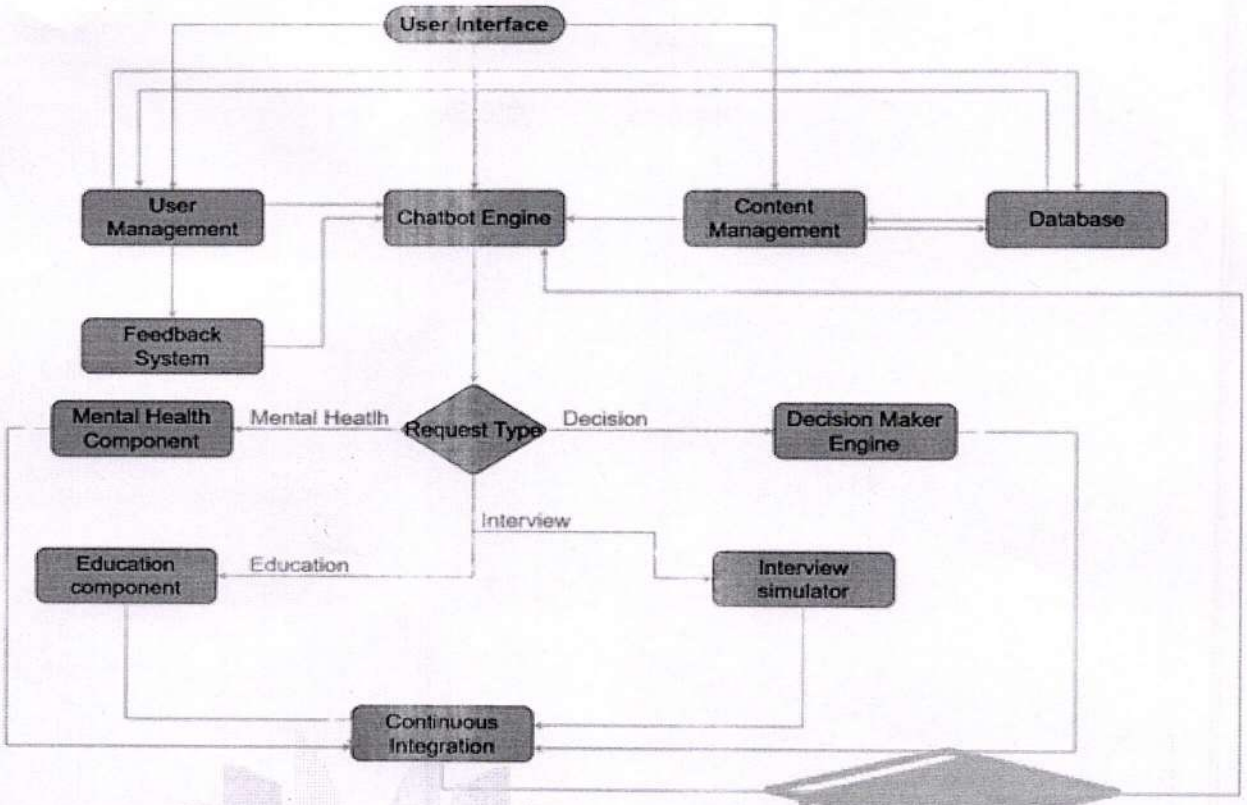


Figure 1. System Diagram of WellNest (Architecture)

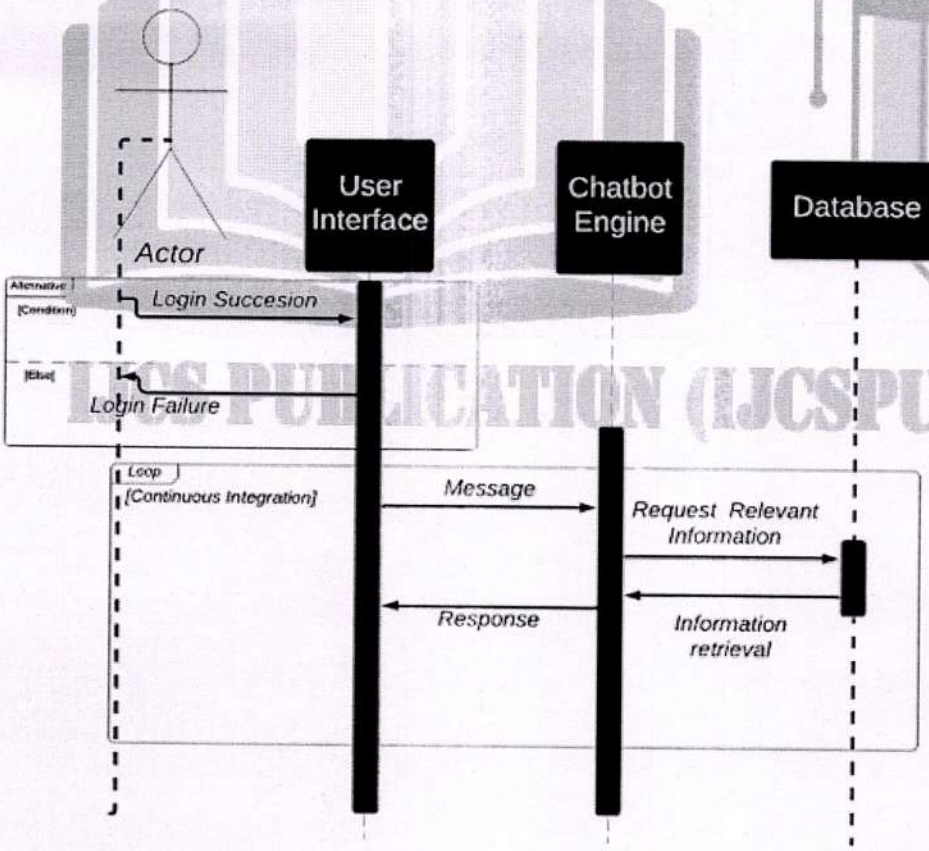


Figure 2. UML Sequence Diagram for WellNest

V. CONCLUSION

WellNest contributes to the advancement of knowledge and practice in the field of mental health and well-being by providing an innovative and accessible solution that can benefit a large number of users.

VI. REFERENCE

[1] Gong Chen, "Nurturing the Companion ChatBot," December 2018.

[2] Saksham Saraswat; Siddhartha Mishra; Vikas Mani; Shristi Priya, "GALGOBOT – The college companion bot", IEEE, 26 may 2021

[3] "Choosing a chatbot development tool", By - Sara Pérez-Soler, Sandra Juárez-Puerta, Esther Guerra, Juan de Lara, IEEE, 28 may, 2021

[4] Recent Advances in Chatbots, By sardar Jaf, 17 JAN, 2022

[5] Study on emotion recognition and companion Chatbot using deep neural network, By – MingChe Lee, 27 March, 2020

[6] AI and Web-Based Interactive College Enquiry Chatbot, By - Akshada Phalle1, Saniya Kadam1, Sakshi Sonphule1, Ila Savant2, 11 Nov, 2021

[7] An overview of artificial intelligence based chatbots and an example chatbot application, Naz Albayrak, Türk Telekomünikasyon A.Ş, Istanbul, Turkey, 34889, Aydeniz Özdemir; Engin Zeydan, IEEE, 9 July 2018

JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue

JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Solar Panel Fault Detection System Using Deep Learning.

[1]Samarth Patil, [2] Manish Jadhav, [3]Pranjal Kharat,[4] Gayatri Chaudhari, [5] Prof.V.V. Jagtap

[1,2,3,4] Student,Shri Chhatrapati Shivaji Maharaj College of Engineering,
[5]Professor, Shri Chhatrapati Shivaji Maharaj College of Engineering,
[1]Department Of Computer Engineering,
[1] Shri Chhatrapati Shivaji Maharaj College of Engineering, Ahmednagar,India.

Abstract : The Fastest-Growing Source Of Clean, Sustainable Energy, Solar Energy Outperforms All Other Types Of Energy Production. Solar Panels Typically Require Little Upkeep And Do Not Need Ongoing Maintenance. Numerous Issues, However, Might Cause A Production Loss Of Up To 20 Percent Because A Faulty Panel Can Affect The Generation Of The Entire Array. The Cost Of Repairs Will Be Lower If The Power Plant Is Properly Maintained On Time, But More Importantly, It Will Last Longer And Provide More Electricity Overall. Large Solar Plantations Require Expensive And Time-Consuming Manual Panel Monitoring, And It Is More Difficult For People To Get To Remote Solar Plantations. In This Article, Deep Learning-Based Methods For Detecting Faults In Photovoltaic Systems Are Presented Utilizing Thermal Images From An Unmanned Aerial Vehicle (UAV) Equipped With Infrared Sensors. The Software Which Will Be Produced As An Output Of This Research And Work Will Be Able To Detect Solar Panel Faults(Internal) Accurately And Will Be Able To Predict The Amount Of Solar Energy Produced As A Result Of These Defects Using The Voltage And Current Values Which Have Been Observed Previously. In Future Scope, This Software May Also Be Able Identify Faults From Images Of Solar Panels.

Keyword - Solar Panel Fault Detection,Deep Learning, Artificial Neural Network, Pre-processing, Maximum Power Output,Photovoltaic-cells.

I. Introduction

Fault detection and timely troubleshooting are essential for the optimum performance in any power generation system, including photovoltaic (PV) systems. In particular, the goal for any commercial power-producing house is maximizing power production, minimizing energy loss and maintenance cost, and the safe operation of the facility. Since PV systems are subject to various faults and failures, early detection of such faults and failures is very crucial for achieving the goal. The US National Electric Code requires the installation of OCPD (Overcurrent Protection Device) and GFDI (Ground Fault Detection Interrupters) in PV installations for protection against certain faults. However, the Bakersfield Fire case, 2009, and Mount Holly, 2011, show the inability of these devices to detect the fault in those particular scenarios. Faults in a PV system can arise from either physical, environmental electrical conditions. We propose an intelligent fault diagnosis model for detecting faulty modules and further classifying the fault type that is applicable in all environmental conditions. The model utilizes the machine learning and follows the supervised learning approach. It is robustly trained with historical data of different faulty and normal states in different environmental conditions.

II. Overview of PV system Faults

The classification of faults occurring in a PV system can be categorized from different aspects. We classify such faults into three types: physical, environmental, and electrical . However, the classification of faults can also be made on other bases, e.g., location and structure. Physical faults can be internal or external and generally include damage, cracks, and degradation in PV modules. Also, PV system failures are caused by the aging effect which is also a physical phenomenon. Environmental faults include soiling and dust accumulation, bird drops, and temporary shading. Permanent environmental faults include permanent shading due to the poor choice of installment location. Hotspot faults in the PV modules can be caused by both permanent and temporary shading. Lastly, electrical faults include open circuit, line-line, and ground faults, either in PV modules, arrays, or in the whole systems. Open circuit faults are caused by the disconnection of wires in single or multiple branches of a PV circuit. Line-line faults are created by unintentional low impedance current path in a PV array. Ground faults are similar to line-line faults; however, the low impedance path is from current-carrying conductors to ground/earth. A PV module can be modeled electrically with a one diode or two diode model . However, modeling a real PV system is very complex because electrical parameters vary largely between PV systems due to variation in the construction of PV modules (dimension, material, and ground connection), site, and physical layout . Especially in large scale power generation systems, modeling a system comes with the special technical challenge. In this study, we have limited our work to detect only electrical faults.

III. Research Methodology

1. Data Collection: Data collection is a process of systematically collecting and calculating information from multiple sources to get an absolute and precise picture of an area of interest. For the proposed system, we are using varied number of dataset for training the machine learning model.

2. Data Preparation: Data preparation is a process of getting data ready to By cleaning and modifying raw data. This step is performed before processing and analysis and involves reformatting of data, rectification of data and the merging of data sets to improve the data.

3. Data Exploration: Data exploration is a process of understanding the data by visually representing it in the form of charts, histograms, graphs, etc.

4. Data Mining: Data mining is a procedure used to convert raw data into helpful information. It discovers patterns in large set of data using software.

5. Information Retrieval:Information retrieval (IR) is a software program that works with the retrieval, evaluation, organization and storage of information and fulfills the information need from within the collection of resources.

6. Evaluation:Evaluation is a procedure that includes analyzing and collecting information about programs tasks, characteristics and result.

- **Deep Learning**

Deep learning is a type of machine learning that uses artificial neural networks to learn from data. Artificial neural networks are inspired by the structure and function of the human brain, and they are able to learn complex patterns from data.

Deep learning has been used to achieve state-of-the-art results in a variety of tasks, including image recognition, natural language processing, and machine translation. Deep learning is also being used to develop new and innovative applications in a variety of fields, including healthcare, finance, and transportation.

In the context of panel fault detection, deep learning can be used to develop algorithms that can automatically detect faults in the data uploaded. Deep learning algorithms can be trained on large datasets of current vs voltage readings of solar panels. Once trained, these algorithms can be used to automatically detect faults in solar panels.

Deep learning-based Solar Panel fault detection algorithms have the potential to revolutionize the way that faults are detected and managed. These algorithms can automate the clerical fault detection process, improve the accuracy of early detection, and enable technicians to make more informed decisions about grid management.

Here are some of the benefits of using deep learning for Solar Panel Fault detection:

- Accuracy: Deep learning algorithms can be trained to achieve high levels of accuracy in detecting Major faults, even in challenging conditions.
- Speed: Deep learning algorithms can automatically detect faults in solar panel grid, which can save technicians a significant amount of time.
- Early detection: Deep learning algorithms can detect faults in their early stages, which can help to reduce power loss.
- Scalability: Deep learning algorithms can be scaled to detect faults in large areas of Ground connected Grid system.

Deep learning-based solar panel fault detection system are still under development, but they have the potential to have a major impact on Power generation. These systems can help technician to reduce power losses, improve output, and make more sustainable energy resource generation.

The deep learning model is trained by iteratively adjusting the weights of the artificial neurons. The goal is to minimize the error between the model's predictions and the correct answers. Once the model is trained, it can be used to make predictions on new data.

Deep learning has been used to achieve state-of-the-art results in a variety of tasks, including image recognition, natural language processing, and machine translation. Deep learning is also being used to develop new and innovative applications in a variety of fields, including healthcare, finance, and transportation.

Here are some of the benefits of using deep learning:

- Accuracy: Deep learning models can be trained to achieve high levels of accuracy in a variety of tasks.

- Scalability: Deep learning models can be scaled to handle large datasets and complex problems.
- Flexibility: Deep learning models can be adapted to a wide range of tasks and data types.

However, deep learning also has some challenges:

Data requirements: Deep learning models require large datasets of data to train.
Computational requirements: Training deep learning models can be computationally expensive.
Interpretability: Deep learning models can be difficult to interpret, making it difficult to understand why they make certain predictions.

- **Deep learning in Solar Panel Fault Detection.**

1. Artificial Neural Networks:-

ANNs are designed to automatically and adaptively learn patterns directly from data. Artificial layers apply a set of learnable filters (kernels) to input datasets. These filters slide over the features and variables, performing element-wise multiplications and accumulating the results to create a feature map. These maps capture various features at different levels of abstraction.

2 . Pooling Layers:-

Pooling layers reduce the spatial dimensions of the feature maps while retaining important information. Common pooling operations include max pooling (selecting the maximum value in a certain region) and average pooling (calculating the average value).

3. Activation Functions:-

Non-linear activation functions (e.g., ReLU - Rectified Linear Unit) are applied after each pooling layer to introduce non-linearity into the model. This allows ANNs to learn complex patterns and relationships in the data.

4. Fully Connected Layers:-

After several pooling layers, fully connected layers are added. These layers perform classification based on the features learned in the previous layers. They are typical dense layers where all neurons are connected.

5. Dropout:-

Dropout layers are employed to mitigate overfitting. During training, random neurons are "dropped out," meaning they are temporarily ignored, reducing co-dependencies and encouraging the network to learn more robust features.

6 . Batch Normalization:-

Batch normalization layers help in stabilizing and accelerating the training process. They normalize the activations of each layer in a mini-batch, reducing internal covariate shifts and aiding in faster convergence.

7. Loss Function:-

In the context of solar panel fault detection, a categorical cross-entropy loss function is commonly used. This measures the difference between the predicted probabilities and the true labels.

8. Optimization Algorithm:-

Stochastic Gradient Descent (SGD) or advanced variants like Adam are popular optimization algorithms used to update the weights of the network during training. These algorithms aim to minimize the loss function.

10. Output Layer:-

The output layer consists of neurons equal to the number of fault classes. It uses a softmax activation function to provide a probability distribution over the different fault classes.

[4] A. Y. Appiah, X. Zhang, B. B. K. Ayawli, and F. Kyeremeh, "Review and performance evaluation of photovoltaic array fault detection and diagnosis techniques," International Journal of Photoenergy, vol. 2019, Article ID 6953530, 19 pages, 2019.

[5] J. Dong, C. Zhang, M. Lv, Y. Ma, and N. Guan, "Photovoltaic array fault detection by automatic reconfiguration," Energies, vol. 10, no. 5, p. 699, 2017.

[6] D. S. Pillai and N. Rajesekar, "A comprehensive review on protection challenges and fault diagnosis in PV systems," Renewable and Sustainable Energy Reviews, vol. 91, pp. 18–40, 2018.

[7] A. Haque, K. V. S. Bharath, M. A. Khan, I. Khan, and Z. A. Jaffery, "Fault diagnosis of photovoltaic modules," Energy Science & Engineering, vol. 7, pp. 622–644, 2019.

[8] M. H. Ali, A. Rabhi, A. El Hajjaji, and G. M. Tina, "Real time fault detection in photovoltaic systems," Energy Procedia, vol. 111, pp. 914–923, 2017.

[9] Y. Hu, W. Cao, J. Ma, S. Finney, and D. Li, "Identifying PV module mismatch faults by a thermography-based temperature distribution analysis," IEEE Transactions on Device and Materials Reliability, vol. 14, no. 4, pp. 951–960, 2014.

[10] M. Aghaei, U. E. Madukanya, A. K. V. de Oliveira, and R. Ruther, "Fault inspection by aerial infrared thermography in a PV plant after a meteorological tsunami," in VII Congresso Brasileiro de Energia Solar–Gramado, 17 a 20 de Abril de, Brazil, 2018.

JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

PLANT DISEASE PREDICTION APPLICATION USING DEEP LEARNING.

[1]Aditya Kadam, [2]Yash Nimbalkar, [3] Hareshwar Avhad , [4] Sarthak Mete, [5] Prof.Rohit Ghadage

[1,2,3,4]Student,Shri Chhatrapati Shivaji Maharaj College of Engineering,
[5]Ass.Prof, Shri Chhatrapati Shivaji Maharaj College of Engineering,
[1]Department Of Computer Engineering,
[1] Shri Chhatrapati Shivaji Maharaj College of Engineering, Ahmednagar,India

Abstract : Plant disease prediction by deep learning will make a definite good impact on the environment. Plant diseases significantly impact agricultural productivity, leading to substantial economic losses and food security threats. Timely and accurate disease detection is crucial for effective disease management. Traditional methods rely on visual inspection by trained experts, which can be time-consuming and subjective. In recent years, deep learning has emerged as a powerful tool for automating plant disease diagnosis. This paper provides a comprehensive review of state-of-the-art deep learning techniques applied to plant disease detection. The study begins by presenting an overview of plant diseases, their economic implications, and the challenges associated with conventional detection methods. It then delves into the fundamentals of deep learning, emphasizing convolutional neural networks (CNNs) and their suitability for image-based tasks. Various pre-processing techniques, such as data augmentation and normalization, are discussed to enhance model performance. The review highlights benchmark datasets commonly used in plant disease detection research and evaluates the performance of prominent deep learning models, including AlexNet, VGG, Inception, Res-Net, and their variants. Transfer learning techniques and their effectiveness in adapting pretrained models to specific plant disease detection tasks are also explored.

keyword **- Plant Disease Detection, Deep Learning, Convolutional Neural Networks, Pre-processing, Benchmark Datasets, Multi-modal Sensing, Agriculture, Food Security**

I.INTRODUCTION

In recent years, agriculture has undergone significant transformations, driven by technological advancements that aim to address the growing global demand for food. One crucial aspect of agricultural sustainability is the early detection and management of plant diseases, which can have devastating effects on crop yields and quality. The emergence of deep learning, a subset of artificial intelligence, has paved the way for groundbreaking innovations in this field. This project focuses on the development of a cutting-edge mobile application that leverages deep learning algorithms to detect and diagnose plant diseases accurately and efficiently.Plant disease detection is a critical component of modern agriculture and botany, employing a range of advanced technologies and techniques to identify and manage diseases affecting plants. This field combines biology, computer science, and image analysis to develop tools and systems capable of accurately diagnosing diseases, often using various parameters such as visual symptoms, molecular markers, and environmental factors. With the advent of artificial intelligence and machine learning, automated systems can process vast amounts of data, including high-resolution images of plants, and swiftly identify signs of infection or stress. The timely detection of plant diseases not only aids in minimizing crop losses but also supports sustainable farming practices, reducing the reliance on pesticides and fostering more efficient resource management for a world with growing agricultural demands.

- IMPACT OF PLANT DISEASE :-

Plant diseases can have far-reaching impacts on the environment, affecting ecosystems, biodiversity, and even human health. Here are some of the significant environmental consequences of plant diseases:

1. Reduced Biodiversity:-

Disease outbreaks can lead to the decline or even extinction of specific plant species. This can disrupt the delicate balance of local ecosystems, affecting the wildlife that depend on those plants for food and shelter.

2. Altered Ecosystem Services:-

Plants provide critical ecosystem services such as oxygen production, carbon sequestration, and soil stabilization. Disease-related declines in plant populations can disrupt these services, potentially leading to imbalances in the broader ecosystem.

3. Disruption of Food Webs:-

Plants are primary producers and form the foundation of many food webs. When plants are affected by disease, it can lead to cascading effects on herbivores, predators, and other species in the ecosystem.

4. Changes in Soil Health:-

Plant diseases can alter the composition of the soil microbiome. Some diseases may lead to the buildup of pathogens in the soil, making it less suitable for future plant growth.

5. Increased Pesticide Use-
:

To combat plant diseases, farmers often resort to increased pesticide use. This can have detrimental effects on non-target species, including beneficial insects, birds, and aquatic organisms. Pesticides can also leach into the soil and water, potentially causing pollution.

6. Loss of Genetic Diversity:-

Disease susceptibility varies among different plant varieties. When a disease impacts a specific variety, it can lead to the loss of genetic diversity within the plant population, making it more susceptible to future outbreaks.

7. Erosion and Land Degradation:-

Diseased plants may be weaker and less able to hold soil in place. This can lead to increased erosion, which can have negative impacts on water quality and aquatic habitats downstream.

8. Carbon Cycling:-

Dead and diseased plants may not decompose at the same rate as healthy plants. This can affect the carbon cycling process, potentially influencing greenhouse gas emissions and climate regulation.

9. Economic Implications:-

Plant diseases can have significant economic impacts on industries reliant on agriculture and horticulture. Reduced yields, loss of marketable produce, and increased costs for disease management can all have far-reaching economic consequences

In addition to these direct impacts, plant diseases can also have a number of indirect impacts. For example, plant diseases can lead to deforestation, as farmers are forced to clear new land for agriculture. This can have a negative impact on the environment, including biodiversity loss and climate change.

Plant diseases are a major threat to global food security and human health. It is important to develop and implement effective strategies to manage and control plant diseases. This includes research into new disease-resistant crops, development of new fungicides and pesticides, and improved agricultural practices.

II. Research Methodology

The project will employ a deep learning framework, utilizing convolutional neural networks (CNNs) for image classification. A comprehensive dataset comprising images of healthy plants and various diseased states will be collected and curated. This dataset will serve as the foundation for training and fine-tuning the model. The app will be designed to accommodate real-time image processing, ensuring swift and accurate results. This project represents a significant advancement in modern agriculture, offering a scalable solution for early disease detection and management. By empowering farmers with a powerful tool that harnesses the capabilities of deep learning, we aim to enhance crop productivity, reduce economic losses, and contribute to global food security.

- **TRADITIONAL METHOD :-**

Traditional methods of plant disease detection include:

- ➢ Visual inspection: This is the most common method of plant disease detection, and it involves examining plants for visible signs of disease, such as discoloration, wilting, or lesions. Visual inspection can be done by farmers, crop scouts, or other trained personnel.
- ➢ Microscopic examination: This method involves examining plant tissues under a microscope to look for signs of disease-causing pathogens, such as fungi, bacteria, or viruses. Microscopic examination is typically done in a laboratory by a trained plant pathologist.
- ➢ Laboratory tests: There are a variety of laboratory tests that can be used to detect plant diseases, such as culturing, serological tests, and molecular diagnostic tests. Culturing involves incubating plant tissues in a nutrient medium to see if any pathogens grow. Serological tests involve detecting the presence of antibodies to specific pathogens in plant tissues. Molecular diagnostic tests involve detecting the presence of specific DNA or RNA sequences associated with disease-causing pathogens.

Traditional methods of plant disease detection have a number of advantages. They are relatively inexpensive and easy to implement. Additionally, they can be used to detect a wide range of plant diseases.

However, traditional methods of plant disease detection also have some disadvantages. Visual inspection can be subjective and time-consuming, and it is not always possible to accurately identify diseases in their early stages. Microscopic examination and laboratory tests can be more accurate, but they are also more time-consuming and expensive.

Disadvantage Of Traditional Method:

1. Subjectivity and Human Error:-
   Visual inspections are subjective and heavily reliant on the expertise of the observer. Different inspectors may interpret symptoms differently, leading to inconsistent results.

2. Time-Consuming Process:-
   Traditional methods can be time-consuming, especially for large agricultural areas. It may take a significant amount of time to manually inspect each plant, which can delay the detection and treatment of diseases.

3. Limited Scale and Coverage:-
   - Human inspectors have limitations in terms of the area they can cover in a given timeframe. This means that large agricultural areas may not receive thorough inspections, potentially leading to undetected diseases.

4. Inability to Detect Early-Stage Infections:-
   Visual inspections may not always catch diseases in their early stages when symptoms are subtle or not yet apparent. This can lead to delayed treatment and increased spread of the disease.

5. Dependence on Expertise:-
   Traditional methods require skilled agronomists or farmers with specialized training in plant pathology. This expertise may not always be readily available, especially in remote or underserved areas.

6. Limited to Visible Symptoms:-
   Visual inspections can only detect diseases with visible symptoms. Some pathogens, such as viruses or bacteria, may not display obvious visual cues, making them harder to detect.

- **DEEP LEARNING**

Deep learning is a type of machine learning that uses artificial neural networks to learn from data. Artificial neural networks are inspired by the structure and function of the human brain, and they are able to learn complex patterns from data.

Deep learning has been used to achieve state-of-the-art results in a variety of tasks, including image recognition, natural language processing, and machine translation. Deep learning is also being used to develop new and innovative applications in a variety of fields, including healthcare, finance, and transportation.

In the context of plant disease detection, deep learning can be used to develop algorithms that can automatically detect diseases in images of plants. Deep learning algorithms can be trained on large datasets of images of diseased and healthy plants to learn to identify the visual characteristics of diseases. Once trained, these algorithms can be used to automatically detect diseases in new images of plants.

Deep learning-based plant disease detection algorithms have the potential to revolutionize the way that plant diseases are detected and managed. These algorithms can automate the plant disease detection process, improve the accuracy of early detection, and enable farmers to make more informed decisions about disease management.

Here are some of the benefits of using deep learning for plant disease detection:

- Accuracy: Deep learning algorithms can be trained to achieve high levels of accuracy in detecting plant diseases, even in challenging conditions.
- Speed: Deep learning algorithms can automatically detect diseases in images of plants, which can save farmers a significant amount of time.
- Early detection: Deep learning algorithms can detect diseases in their early stages, which can help to reduce crop losses.
- Scalability: Deep learning algorithms can be scaled to detect diseases in large areas of farmland.

Deep learning-based plant disease detection systems are still under development, but they have the potential to have a major impact on agriculture. These systems can help farmers to reduce crop losses, improve yields, and make more sustainable farming decisions.
The deep learning model is trained by iteratively adjusting the weights of the artificial neurons. The goal is to minimize the error between the model's predictions and the correct answers. Once the model is trained, it can be used to make predictions on new data.

Deep learning has been used to achieve state-of-the-art results in a variety of tasks, including image recognition, natural language processing, and machine translation. Deep learning is also being used to develop new and innovative applications in a variety of fields, including healthcare, finance, and transportation.

Here are some of the benefits of using deep learning:

- Accuracy: Deep learning models can be trained to achieve high levels of accuracy in a variety of tasks.
- Scalability: Deep learning models can be scaled to handle large datasets and complex problems.
- Flexibility: Deep learning models can be adapted to a wide range of tasks and data types.
- However, deep learning also has some challenges:

Data requirements: Deep learning models require large datasets of data to train.
Computational requirements: Training deep learning models can be computationally expensive.
Interpretability: Deep learning models can be difficult to interpret, making it difficult to understand why they make certain predictions.

In the context of agriculture, deep learning can be used to develop a variety of applications, including:

Plant disease detection: Deep learning algorithms can be trained to detect plant diseases in images of plants. This can help farmers to identify diseases early and take steps to control them. Yield prediction: Deep learning algorithms can be used to predict crop yields based on factors such as weather data, soil data, and crop data. This information can help farmers to make better decisions about crop management and marketing.Precision agriculture: Deep learning algorithms can be used to develop precision agriculture systems that can help farmers to apply water, fertilizer, and pesticides more efficiently. This can help to reduce costs and environmental impact. Livestock management: Deep learning algorithms can be used to develop livestock management systems that can help farmers to monitor the health and productivity of their animals. This information can help farmers to identify problems early and take steps to address them.Deep learning is a powerful tool that has the potential to revolutionize agriculture. By automating tasks, improving efficiency, and enabling farmers to make better decisions, deep learning can help to improve agricultural productivity and sustainability

- **LITERATURE SURVEY**

Sr.No	Title	Author	Summary
1	Convolutional Neural Networks based Classification and Detection of Plant Disease	P. Vishnu Raja; K. Sangeetha; Ninisa B A; Samiksha M; Sanjutha S S; Dept of CSE, Kongu Engineering College, Perundu 13 April 2022 IEEE	15 classifications, is used to help with plant disease recognition study

2	Deep Learning based Plant Leaf Disease Detection and Classification	S.H. Annie Silviya; Sriman B; P. Baby Shamini; A. Elangovan; Monica A. R; N.V. Keerthana. 29 December 2022 IEEE	CNN is used for classification and the result is display on GUI of user
3	Detection of Plant Disease using Convolutional Neural Networks (CNN)	T Chaturya; Y Swathi; Vinod Kumar; P Karthik; A Nayan; Arvind Yadav. 25 April 2023 IEEE	This paper is only based on potato plant disease detection With Minimum accuracy
4	Automatic Plant Disease Detection Using Deep Learning	Saeka Rahman; Sudip Vhaduri; Miad Faezipour 25 August 2023 IEEE	The model is validated using 2-D color images of potato leaves, including healthy and infected, collected from the PlantVillage dataset of the Kaggle public website. Test accuracy, the required number of parameters, and model run-time are considered to evaluate the model.

- **DEEP LEARNING IN AGRICULTURE**

Deep learning is a type of machine learning that uses artificial neural networks to learn from data. Artificial neural networks are inspired by the structure and function of the human brain, and they are able to learn complex patterns from data.Deep learning has been used to achieve state-of-the-art results in a variety of tasks, including image recognition, natural language processing, and machine translation. Deep learning is also being used to develop new and innovative applications in a variety of fields, including healthcare, finance, and transportation.

Here are some examples of how deep learning is being used in agriculture today:

- ➢ Drone-based plant disease detection: Researchers are developing drones that can be equipped with cameras and deep learning algorithms to detect diseases in crops.
- ➢ Precision agriculture: Farmers are using deep learning to develop precision agriculture systems that can help them to apply water, fertilizer, and pesticides more efficiently.
- ➢ Livestock management: Farmers are using deep learning to develop livestock management systems that can help them to monitor the health and productivity of their animals.

Deep learning is still under development, but it has the potential to have a major impact on agriculture. Deep learning-based systems can help farmers to reduce crop losses, improve yields, and make more sustainable farming decisions.
Certainly! In the context of a Plant Disease Prediction App, a Convolutional Neural Network (CNN) plays a crucial role in image classification, which is essential for identifying diseases in plants based on images. Here's some detailed information about the CNN algorithm:

1. Convolutional Layers:-

CNNs are designed to automatically and adaptively learn patterns directly from data. Convolutional layers apply a set of learnable filters (kernels) to input images. These filters slide over the input image, performing element-wise multiplications and accumulating the results to create a feature map. These maps capture various features at different levels of abstraction.

2. Pooling Layers:-

Pooling layers reduce the spatial dimensions of the feature maps while retaining important information. Common pooling operations include max pooling (selecting the maximum value in a certain region) and average pooling (calculating the average value).

3. Activation Functions:-

Non-linear activation functions (e.g., ReLU - Rectified Linear Unit) are applied after each convolutional and pooling layer to introduce non-linearity into the model. This allows CNNs to learn complex patterns and relationships in the data.

4. Fully Connected Layers:-

After several convolutional and pooling layers, fully connected layers are added. These layers perform classification based on the features learned in the previous layers. They are typical dense layers where all neurons are connected.

5. Dropout:-

Dropout layers are employed to mitigate overfitting. During training, random neurons are "dropped out," meaning they are temporarily ignored, reducing co-dependencies and encouraging the network to learn more robust features.

6. Batch Normalization:-

Batch normalization layers help in stabilizing and accelerating the training process. They normalize the activations of each layer in a mini-batch, reducing internal covariate shifts and aiding in faster convergence.

7. Loss Function:-

In the context of plant disease prediction, a categorical cross-entropy loss function is commonly used. This measures the difference between the predicted probabilities and the true labels.

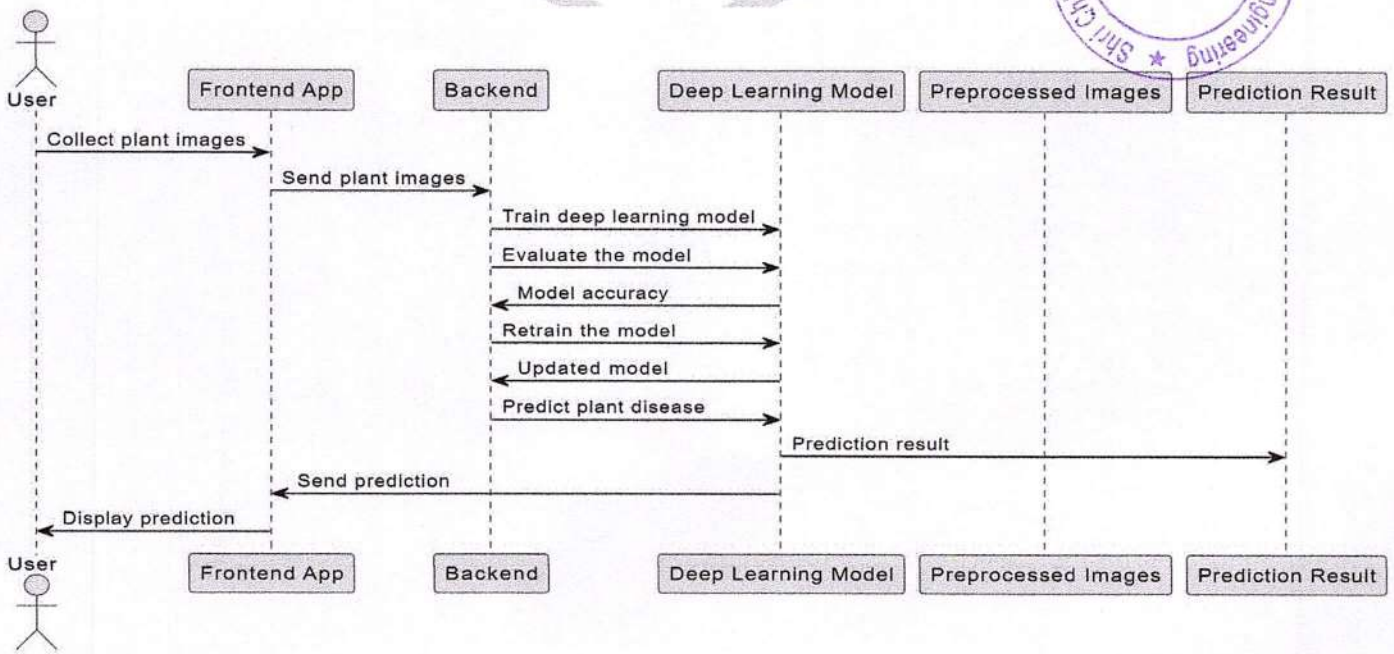
8. Optimization Algorithm:-

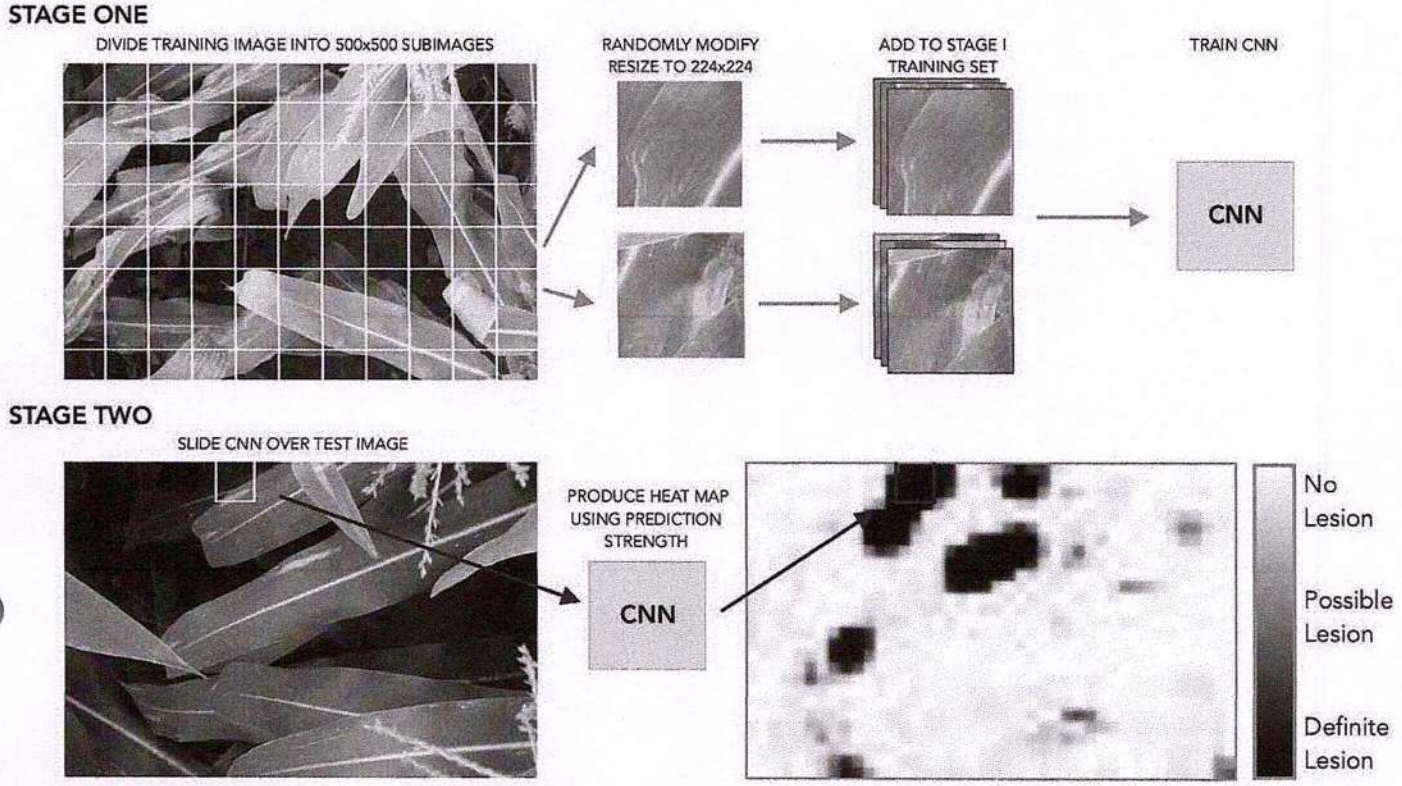
Stochastic Gradient Descent (SGD) or advanced variants like Adam are popular optimization algorithms used to update the weights of the network during training. These algorithms aim to minimize the loss function.

10. Output Layer:-

The output layer consists of neurons equal to the number of disease classes. It uses a softmax activation function to provide a probability distribution over the different disease classes.

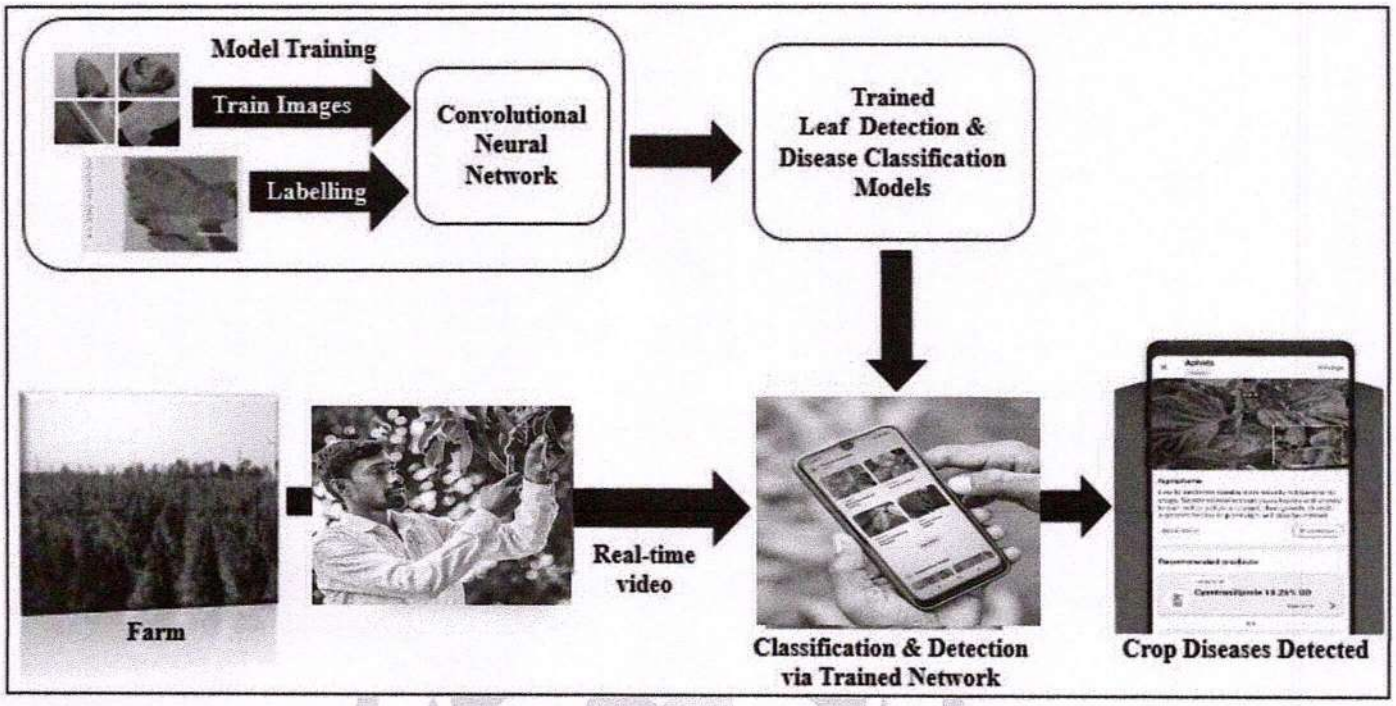
I. WORKING





IV. ARCHITECTURE :

Designing the architecture for a Plant Disease Detection App using deep learning involves several key components. Here's a high-level overview of the architecture:



1. User Interface (UI):-

The UI is the user-facing component of the application. It includes features like uploading images, displaying results, providing additional information about diseases, and user interactions.

2. Image Upload and Preprocessing:-

When a user uploads an image of a plant, this component handles the data input. It may involve resizing, normalization, and other preprocessing steps to prepare the image for input into the deep learning model.

3. Deep Learning Model:-

The core of the application, this component consists of a Convolutional Neural Network (CNN) or a similar deep learning architecture. The model is responsible for classifying the uploaded image and detecting the presence of plant diseases.

4. Model Training and Fine-Tuning (Backend):-

This backend component is responsible for training and fine-tuning the deep learning model. It uses a labeled dataset of plant images, with annotations indicating the presence of diseases. The trained model is then deployed for inference.

5. Database (Optional):-

A database may be employed to store information about diseases, including images, descriptions, and recommended treatments. This database can be integrated with the application for quick access to additional information.

6. Real-Time Inference:-

Once the model is trained, it can be deployed for real-time inference. This component processes the uploaded image through the trained model and returns the prediction.

7. Result Presentation:-

The results from the model are displayed to the user. This includes information on the detected disease, its severity, and any recommended actions.

8. Security and Privacy:-

This aspect ensures that user data is handled securely, with appropriate encryption and privacy measures in place.

9. Logging and Monitoring:-

This component tracks user interactions, model performance, and any errors or exceptions that occur during app usage. This information can be valuable for debugging and improving the application.

10. Integration with External Systems (Optional):-

The app can be designed to integrate with external systems, such as agricultural management platforms, to provide a comprehensive solution for farmers.

V. FUTURE SCOPE

Plant disease detection using deep learning has a wide scope and a range of applications that can significantly impact agriculture and food security.

1. Disease Identification and Diagnosis:
- Early detection of diseases like blights, rusts, and mildews.
- Accurate identification of disease types, strains, and severity.
- Rapid assessment of disease outbreaks in large agricultural fields.

2. Crop Health Monitoring:
- Monitoring the overall health of crops throughout the growing season.
- Detecting signs of stress, nutrient deficiencies, or environmental factors affecting crop health.
- Predicting disease outbreaks based on historical data and environmental conditions.

3. Yield Optimization:
- Maximizing crop production by preventing disease-related losses.
- Minimizing the need for excessive pesticide use through targeted treatment.

4. Research and Data Collection:
- Gathering large-scale datasets for disease research.
- Analyzing disease patterns and trends over time and across regions.
- Supporting the development of disease-resistant crop varieties through genetic analysis.

5. Pest Detection:
- Identifying and quantifying pest populations.
- Integrating pest and disease data for comprehensive crop protection.

6. Global Food Security:
- Addressing the challenge of feeding a growing global population by preserving crop yields.
- Mitigating the economic impact of crop diseases on farmers and food supply chains.

The scope and applications of plant disease detection using deep learning continue to expand as the technology matures and more data becomes available. It holds great promise for enhancing agricultural sustainability, reducing crop losses, and ensuring food security in a rapidly changing world.

VI. CONCLUSION

Plant disease detection is a crucial process in agriculture, as early and accurate detection of diseases can help to reduce crop losses and improve food security. Traditional methods of plant disease detection can be time-consuming and subjective, and they are not always possible to accurately identify diseases in their early stages.

Machine learning-based plant disease detection systems have the potential to revolutionize the way that plant diseases are detected and managed. These systems can automate the plant disease detection process, improve the accuracy of early detection, and enable farmers to make more informed decisions about disease management.

Deep learning is a type of machine learning that has been shown to be particularly effective for plant disease detection. Deep learning algorithms can be trained on large datasets of images of diseased and healthy plants to learn to identify the visual characteristics of diseases. Once trained, these algorithms can be used to automatically detect diseases in new images of plants.

Deep learning-based plant disease detection systems are still under development, but they have the potential to have a major impact on agriculture. These systems can help farmers to reduce crop losses, improve yields, and make more sustainable farming decisions.

Here are some of the benefits of using deep learning for plant disease detection:

- Accuracy: Deep learning algorithms can be trained to achieve high levels of accuracy in detecting plant diseases, even in challenging conditions.
- Speed: Deep learning algorithms can automatically detect diseases in images of plants, which can save farmers a significant amount of time.
- Early detection: Deep learning algorithms can detect diseases in their early stages, which can help to reduce crop losses.
- Scalability: Deep learning algorithms can be scaled to detect diseases in large areas of farmland.

Deep learning-based plant disease detection systems have the potential to revolutionize the way that plant diseases are detected and managed. These systems can help farmers to reduce crop losses, improve yields, and make more sustainable farming decisions.

VII. ACKNOWLEDGMENT

We take this opportunity to express my heartfelt thanks to all those who helped me in the completion of the Project on "**PLANT DISEASE PREDICTION APPLICATION USING DEEP LEARNING**". We would especially like to express my sincere gratitude to **Prof. ROHIT GHADAGE** our Guide and **Prof. V. V JAGTAP** HOD Department of Computer Engineering who extended their moral support, inspiring guidance and encouraging independence throughout this task. We are also grateful to **Dr. [illegible]. R. Kharde**, Principal of Shri chhatrapati Shivaji Maharaj College Of Engineering And Management for his indispensable support, suggestions

VIII. REFERENCE

[1] . Wu, Y. Chen, and J. Meng, ''DCGAN-based data augmentation for tomato leaf disease identification,'' IEEE Access, vol. 8, pp. 98716–98728, 2020

[2] D. Das and C. S. G. Lee, ''A two-stage approach to few-shot learning for image recognition,'' IEEE Trans. Image Process., vol. 29, no. 5, pp. 3336–3350, Dec. 2020

[3] D. Ashourloo, H. Aghighi, A. A. Matkan, M. R. Mobasheri, and A. M. Rad, "An investigation into machine learning regression techniques for the leaf rust disease detection using hyperspectral measurement," IEEE J. Sel. Topics Appl. Earth Observ. Remote Sens., vol. 9, no. 9, pp. 4344–4351, Sep. 2016, doi: 10.1109/jstars.2016.2575360

[4] P. Jiang, Y. Chen, B. Liu, D. He, and C. Liang, ''Real-time detection of apple leaf diseases using deep learning approach based on improved convolutional neural networks,'' IEEE Access, vol. 7, pp. 59069–59080, 2019

[5] B. Sandika, S. Avil, S. Sanat, and P. Srinivasu, ''Random forest based classification of diseases in grapes from images captured in uncontrolled environments,'' in Proc. IEEE 13th Int. Conf. Signal Process. (ICSP), Nov. 2016, pp. 1775–1780.

[6] J. Chen, J. Chen, D. Zhang, Y. Sun, and Y. A. Nanehkaran, ''Using deep transfer learning for image-based plant disease identification,'' Comput. Electron. Agriculture., vol. 173, Jun. 2020, Art. no. 105393.

[7] S.-N. Ren, Y. Sun, H.-Y. Zhang, and L.-X. Guo, ''Plant disease identification for small sample based on one-shot learning,'' Jiangsu J. Agricult. Sci., vol. 35, no. 5, pp. 1061–1067, May 2019.

[8] K. Nagasubramanian, S. Jones, A. K. Singh, S. Sarkar, A. Singh, and B. Ganapathysubramanian, ''Plant disease identification using explainable 3D deep learning on hyperspectral images,'' Plant Methods, vol. 15, no. 1, pp. 1–10, Aug. 2019

[9] W. Yang, C. Yang, Z. Hao, C. Xie, and M. Li, ''Diagnosis of plant cold damage based on hyperspectral imaging and convolutional neural network,'' IEEE Access, vol. 7, pp. 118239– 118248, 2019

[10] S. P. Mohanty, D. P. Hughes, and M. Salath'e, "Using deep learning for image-based plant disease detection," Frontiers plant science, vol. 7, pp. 1419, 2016 IEEE

International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 04 | April - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

Smart Plate Access Control

Vinay Kumar Pandey
Department Of Computer Engineering
Shri Chhatrapati Shivaji Maharaj College of Engineering,
Ahmednagar, India
vinayxpandey11@gmail.com

Prachi Katkar
Department Of Computer Engineering
Shri Chhatrapati Shivaji Maharaj College of Engineering
Ahmednagar, India
Prachikatkar116@gmail.com

Janhavi Hirwe
Department Of Computer Engineering
Shri Chhatrapati Shivaji Maharaj College of Engineering,
Ahmednagar, India
janhavihirwe@gmail.com

Prof. R. A. Ghadage
Department Of Computer Engineering
Shri Chhatrapati Shivaji Maharaj College of Engineering
Ahmednagar, India
rohit.ghadage@scoea.org

Abstract - **Access control systems play a crucial role in safeguarding various environments, from residential complexes to commercial spaces. Traditional access control methods, such as keycards and PIN codes, have shown limitations in terms of security and efficiency. This paper presents a novel approach to access control through the implementation of a "Smart Plate" system."Smart Plate Access Control" is a transformative project poised to redefine access management and bolster security across society. This innovative system leverages machine learning and IoT technology for real-time number plate recognition, ensuring only authorized vehicles access secure locations. By seamlessly integrating machine learning, IoT, and database management, it enhances efficiency and security in access control. This innovation promises safer, streamlined access, addressing evolving security challenges. Benefits include heightened security, reduced unauthorized access, improved traffic flow, and decreased administrative overhead. "Smart Plate Access Control" represents more than a technological leap; it's a societal boon, fostering safer, accessible shared spaces for all.**

Keywords - IoT, security, access control, decreased administrative overhead.

I INTRODUCTION

In the era of digital transformation, the fusion of computer vision and artificial intelligence has ushered in a new frontier in the field of security and surveillance. Number Plate Detection Systems (NPDS) and Face Recognition (FR) technologies have emerged as pivotal pillars in safeguarding our ever-expanding urban landscapes, transportation networks, and critical infrastructures. Access control systems are pivotal components of security infrastructure in a variety of contexts, ranging from residential communities and corporate offices to critical infrastructure facilities. The traditional methods employed for access control, such as physical keys, access cards, and PIN codes, while effective to a certain extent, have exhibited vulnerabilities and limitations in today's dynamic and technologically advanced world. These shortcomings include the potential for card cloning, forgotten PINs, and the need for physical interactions with access devices. Consequently, there is an increasing demand for innovative and technologically sophisticated access control solutions that can provide heightened security and convenience. In response to these challenges, this review paper introduces the concept of "Smart Plate Access Control," an emerging paradigm that leverages cutting-edge technologies to enhance access management and security. The central premise of the Smart Plate Access Control system is the integration of number plate recognition technology, face authentication, Internet of Things (IoT), and Machine learning to create a comprehensive and intelligent access control solution. Number Plate Detection Systems, equipped with cutting-edge optical character recognition algorithms and cameras, have become essential components in traffic management, law enforcement, and access control. Face Recognition technology, driven by deep learning and neural networks, has transcended conventional biometric methods and is revolutionizing identity verification and surveillance.

II. RELATED WORK

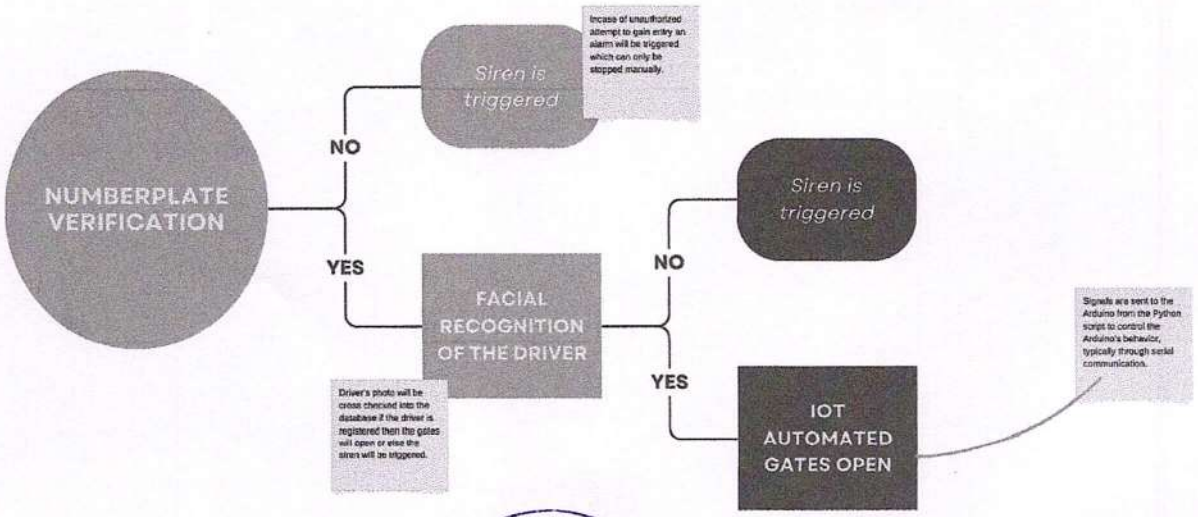
The "Smart Plate Access Control" system stands at the forefront of access management and security innovation, offering a groundbreaking solution in a landscape dominated by traditional access control systems. These older systems rely on physical cards or fobs for entry, often lacking the robust security and real-time capabilities that the "Smart Plate Access Control" system embodies. Additionally, while License Plate Recognition (LPR) systems have their place in toll collection and traffic monitoring, they usually don't encompass the comprehensive access control features and seamless integration with IoT technology that define our system. Moreover, facial recognition systems, although powerful in their own right for security applications, are not typically combined with license plate recognition in the way the "Smart Plate Access Control" system does.

Parking management systems, too, serve their purpose in regulating vehicle access to parking areas, but they tend to be limited to parking facilities and lack the broader security features of our innovation. Lastly, while some IoT-based access control systems exist, they may not offer the real-time license plate recognition and facial recognition features that set the "Smart Plate Access Control" system apart. In summary, the "Smart Plate Access Control" system is not just a technological leap; it's a societal boon. It fosters safer, accessible shared spaces by enhancing security, reducing unauthorized access, improving traffic flow, and decreasing administrative overhead. By combining real-time number plate recognition, facial recognition, and IoT technology, it provides a comprehensive and secure solution that redefines access management across a variety of applications.

III. PROPOSED METHOD

Access control systems have witnessed significant advancements, and our proposed smart plate access control system represents an innovative approach that leverages image recognition and face recognition technologies to enhance security and user convenience. This system is designed to provide a comprehensive and robust solution for various access control scenarios, ranging from residential areas to commercial and industrial facilities. Image recognition technology is integrated into our system to enable the recognition of vehicles and individuals based on their visual characteristics. This component allows us to identify vehicles and their occupants even when license plates may not be clearly visible. Additionally, our face recognition technology enhances security by authenticating individuals associated with the vehicles. Our system comprises various components, including high-resolution cameras and sensors, authentication methods, backend systems, and user interfaces. These components work cohesively to ensure efficient and secure access control.

High-quality cameras capture images of vehicles and individuals, providing the input data required for recognition and authentication. Our system uses a multi-



modal approach, combining number plate recognition, image recognition, and face recognition to verify both the vehicle and its occupants. Our system's design is scalable and customizable, allowing it to adapt to various environments and requirements. The architecture ensures that it can be easily integrated with existing security systems and IoT devices, enhancing its versatility. The versatility of our smart plate access control system makes it suitable for a wide range of applications. It can be employed in residential areas for secure entry and exit, in parking facilities for efficient management, in commercial and industrial settings to enhance security, and by law enforcement agencies for public safety and investigation purposes.

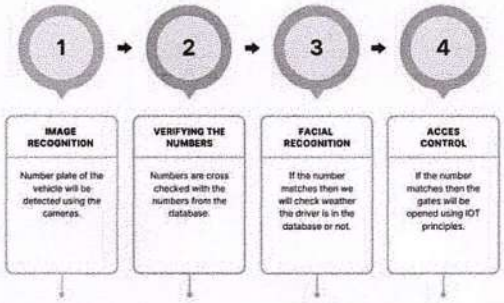


Fig.1 Proposed System Architecture

IV. WORKING MODULE

In our proposed system, we leverage blockchain technology to revolutionize the traditional tender allocation process. Utilizing the transparency and security features of blockchain, we ensure a tamper-proof and auditable record of all transactions. The system operates through smart contracts, automating the entire tender process from the announcement to the awarding. The "Smart Plate Access Control" system operates at the intersection of cutting-edge technology and seamless access management. The core of this innovative system lies in its ability to instantaneously and accurately recognize license plates and verify the driver's identity through facial recognition. Here, we delve into the intricacies of its working model:

1. **Real-time License Plate Recognition**: The system's foundation is built on machine learning algorithms tailored for license plate recognition. When a vehicle approaches an entry point, such as a parking facility or a secure access point, our cameras capture the vehicle's license plate. These images are then processed in real-time to extract the license plate number.

2. **Facial Recognition for Driver Verification:** In parallel, the system employs advanced facial recognition technology. The driver's face is scanned and matched against a pre-existing database of authorized individuals. This dual-check system enhances security by ensuring that not only the vehicle but also the driver are authorized for entry.

3. **IoT Integration**: The system is IoT-enabled, allowing for seamless communication and data sharing between different components. Data from the license plate recognition and facial recognition processes are swiftly transmitted to a central server. This integration permits real-time decision-making regarding entry authorization.

4. **Database Management**: A pivotal component of the system is the centralized database. It contains records of authorized vehicles, drivers, and access permissions. When a vehicle approaches an access point, the system checks the license plate against this database, alongside the facial recognition results.

5. **Automated Decision-making**: Based on the real-time data, the system makes instantaneous decisions regarding access authorization. If both the license plate and facial recognition checks pass, the entry barrier is automatically raised, granting access. In the event of a discrepancy or unauthorized entry attempt, the system triggers alarms and notifies security personnel.

6. **Logging and Reporting**: The system maintains comprehensive logs of all entries and access attempts. These logs are invaluable for post-incident analysis and auditing, as they provide a detailed record of who entered and when. Additionally, these logs are accessible by authorized personnel for real-time monitoring and reporting.

7. **Scalability and Adaptability**: "Smart Plate Access Control" is a highly adaptable system that can be deployed across various settings, including military bases, government buildings, and shopping malls. Its scalable architecture enables it to handle multiple entry points simultaneously.

V. ALGORITHM DESIGN :

Convolutional Neural Networks (CNNs) are composed of layers that play specific roles in processing and learning hierarchical features from input data. CNNs enables the system to learn and recognize intricate patterns, contributing to heightened security, efficient access management, and adaptability across diverse environments. Here are the key layers typically found in a CNN

1. **Input Layer:**
- License Plate Recognition: Receives raw image data of license plates captured by the system's cameras.
- Facial Recognition: Takes in facial images for identification.

2. **Preprocessing:**
Captured images undergo preprocessing to enhance quality and remove noise, ensuring optimal input for the CNN.

3. **Convolutional Layers:**
- License Plate Recognition: Extracts intricate features from license plate images, recognizing patterns like characters and unique identifiers.
- Facial Recognition: Identifies facial features and patterns crucial for accurate authentication.

4. **Activation (ReLU) Layers:**
- License Plate Recognition: Introduces non-linearity to learn complex patterns on license plates.
- Facial Recognition: Enhances the system's ability to recognize complex facial features.

5. **Pooling Layers:**
- License Plate Recognition: Contributes to spatial reduction for computational efficiency in processing license plate data.
- Facial Recognition: Assists in recognizing essential facial features while reducing computational load.

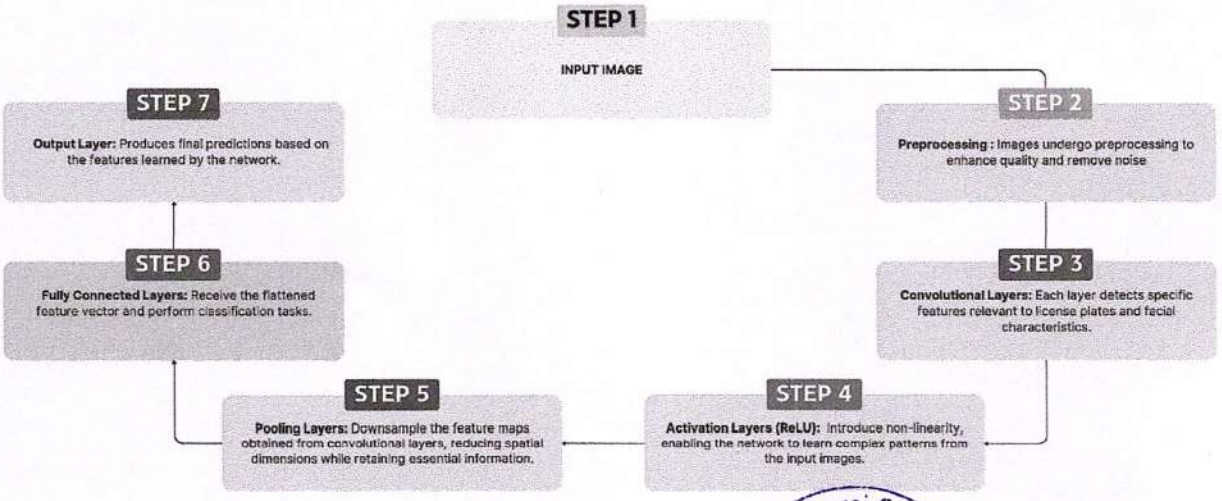
6. **Fully Connected (Dense) Layers:**
- License Plate Recognition: Maps learned license plate characteristics to specific classes.
- Facial Recognition: Establishes connections to the flattened facial features, mapping them to known individuals.

7. **Output Layer:**
- License Plate Recognition: Produces results indicating whether the presented license plate is authorized.
- Facial Recognition: Produces authentication results based on learned facial features.

Integration with Project's Workflow:

Real-time Recognition: The efficiency of CNN layers ensures quick and accurate processing for both license plate and facial recognition, making real-time decisions at access points.
Enhanced Security: The combined power of license plate and facial recognition through CNN layers significantly enhances overall system security by providing dual checks for authorization.
Versatile Deployment: The adaptable architecture of CNN layers allows the system to be deployed across various settings, showcasing its versatility in

access control scenarios encompassing license plate and facial recognition.
By incorporating CNN layers for both license plate and facial recognition, our "Smart Plate Access Control" project establishes itself as a comprehensive solution, addressing security challenges with a sophisticated blend of technologies. The use of CNNs ensures the project's adaptability, efficiency, and reliability across diverse environments.



VII CONCLUSION

In the realm of security, where every moment counts, our "Smart Plate Access Control" system emerges not just as a technological advancement but as a guardian of safety in our daily lives. By combining the prowess of real-time number plate recognition, facial authentication, and the intelligence of the Internet of Things, we've crafted more than a system; we've woven a shield.

Traditionally, keys and codes guarded our spaces, but vulnerabilities lingered. Our innovation addresses these gaps, offering a comprehensive alternative. Imagine a world where, at the entry point, your license plate and face become your unique keys—quickly and accurately recognized by a system powered by Convolutional Neural Networks (CNNs).

In simple words, our system works like a watchful guardian. As your vehicle approaches, it reads the license plate, verifies your face, and, in a blink, decides if access is granted. This isn't just about technology; it's about making our shared spaces safer and more accessible for everyone.

Picture this: military bases, government buildings, shopping malls, and more, all safeguarded by a system that adapts, learns, and secures. It's not just about access; it's about trust, efficiency, and a collective step towards a secure future.

So, as our project paves the way for this new era of access control, it's not just about gates opening; it's about a safer, smarter, and more connected world—where security is not a compromise but a promise kept. Welcome to the future of secure access; welcome to a world where safety meets innovation.

REFERENCES

1."Smart IoT based security system for residence" by Muhhammad Irsyad Haziq, Ilanur Muhanini Binti Mohd Noor, Raed Abdulla.(2022)

2."Automatic vehicle Number plate recognition system using ML" by JMSV Ravi Kumar, B Sujatha, N leelavathi. (2021)

3."Machine Learning based Number plate detection and recognition" by Zuhaib Ahmed Shaikh, Umair Ali Khan, Muhammad Awais Rajput, Abdul Wahid Memon.(2018)

4."Automatic Number Plate Recognition: A Detailed Survey of Relevant Algorithms" by Lubna , Naveed Mufti, and Syed Afaq Ali Shah.(2018)

5.N. Surantha and W. R. Wicaksono, "Design of Smart Home Security System using Object Recognition and PIR Sensor," in Procedia Computer Science, 2018, vol. 135, pp. 465–472.

6.A. Andreas, C. R. Aldawira, H. W. Putra, N. Hanafiah, S. Surjarwo, and A. Wibisurya, "Door Security System for Home Monitoring Based on ESP32," Procedia Computer Science, vol. 157, no. 673-682, 201910.1016/j.procs.2019.08.218.

7.H. Singh, R. Abdulla, S. K. Selvaperumal., "Carbon Monoxide Detection Based IoT," Journal of Applied Technology and Innovation,vol. 5(3), pp. 7-12, 2021.

8.W. M. Rasheed, R. Abdulla, L. Y. San., "Manhole cover monitoring system over IOT," Journal of Applied Technology and Innovation, vol. 5, no. 3, pp. 1-6, 2021.

JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue

JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

HOMMIE: CONVERSATIONAL AI ASSISTANT

[1]Vrushali Khandave, [2]Mohini Karale, [3] Khushbu Sharma, [4] Rohan Raikwad, [5] Prof.Rohit Ghadage

[1,2,3,4]Student,Shri Chhatrapati Shivaji Maharaj College of Engineering,

[5]Ass.Prof, Shri Chhatrapati Shivaji Maharaj College of Engineering,

[1]Department Of Computer Engineering,

[1] Shri Chhatrapati Shivaji Maharaj College of Engineering,Nepti, Ahmednagar,India

Abstract : Conversational AI assistants have witnessed remarkable progress in recent years, transforming human-computer interaction across a spectrum of applications. This paper offers a comprehensive overview of the state-of-the-art techniques, methodologies, and challenges in the field. We examine the core components of conversational AI, including natural language understanding, dialogue management, and response generation. Additionally, we address key challenges such as context modeling, personalization, and ethical considerations. The paper serves as a roadmap for researchers and developers, highlighting current achievements and avenues for future advancements in the dynamic domain of conversational AI.

keyword **- Conversational AI, NLP, Assistant, Machine Learning, Chatbot**

I. INTRODUCTION

Conversational Artificial Intelligence (or Conversational AI) is a set of technologies underpinning automated messaging and speech-enabled systems that enable human-like interactions between computers and humans. Conversational AI assistants, also known as chatbots, virtual assistants, or simply AI bots, represent a rapidly evolving and increasingly influential domain within the broader field of artificial intelligence (AI). These intelligent systems are designed to engage in human-like conversations with users, offering information, assistance, and performing tasks in a natural and interactive manner. Conversational AI has found application in a wide array of domains, from customer support and e-commerce to healthcare, education, and entertainment.

The fundamental objective of conversational AI assistants is to bridge the gap between humans and machines, making interactions with technology more intuitive and accessible. By harnessing natural language processing (NLP), machine learning, and other AI technologies, these systems can comprehend user input, interpret intent, and respond coherently. This field has witnessed significant advancements in recent years, largely driven by the availability of large datasets, powerful computing resources, and breakthroughs in neural network architectures.

Conversational AI is essentially powered by two functionalities. The first of these is machine learning. Simply said, machine learning means that the technology "learns" and improves as it is utilised. It gathers data from its exchanges. It then utilises that knowledge to develop itself over time.

1. **Natural Language Processing :**A conversational agent uses Natural Language Processing, NLP, to perform interactive dialogs with a user. NLP uses computer and information sciences, linguistics, mathematics, electrical and electronic engineering, artificial intelligence and robotics, psychology, and other areas to explore how computers can be used to understand and manipulate natural language text or speech, by gathering information about how human beings understand and use language . The aim of NLP research is to develop appropriate tools and techniques to make computer systems able to understand and manipulate natural languages to perform the desired tasks.

2. **Speech interface :** A speech interface allows the user to, instead of with a mouse, keyboard or similar physical objects, use speech and hearing to interact with technology. Speech interfaces consists of two main parts: speech recognition, where an acoustic signal is transformed into textual words, i.e. the user's speech is being recognized by the computer, and speech synthesis, which transforms text into speech. Even though a speech interface can transform speech to text and text to speech, it cannot in itself understand what the user is saying.

3. **Recipes and cooking:** Hommie works on voice based output format, the Hommie replies in voice output interacting with user and responses to the inputs.Step-by-step process of cooking in interacting mode is done with the help of Hommie.It's

just a name given by our team to call a recipe bot.It helps us like a mother, friends, etc.That is why the name is given to our assistant Hommie.

II. COMPONENTS:

The development of Conversational AI Assistants involves several core components:

1.Natural Language Understanding (NLU): NLU enables the AI assistant to comprehend and extract meaning from the user's spoken or written language. It involves tasks such as text classification, entity recognition, and sentiment analysis.

2.Dialog Management: Dialog management is the heart of a conversational AI system. It orchestrates the conversation, keeping track of context, managing turn-taking, and determining appropriate responses based on the ongoing interaction.

3.Response Generation: This component involves generating coherent and contextually relevant responses to user queries. It often incorporates language generation models, such as sequence-to-sequence models.

4.Context Modeling: Maintaining context across multiple turns of conversation is crucial for providing meaningful responses. Effective context modeling allows the AI assistant to remember user inputs, understand references, and provide relevant information.

5.Personalization: Personalization tailors the interaction to individual users, considering their preferences, history, and behavior. It enhances user engagement and satisfaction.

Artificial Intelligence for Conversational AI Assistant:

Conversational AI is a type of artificial intelligence (AI) that can simulate human conversation. It is made possible by natural language processing (NLP), a field of AI that allows computers to understand and process human language and Google's foundation models that power new generative AI capabilities. Google Cloud offers conversational AI as part of Vertex AI platform offerings like Vertex AI Conversation and Vertex AI solutions like Contact Center AI.Conversational AI works by using a combination of natural language processing (NLP), foundation models, and machine learning (ML).Conversational AI systems are trained on large amounts of data, such as text and speech. This data is used to teach the system how to understand and process human language. The system then uses this knowledge to interact with humans in a natural way. It's constantly learning from its interactions and improving its response quality over time.

Machine Learning for Conversational AI Assistant:

A chatbot (Conversational AI) is an automated program that simulates human conversation through text messages, voice chats, or both. It learns to do that based on a lot of inputs, and Natural Language Processing (NLP).

For the sake of semantics, chatbots and conversational assistants will be used interchangeably in this article, they sort of mean the same thing. Conversational AI is an umbrella term used to describe various methods of enabling computers to carry on a conversation with a human. This technology ranges from fairly simple natural language processing (NLP) to more sophisticated machine learning (ML) models that can interpret a much wider range of inputs and carry on more complex conversations.

One of the most common applications of conversational AI is in chatbots, which use NLP to interpret user inputs and carry on a conversation. Other applications include virtual assistants, customer service chatbots, and voice assistants.

III. LITERATURE SURVEY

Sr.No	Title	Author	Summary
1	Virtual Assistant using Python	Vedant Kulkarni, Shreyas Kallurka, Vipul Waikar, Saurab Patil, Swarupa Deshpande May 2022,JETIR	Virtual Assistant saves time,User friendly GUI

2	AI Based Voice Assistant	Subhash S, Prajwal N Srivatsa, Siddesh S, Ullas A, Santhosh B October 2020,IEEE	Control PC with Voice Commands
3	Conversational AI Assistant	Tarique Ansari, Pathan Arshad, Vishal Khetan ,BHimashankar Bembre, Prof.Priyanka Halle November 2022,IJRASET	Educational Assistant
4	The Use of Conversational Natural Language Processing Chatbots	Manoj Kamber, Divyakumar Shah 2022,IJRASET	Innovation progresses with the improvement of AI.

IV. MODULES

- Speech Recognition: This module converts spoken language into text, allowing the system to understand what the user is saying.
- Natural Language Processing (NLP): NLP processes the text generated by speech recognition to understand the user's intent, extract entities, and determine the appropriate response.
- Dialog Management: This module handles the conversation flow, maintaining context and managing multi-turn interactions with the user.
- Text-to-Speech (TTS): TTS converts the system's responses into spoken language, allowing the voice assistant to communicate with the user.
- User Profile and Preferences: These modules store and manage user-specific data, such as preferences, user history, and personalized settings.
- Knowledge Base: Voice assistants often have access to a knowledge base or database to retrieve information or perform tasks. This can include general knowledge, user-specific data, or integration with other services and APIs.
- Wake Word Detection: The wake word module listens for a specific word or phrase (e.g., "Hey, Siri" or "Alexa") to activate the voice assistant.
- Voice Biometrics: Some voice assistants use voice recognition to identify and authenticate users.
- Contextual Awareness: This module provides the voice assistant with context about the user's environment, location, and time, enabling more relevant responses and actions.
- Privacy and Security: Ensures that user data is protected and implements security measures to prevent unauthorized access or data breaches.
- Skill/Action Management: For voice assistants with third-party integrations, this module manages the installation, execution, and updates of skills or actions provided by third-party developers.

- Analytics and Learning: Collects data on user interactions to improve the voice assistant's performance and user experience over time.

V. OBJECTIVES

The objective of virtual assistant is to operate pc on voice commands.

Virtual assistant can handle open youtube, open website,open google, run video, open file and many more commands

Benefits of virtual assistant

- Virtual Assistants can save time.
- The Fact that you can operate your PC hands free.
- It is simple to use.
- Its GUI is user friendly
- The main motive behind virtual assistant is to control your pc with voice comma

VI. SYSTEM ARCHITECTURE :

In this chapter the program with its sections and functions is presented. The subsections of the chapter follow the sectioning of the code to give a clear view of how the program was built. Each subsection gives information about functions in that part of the program, and what and how modules have been used.

The structure of a how a user's input is handled and a response is triggered looks like this:

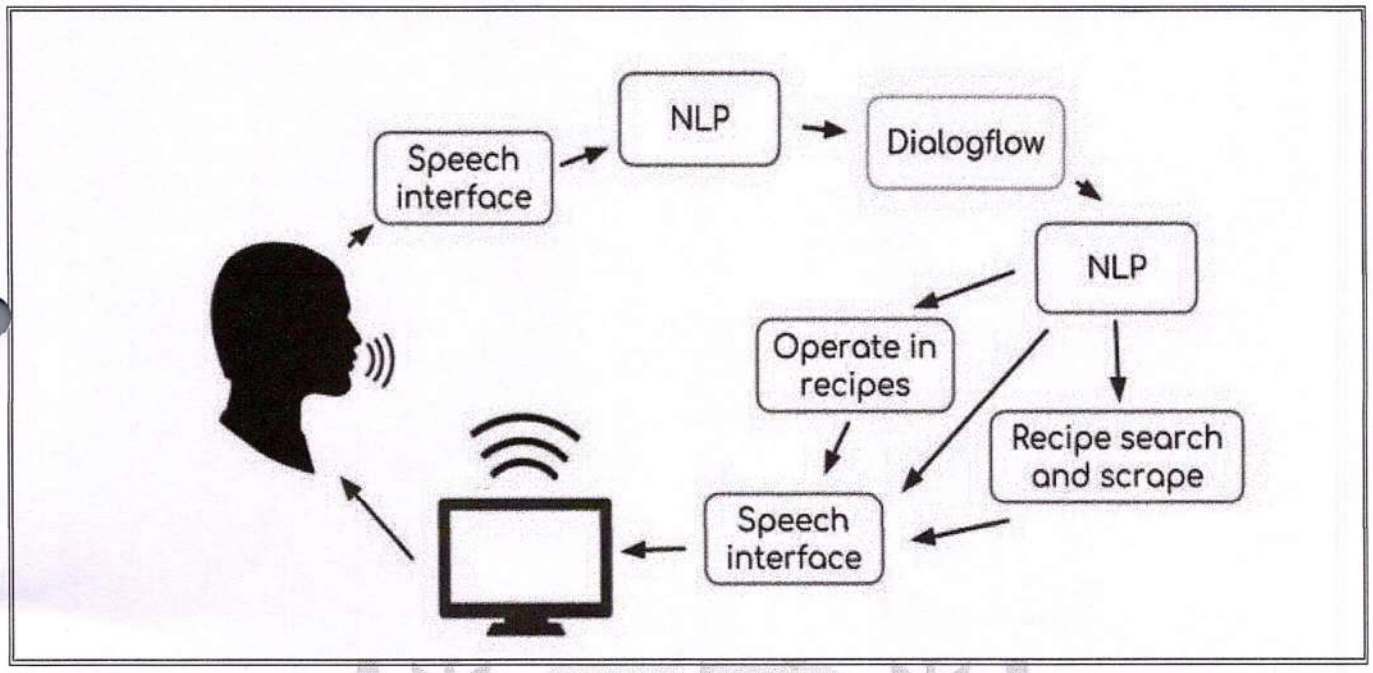


Fig.1

1. The user speaks.
2. The speech interface part of the program translates the speech to text and forwards it to the NLP part.
3. The data is sent from NLP to Dialogflow, and is then interpreted and a json file is generated.
4. The json file is extracted to the NLP part of program.
5. Depending on what the intent is activated in Dialogflow, the response from Dialogflow is either directly sent to the speech interface which performs a text to speech translation and reads the response to the user, or the response is first sent to one of the other two parts of the program; operating in recipes or recipe search and scrape, and from there to the speech interface.
6. The program goes into an infinite loop, which can only be broken if the quitting-intent is activated in Dialogflow (not shown in flowchart).

VII. ADVANTAGES :

It's important to note that the effectiveness of a conversational AI assistant depends on its design, training data, and ongoing maintenance. While they offer numerous advantages, they may also have limitations, such as the need for continuous improvement and the potential for misunderstandings in complex or ambiguous interactions.

1. 24/7 Availability: Conversational AI assistants can operate around the clock, providing instant responses and assistance to users, irrespective of the time of day.
2. Scalability: They can handle multiple interactions simultaneously, making them highly scalable for businesses with a large customer base.
3. Cost-Efficiency: Automating customer support and routine tasks with AI assistants can significantly reduce operational costs compared to maintaining a human workforce for the same tasks.
4. Consistency: Conversational AI assistants provide consistent and accurate information to users, eliminating the variability that can occur with human agents.

5. Speed: They can process and respond to user queries at a rapid pace, leading to faster problem resolution and improved user satisfaction.
6. Multilingual Support: Many AI assistants can communicate in multiple languages, broadening their reach to a global audience.

VIII. DISADVANTAGES:

1. Limited Culinary Expertise: Recipe bots are generally not culinary experts, so they may lack the ability to provide in-depth guidance, substitute ingredients effectively, or offer creative cooking ideas. Users may miss out on the expertise of human chefs.
2. Misinterpretation of Queries: Recipe bots may misinterpret or fail to understand complex or nuanced cooking-related queries, leading to unsatisfactory responses.
3. Lack of Personalization: While some recipe bots can offer basic personalization based on user preferences, they may not provide the level of personalization and customization that a human chef or cookbook can offer.
4. Ingredient Availability: Recipe bots may not consider local ingredient availability or dietary restrictions, potentially leading to impractical or unusable recipe suggestions.
5. Limited Creativity: They may lack the ability to think creatively and adapt recipes to suit users' tastes or available ingredients.

IX. RESEARCH METHODOLOGY

Voice assistants are all written in programming languages, which listens the verbal commands and respond Python Programming language to build the AI-based Voice assistant. It will respond with the results by playing that particular song or by opening Facebook website. The Voice assistant waits for a pause to know that users have finished their request, then the voice assistant sends users request to its database to search for the request.

1. The request asked by the user gets split into separate commands, so that our voice assistant can able to understand.
2. Once within the commands list, our request is searched and compared with the other requests.
3. The commands list then sends these commands back to the Voice assistant.
4. Once the voice assistant receives those commands, then it knows what to do next.
5. The voice assistant would even ask a question if the request is not clear enough to process it, in other words, to make sure it understands what we would like to receive.
6. If it thinks, it understands enough to process it, the voice assistant will perform the task which the user has asked for.

X. FUTURE SCOPE

- The future scope of a conversational recipe bot is quite promising. Here are some potential areas for growth and development:
- Personalization: Recipe bots can become more tailored to individual preferences, dietary restrictions, and cultural backgrounds, offering recipe suggestions that suit each user's unique needs and tastes.
- Integration with Smart Appliances: As smart kitchen appliances become more common, recipe bots can integrate with them to offer hands-free cooking experiences. Users can receive step-by-step instructions and control their appliances through voice commands.
- Nutritional Guidance: Recipe bots can provide users with more detailed nutritional information and even offer personalized dietary advice, helping users make healthier food choices.
- Interactive Cooking Experiences: Bots could incorporate augmented reality (AR) or virtual reality (VR) to guide users through cooking, making it a more interactive and engaging experience.
- Multi-Lingual and Cross-Cultural Support: Expanding the bot's language and cuisine capabilities to cater to a global audience can be a significant opportunity.
- E-commerce Integration: Bots could enable users to order ingredients directly from grocery stores, streamlining the cooking process.
- Restaurant Recommendations: Recipe bots could also suggest nearby restaurants that serve dishes similar to what users are preparing at home, offering dining-out options.

XI. CONCLUSION:

The goal of this thesis project was evaluating to what extent a conversational agent is useful in the kitchen. Even though the evaluation was restricted to a small amount of testers, it nevertheless provided information of great use for this project. It turns out that a conversational agent implemented with help of Google API has positive reactions among the testers, and that they believed they were to use it if improvements were made. It is concluded that a conversational agent like the one created in this project definitely can be

integrated and of use in the kitchen. The greater part of the testers said they would use it if commercially available. If improvements based on errors and the feedback of the testers were to be made it is believed to increase the practicality and satisfaction of the user further.

XII. ACKNOWLEDGMENT

We take this opportunity to express my heartfelt thanks to all those who helped me in the completion of the Project on " **HOMMIE: CONVERSATIONAL AI ASSISTANT**". We would especially like to express my sincere gratitude to **Prof. R. A. GHADAGE** our Guide and **Prof. V. V JAGTAP** HOD Department of Computer Engineering who extended their moral support, inspiring guidance and encouraging independence throughout this task. We are also grateful to **Dr. Y. R. KHARDE**, Principal of Shri chhatrapati Shivaji Maharaj College Of Engineering And Management for his indispensable support, suggestions .

XIII. REFERENCES

[1] Vedant Kulkarni, Shreyas Kallurka, Vipul Waikar, Saurab Patil, Swarupa Deshpande, "Virtual Assistant using Python" May 2022,JETIR.
https://www.jetir.org/view?paper=JETIR2205B23

[2] BonAppetit. Bon App´etit Magazine: Recipes, Cooking, Entertaining, Restaurants | Bon Appetit. URL https://www.bonappetit.com/.

[3] Gobinda G. Chowdhury. Natural language processing. Annual Review of Information Science and Technology, 37(1):51–89, January 2005. ISSN 00664200. doi: 10.1002/aris.1440370103. URL http://doi.wiley.com/10.1002/aris.1440370103.

[4] Piyush Vashishta, Juginder Pal Singh, Pranav Jain, Jitendra Kumar, ³Raspberry PI based voice-operated personal assistant´International Conference on Electronics And Communication and Aerospace Technology, ICECA, 2019.

[5] Piyush Vashishta, Juginder Pal Singh, Pranav Jain, Jitendra Kumar, ³Raspberry PI based voice-operated personal assistant´International Conference on Electronics And Communication and Aerospace Technology, ICECA, 2019.

[6] Dr. Kevin Curran, Dr. Daniel Kelly. Task-based Interaction Chatbot. EEE521 final year project Report school of computing, Engineering & Intelligent System.

[7] Saadman Shahid Chowdury, Atiar Talukdar, Ashik Mahmud, Tanzilur Rahman³Domain specific Intelligent personal assistant with bilingual voice command processing´IEEE 2018.

[8] Yogi Wisesa Chandraa Suyanto (2019) "Indonesian Chatbot of Uni- versity Admission Using a Question Answering System Based on SequencetoSequence Model", 4th International Conference on Computer Science and Computational Intelligence, Elsevier B V, 2019.

International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET)

|e-ISSN: 2319-8753, p-ISSN: 2347-6710| www.ijirset.com | Impact Factor: 8.423| A Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 11, November 2023 ||

| DOI:10.15680/IJIRSET.2023.1211001 |

Smart Trolley and Billing System

Sejal Rajendra Bingi 1, Veda Nandkumar Kashid 2, Nikita Janardan Shirsath 3, Komal Sanjay Shripat 4, Prof. P.S. Kohakade 5

U.G. Student 1-4, Department of computer Engineering, Shri chhatrapati shivaji maharaj college of engineering, Nepti, Ahmednagar, India.

Professor 5, Department of computer Engineering, Shri chhatrapati shivaji maharaj college of engineering, Nepti, Ahmednagar, India.

ABSTRACT: The goal of this project is to improve and enhance the present supermarket cart-based sell and purchase procedure such that it is faster and more effective for both the seller and the customer. Customers now have to wait in lengthy lines at the payment counter during peak hours at their neighbourhood grocery store, standing and waiting for extended periods of time. Customers have found this to be quite problematic, particularly the elderly, people with health concerns, people in a haste, and people who are carrying little children. An RFID scanning system device was mounted to a grocery cart in order to address this issue. This solution is entirely made to speed up the purchasing and checkout processes for customers, saving them time at the payment counter. This study includes a feasibility study, which aims to be an initial assessment of the data to see whether it merits moving further to the analysis stage. Furthermore, Laragon, Node.js, and the Arduino IDE were used to design the system programming. Next, Autodesk Inventor Professional 2019 software was used to create the gadget housing. Regarding its system, it is divided into two sections: one for customers and the other for retailers. The experiment's findings demonstrated how RFID grocery carts shorten customers' shopping and payment processes.

KEYWORDS: **Customer,Development, NodeJs, Recommendation. RFID.**

I. INTRODUCTION

A grocery trolley, also known as a shopping cart, is a wheeled vehicle provided by a store, particularly a supermarket, for customers to use inside the establishment to move goods as they shop and make their way to the checkout counter or cashiers. Depending on the area, the term "wagon," "buggies," or "chariot" may also be used to describe this type of vehicle. They are widely utilized in practically all department stores, superstores that sell bulk goods, and grocery stores. The use of shopping carts is becoming increasingly important since they relieve customers of the stress of carrying large loads of items while navigating the store and enable them to make several, larger-sized, and heavier purchases at once. RFID grocery carts can be utilized in any type of store or supermarket, but they work best in crowded supermarkets at peak hours, on weekends, and during the holiday season when there are a lot of people shopping. It is compatible because RFID grocery carts, which use radio frequency identification (RFID) technology, can cut down on the amount of time customers spend making purchases (especially when paying and checking out), eliminate lengthy lines at checkout counters, and improve the overall shopping experience.

RFID grocery carts are made with the same precise design to function as the modern, traditional shopping carts—that is, to be as strong, practical, and adaptable. To improve the control and mobility of the grocery cart, only minor adjustments are made. Furthermore, as society moves into the Industrial Revolution 4.0 (IR4.0) age, a shopping cart equipped with an RFID technology and system satisfies the requirements for an IR 4.0 component, as it consists of two of the four primary components of IR4.0: cloud computing and the Internet of Things (IoT).

II. RELATED WORK

The literature survey phase is crucial to the system development life cycle because it gathers and gathers the data needed to manage or build a project during this stage. A description of the literature that is pertinent to a given field or topic is called a literature review. It provides a summary of the main points made, the identities of the important authors, the theories and hypotheses that are now in circulation, and the methods and approaches that are

|e-ISSN: 2319-8753, p-ISSN: 2347-6710| www.ijirset.com | Impact Factor: 8.423| A Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 11, November 2023 ||

| DOI:10.15680/IJIRSET.2023.1211001 |

acceptable and beneficial. Research is done in this portion before beginning the project and comprehending the many approaches that have been employed in the past. A thorough examination of the current systems was carried out. The advantages and disadvantages of the current systems were identified with the aid of this investigation.

Given that the project is an application of RFID technology, a review of the literature has been conducted on a few articles pertaining to various components and procedures or techniques. Data has been gathered from these papers in accordance with the project requirements.

People visit supermarkets to make payments and buy the goods they need on a regular basis. Therefore, the total products and total amount must be calculated. Here, self-service is used using RFID tags to cut down on labor costs and wait times. Utilizing Zigbee technology lowers low power consumption, low cost, and low data rate [1].

The goal of this study is to design a system that uses RFID reader antennas to scan both static and dynamic objects in a retail environment. Aisle-level scanning is used in place of performing RFID observations at the level of individual carts [2].

Instead of a barcode scanner, every product in this paper had an RFID tag. An LCD monitor, a Zigbee transmitter, and an RFID reader will be included in the smart trolley. When a goods is placed in the trolley, a scanner scans it and displays the product's pricing on the LCD. Radio frequency identification, or RFID, recognizes and tracks tags affixed to items automatically [3].

Problem Statement: Create a solution that will be economical and shorten the supermarket's billing process. A novel product that improves everyday comfort, ease, and efficiency is one that the public finds acceptable. In large cities, shopping and making purchases at malls has become a daily routine. Individuals buy various goods and load them into the cart. Once purchases are made, payments must be made at the billing counter. There is a lengthy line at the billing counter because the cashier prepares the bill using a bar code reader, which takes a lot of time. Time spent standing and waiting for individual turns can be better spent doing something useful. Finding the goods they need is another issue that the majority of people have. The majority of people are also having trouble learning about the current promotions that are offered for a given product. Shop owners are also quite concerned about potential theft or product take-out, which would result in additional losses.

III. METHODOLOGY

This chapter will provide a more thorough explanation of the steps involved in creating an RFID system for a grocery cart. Software from Laragon, Node.js, and the Arduino IDE were used to design the system's programming. Next, Autodesk Inventor Professional 2019 software was used to design the system enclosure. The project's component and all necessary materials will also be briefly outlined.

A) Assumptions and Dependencies

The objectives of the grocery cart RFID system are:

i. Will address long lines at the counter,

ii. To ensure ease of use and safety,

iii. The consumer's convenience,

iv. To include RFID technology into the purchasing process.

B) User Interface

Application Based Smart shopping cart system.

International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET)

|e-ISSN: 2319-8753, p-ISSN: 2347-6710| www.ijirset.com | Impact Factor: 8.423| A Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 11, November 2023 ||

| DOI:10.15680/IJIRSET.2023.1211001 |

C) Hardware Interfaces:

A thorough analysis of each component and material utilized is necessary to guarantee the production of high-quality products. This is to prevent other types of product errors that could result in new problems and to help design the best solution to the primary issue. The goal of the study in this section is to learn more about the fundamental part of the apparatus that will enable the RFID System Device to function as intended. The following are the parts of the RFID System Device for Grocery Cart:

i. RFID RC522 Module for Arduino
ii. Node MCU Microcontroller
iii. Breadboard 800 Holes
iv. Dupont Jumper Wires M/M
v. RFID Passive Tags
vi. Rechargeable Battery

D) Software Interfaces

1) Arduino IDE Software,
2) Laragon Software and
3) NodeJs Software

E) System Architecture

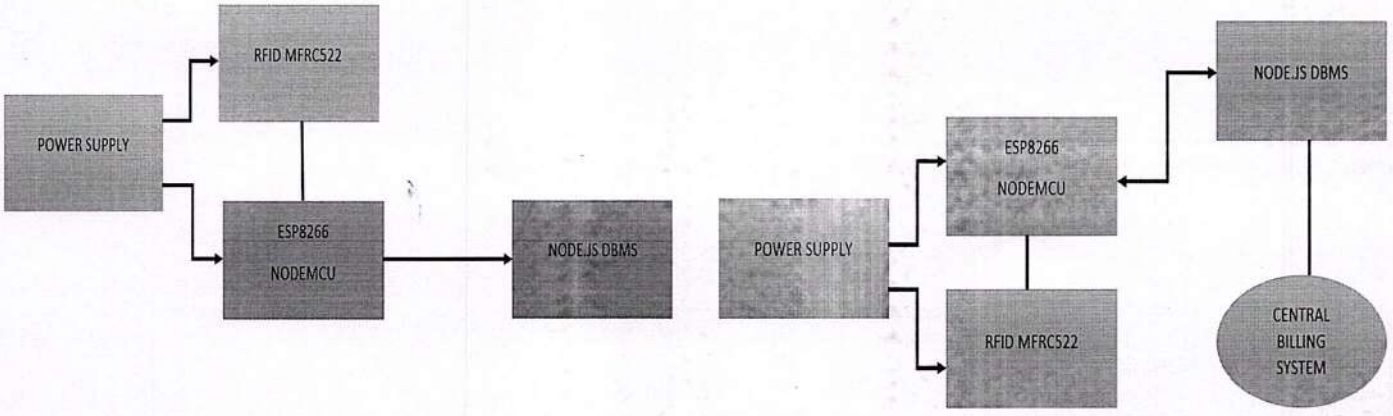


Fig 1 System Architecture: (a) Customer Section (b) Retailer Section

Operational Procedure of RFID System Device for Grocery Cart

Customer Section;

1. Customer enter premises with RFID tags (can also be provide by store retailer).

IJCSPUB.ORG ISSN : 2250-1770

IJCS PUBLICATION (IJCSPUB.ORG)

INTERNATIONAL JOURNAL OF CURRENT SCIENCE (IJCSPUB)

An International Open Access, Peer-reviewed, Refereed Journal

Multi-Classifier Fire And Smoke Detection System Using In Deep Learning

Pratiksha Deshmukh[1], Manasi Dhage[2], Priti Dhiwar[3] , Neha Wadate[4] ,Prof.P.S.Kohakade[5]

[1]Student,Dept Computer Enginnering,Shri Chhatrapati Shivaji Maharaj College Of Engineering,A.nagar
[2]Student,Dept Computer Enginnering,Shri Chhatrapati Shivaji Maharaj College Of Engineering ,A.nagar
[3]Student,Dept Computer Enginnering,Shri chhatrapati Shivaji Maharaj College Of Engineering,A.nagar
[4]Student,Dept Computer Enginnering,Shri chhatrapati Shivaji Maharaj College Of Engineering,A.nagar
Assistant Professor, Computer Engineering, Shri chhatrapati Shivaji Maharaj College Of Engineering,A.nagar

Abstract - *Across the world, there has been a noticeable increase in the occurrence of fires and fire-related disasters. Globally, the frequency of wildfires has surged, and statistics reveal that these wildfires have grown more intense and deadly in recent decades. The rising risk worldwide necessitates the implementation of an effective fire mitigation strategy to combat these phenomena. The first crucial step in prevention and intervention is the prompt and accurate identification of wildfires. Therefore, there is a pressing need for a highly precise and reliable fire identification mechanism. Traditional methods for fire identification heavily rely on complex electronics, which are inefficient and often prone to identification uncertainties. This review provides an overview of efficient approaches to fire identification that have been employed in the past. These techniques have been thoroughly examined to inform our research design, which incorporates Convolutional Neural Networks and Fuzzy Logic. This approach will be further developed in subsequent versions of this paper.*

Key Words: Deep Learning, Multi Classifier, Convolutional Neural Networks, Fuzzy Logic.

1.INTRODUCTION

The discovery of fire by prehistoric civilizations stands as one of humanity's most significant achievements. Primitive humans struggled to comprehend the intricacies of combustion and its control. However, when they mastered the art of managing fire, it led to a profound shift in the course of human history. The ability to cook meals provided a significant boost in nutrition, supporting the growth of larger brain capacities and enabling the pursuit of various activities, including fire mastery. Even in modern times, controlled combustion remains integral to a wide range of applications, from powering our vehicles to generating electricity.

While fire is a powerful and transformative force, it can also be highly destructive when left unchecked. Fire is susceptible to external factors and can rapidly spread under favorable conditions, leading to massive wildfires in hot, dry regions every year. When these wildfires encroach upon populated areas, they can consume vast swathes of forests and cause extensive devastation. Managing such large-scale wildfires is exceedingly challenging. Early detection is crucial to minimizing their impact and reducing the destruction they cause.

Traditional fire detection methods heavily rely on sensors and associated devices that detect smoke or changes in the surrounding temperature. However, these technologies can be expensive due to the cost of sensor arrays, and they are limited in their range. In this context, the concept of fire detection through video monitoring is proposed. Video surveillance can cover expansive areas without the need for complex sensor arrays, making it a more cost-effective and versatile approach.

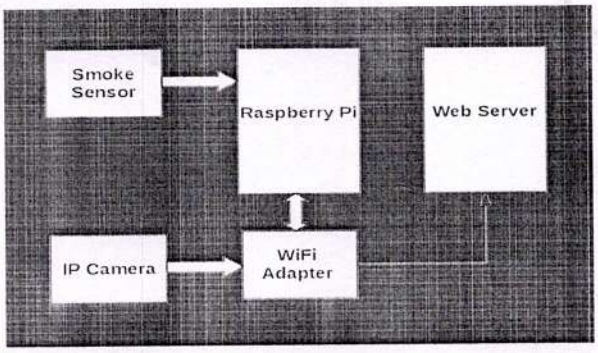
In addition to an efficient fire detection system, this survey also explores the realm of smoke detection. The age-old adage "where there is smoke, there is fire" holds true because smoke is a common indicator of a fire's presence. However, smoke detection has posed challenges, as most conventional techniques have proven unsatisfactory. Addressing this issue is crucial, as smoke detection is a practical and effective method for early fire detection.

This survey thoroughly examines previous research on fire and smoke detection mechanisms, along with the current approaches in use. The analysis has revealed various inconsistencies and shortcomings in existing methods. The methodologies developed in this survey will be further elaborated upon in upcoming research articles on this topic.

The literature survey paper is structured into sections, with Section 2 focusing on the evaluation of prior work in the context of a literature review, and Section 3 providing conclusions and outlining directions for future research.

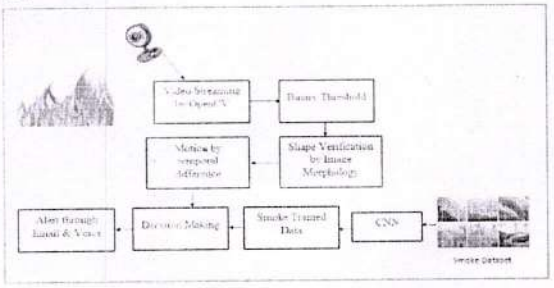
1.1 Existing system

features are extracted from fire photographs before inputs are made. SVMbased on machine learning and CNN-based on deep learning are used to one of the classification strategies. ˆ Experimental evaluations were carried out based on two machine learning methods and deep learning method. ˆ The same data set was used in the two proposed approaches which consisted of (3894) images and the data was divided into the same percentage as well, which was 20% for testing and 80% for training and this was the best percentage after trying all percentages. The CNN deep learning model works efficiently based on a high accuracy of 90%.



1.2 Proposed system

An effective multi-classifier approach for fire detection that identifies the color of the fire, shape of the fire and the movement of the fire, along with the detection of smoke by using the convolution neural network. ˆ This approach has been one of the most effective techniques for the fire detection which is evident through the extensive experimental results that signify the superiority of the proposemulti-classifier and smoke detection approach.



2. literature survey

Y. Xie et al. [1], presents an innovative method for video-based fire detection, which capitalizes on both dynamic features based on motion and flicker analysis, as well as deep static features. Initially, they extract dynamic information by scrutinizing disparities in motion and flicker characteristics between instances of fire and other elements within video recordings. Additionally, authors introduce a groundbreaking approach known as the adaptive lightweight convolutional neural network (AL-CNN) to extract profound static data pertaining to fires. They combine dynamic and static fire characteristics to create a video-based fire detection system that offers superior operational efficiency in terms of accuracy and runtime. To validate the effectiveness of the proposed approach, they assess its precision and computational efficiency on three distinct test datasets. The results clearly demonstrate that their method outperforms current state-of-the-art approaches in the field. Furthermore, the proposed approach has proven its effectiveness in complex video scenarios and on devices with limited computational resources.

The research examined the application of support vector machine and rough set theory in the recognition of fire frames based on image-type data. In practical scenarios, the RS approach has been found to be susceptible to noise and lacks robustness in terms of fault tolerance and generalization. On the other hand, SVM has a high level of resistance to noise and demonstrates great generalization capabilities. The X. Huang et al. [2], has proposed an algorithm for flame recognition using RS-SVM and has developed a classifier for the recognition of fire flame images. In this research, a model utilizing Support Vector Machines (SVM) was constructed. The parameters of the model were optimized to enhance its performance. Additionally, a larger number of feature variables were employed as criteria to represent both static and dynamic characteristics of flames. The research focused on selecting and extracting the most impactful subsets of features. These features, extracted from fire flame images, were then fused together. This approach effectively reduced the amount of training required for flame region recognition and extraction. The numerical value provided is 77960. The experimental findings demonstrate that the fire flame recognition approach achieves a high rate of recognition, rapid speed of recognition, exceptional robustness, and a broad scope of potential applications.

A unique fire detection approach has been devised, employing a combination of deep Long-Short Term Memory (LSTM) neural network and variational autoencoder (VAE). Z. Xu et al. [3], aim was to enhance the efficacy of existing detection technologies. In order to assess the efficacy of the approach, they conducted a series of computer experiments utilizing high-fidelity Large Eddy Simulation (LES) data. These experiments involved the utilization of datasets derived from real-world fires, including blazing, smoldering, and cooking oil fires, as well as non-fire tests. The authors conducted an evaluation and comparison of the performance of the suggested re detection method with several alternative approaches. These alternative methods include the standard Long Short-Term Memory (LSTM) model, the Cumulative Sum (CUSUM) algorithm, the Exponentially Weighted Moving Average (EWMA) technique, as well as two commonly employed fixed-temperature heat detectors with thresholds set at 47°C and 58°C respectively. The findings from both the simulation-based computations and the real-world experiments, both involving re and non-re scenarios, are

3. Methodology

3.1 Algorithm

Algorithm 1 Binary threshold for Fire detection using color component

//Input: V ideoF rame
//Output: F iredetectedimage
1: Start
2: Get Image path.
3: Get Height and width of the Image F (L*W).
4: FOR i=0 to width.
5: FOR j=0 to Height.

6: Get a Pixel at (i, j) as signed integer.
7: Convert pixel integer value to Hexadecimal to get R, G,B.
8: AVG=(R+G+B) /3
9: IF AVG >T (T is Threshold)
10: Pixel at (i,j) is FIRE
11: ELSE
12: Pixel at (i, j) is NOT FIRE
13: End of inner for
14: End of outer for
15: Stop

3.2 Mathematical Model

(A) Set Theory

1. S= {} be as system for Fire Detection
2. Identify Input as S={V1, V2, V3.....Vn}
Where, Vn=Video Frames
S=V
3. Identify F as Output i.e. Fire detection and Alert
S= {Vn, F}
4. Identify Process P
S= {Vn, P, F}
P= {Vf , Ci , Mi , Si , F, CNN , Dm}
Where Vf=Video frame extraction
Ci=Color identification
Mi=Morphology identification
Si=Shape identification and edge Detection
CNN = Convolutional Neural Network
DT = Decision Making
So the final System can be defined as
5. S={Vn, Vf , Ci , Mi , Si , CNN , Dm, F}

(B) Set Description

1. *Video Frame*

Set Vf :
Vf1=Capturing camera content
Vf2=Adding to video track
Vf3=Grab frame content
Vf4= prepare image object

2. *Color identification*

Set Ci :
Ci1 1= Read RGB value in pixel
Ci2 2= Convert into Binary model
Ci3 3= Calculate component difference
Ci4 4=Check for the component rule
Ci5 5= Identify fire pixel

3. *Morphology identification*

Set Mi :
Mi1 1= Get image height and weight
Mi2= Get RGB values of pixel
Mi3= Get the axis distance

,Mi4= Calculate co-axial ratio
Mi5= Create morphological vector

4.Shape identification

Set Si :
Si1 1= Grab a frame in given time
Si2= Calculate RGB values
Si3= Label pixel position and Edge Formation
Si4= Compare pixel position with next frame
Si5=Identify temporal difference

5. Convolutional Neural Network

Set CNN :
CNN0= ROI Extraction
CNN1= First Layer Convolution
CNN2= Fully Connected layer
CNN3= Convolution Rate

6. Decision Making

Set Dm:
Dm0= Crisp values
Dm1=Protocol Setting
Dm2=Protocol Traversing
Dm3=If-then Rules
Dm4=Fire and Smoke Identification

(C) *Representation of SETS and its operation*

1. Union Representation
A. Set Vf = {Vf1, Vf2, Vf3, Vf4}
Set Ci = {Ci0, Ci2, Ci3, Ci4, Ci5}
Set (VfUCi) = {Vf1, Vf2, Vf3, Vf4UCi0, Ci2, Ci3, Ci4, Ci5}

B. Set Mi = {Mi0, Mi1, Mi2, Mi3, Mi4, Mi5}
Set (VfUCiUMi) = {Vf1, Vf2, Vf3, Vf4UCi0, Ci2, Ci3, Ci4, Ci5UMi0, Mi1, Mi2, Mi3, Mi4, Mi5}

Set Si = {Si0, Si1, Si2, Si3, Si4, Si5}
Set (VfUCiUMiUSi) = {Vf1, Vf2, Vf3, Vf4UCi0, Ci2, Ci3, Ci4, Ci5UMi0, Mi1, Mi2, Mi3, Mi4, Mi5USi0, Si1, Si2, Si3, Si4, Si5}

D. Set CNN = {CNN0, CNN1, CNN2, CNN3, CNN4, CNN5} Set (VfUCiUMiUSiUCNN) = {Vf1, Vf2, Vf3, Vf4UCi0, Ci2, Ci3, Ci4, Ci5UMi0, Mi1, Mi2, Mi3, Mi4, Mi5USi0, Si1, Si2, Si3, Si4, Si5UCNN0, CNN1, CNN2, CNN3, CNN4, CNN5}

E. Set Dm = {Dm0, Dm1, Dm2, Dm3, Dm4, Dm5}
Set (VfUCiUMiUSiUCNN UDm) = {Vf1, Vf2, Vf3, Vf4UCi0, Ci2, Ci3, Ci4, Ci5UMi0, Mi1, Mi2, Mi3, Mi4, Mi5USi0, Si1, Si2, Si3, Si4, Si5UCNN0, CNN1, CNN2, CNN3, CNN4, CNN5UDm0, Dm1, Dm2, Dm3, Dm4, Dm5} 2. Venn Diagram

3. CONCLUSIONS

Extensive research has been conducted to thoroughly investigate the video-based methodology for fire detection. This study has meticulously examined various techniques relevant to the development of our approach. Recognizing the significance of fire detection as a critical asset, the utilization of computerized surveillance technologies, such as intrusion detection systems, for identifying flames and smoke has garnered significant attention in recent years. Traditional fire detection systems primarily rely on sensors that measure specific fire characteristics, but they often exhibit a delay in identifying the presence of fire. This delay can be a significant drawback, as it may allow the fire to escalate into a catastrophic blaze, resulting in extensive property damage. To address this issue, our approach leverages Convolutional Neural Networks and Fuzzy logic for fire detection through computer vision. Further details on this innovative technique will be explored in upcoming studies on the subject.

In the future the proposed model can be implemented on the satellite images to identify the wild fire in the forest.

REFERENCES

[1] Y. Xie et al., "Efficient Video Fire Detection Exploiting Motion-Flicker-Based Dynamic Features and Deep Static Features," in IEEE Access, vol. 8, pp. 81904-81917, 2020, DOI: 10.1109/ACCESS.2020.2991338.

[2] Chen, Ke et al. "Research on Image Fire Detection Based on Support Vector Machine." 2019 9th International Conference on Fire Science and Fire Protection Engineering (ICFSFPE) (2019).

[3] Z. Xu, Y. Guo and J. H. Saleh, "Advances Toward the Next Generation Fire Detection: Deep LSTM Variational Autoencoder for Improved Sensitivity and Reliability," in IEEE Access, vol. 9, pp. 30636-30653, 2021, DOI: 10.1109/ACCESS.2021.3060338.

[4] J. Zhang, H. Zhu, P. Wang and X. Ling, "ATT Squeeze U-Net: A Lightweight Network for Forest Fire Detection and Recognition," in IEEE Access, vol. 9, pp. 10858-10870, 2021, DOI: 10.1109/ACCESS.2021.3050628.

BIOGRAPHIES (Optional not mandatory)

1'st Author Photo	Description about the author1 (in 4-6 lines)
2nd Author Photo	Description " "
3rd Author Photo	Description " "
4th Author Photo	Description " "

International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 05 | May - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

Pothole and Road Hump Detection using Deep Learning

Sukeshini Chemate, SCSMCOE Engineering College, Nepti, Ahmednagar,
Shubhangi Ghongade, SCSMCOE Engineering College, Nepti, Ahmednagar,
Gaurav Nawale, SCSMCOE Engineering College, Nepti, Ahmednagar,
Prof.Pallavi Kohakade, SCSMCOE Engineering College, Nepti, Ahmednagar

Abstract **— Every vehicle, whether manual or automatic, relies on the quality of the roads they travel on to reach their destination safely. Damage to vehicles and even death can result from imperfections in the road, such as speed bumps and potholes. Consequently, accidents and vehicle damage can be lessened by identifying and describing these outliers. Due to large quantities of duplicated data and significantly polluted measurement noise, street photographs are inherently multivariate, making the identification of street irregularities more challenging. Using a YOLO Deep learning model, this research provides automated color image processing of road potholes from video frames or smartphone images. In order to make training and usage go more smoothly, a lightweight architecture was selected. It has seven interwoven layers that work together well. With no scaling at all, each and every pixel of the source image is utilized. To acquire the maximum amount of data possible, we employed the standard stride and pooling processes. Because of this, the created model can detect potholes better and warn drivers to be careful. The proposed method gathers vital data for pothole detection by reviewing previous studies in this area.**

Keywords: *Deep learning model, YOLO neural network, Pothole detection, Road hump detection.*

I. INTRODUCTION

Worldwide, poor road conditions are a major contributor to accidents, but distracted driving, speeding, and other driver mistakes also play a major role. Flooding, rain, damages (e.g., from overloaded large vehicles), and lack of physical maintenance are only a few of the many reasons why a road might become unsafe. When evaluating the state of a road, it is important to look for and identify specific signs of surface distress, such as cracks, potholes, or changes in texture, that warrant repair. Being traffic-relevant is the defining characteristic of macro-scale road characteristics. As an additional traffic-relevant feature, speed bumps necessitate identification in order to facilitate driver assistance.

In the context of road hardship, a pothole is unique. The road's geometry is determined arbitrarily, and its exact "border" is usually impossible to determine. we can give them a general idea, but we can be more specific about how deep they go. Cars, people, cyclists, dogs, and cats all have clearly defined shapes that can be identified using deep learning's appearance properties. In contrast, a pothole's complex geometric structure and random shape make it a difficult object-detection task.

Automated systems have emerged in many different industries in recent years, and technology has been crucial to their development. Life has gotten much easier for humans since the introduction of autonomous technology. A lot of good has come out of automating transportation and surveillance systems. When it comes to transportation, highways are crucial because they make up the largest network. Autonomous systems must operate without endangering their users, and potholes are a major problem for transportation networks on roads. There were 4,869 fatal incidents in 2015 due to potholes, according to official statistics given by the Indian government. This highlights the critical nature of keeping roads in good repair.

The COVID-19 epidemic has hit the globe hard. Road maintenance is one of several industries hit hard by the lockdowns. Road conditions have worsened as a result of this. Therefore, a system that can monitor road conditions autonomously is needed. This research presents a method for pothole identification and dimension estimate that utilizes Deep Learning and Image Processing. There have been a slew of new object detection methods created recently that rely on Convolutional Neural Networks to glean features. The YOLO (You Only Look Once) principleis suggested as a method for detecting potholes in this article. Intersection over Union (IoU) and mean average precision (mAP) are used to evaluate the outcomes after training multiple iterations of the YOLO algorithm using a bespoke dataset that includes both dry and waterlogged craters of different shapes and sizes. With respectable precision, the model can identify numerous types of potholes. In addition, the suggested pothole size estimator, which is based on image processing, uses triangular similarity to provide somewhat precise dimensions of the discovered potholes, significantly lowering the total time needed for road maintenance.

. [1] In this paper, P. A. Chitale et al. hope to lessen the reliance on human labor for road maintenance, particularly in the event of a pandemic. The study demonstrates that in terms of accurate pothole detection, the YOLOv4 based model performs better than the YOLOv3 based model. Pothole dimensions are computed with high precision and a significantly low error rate. As YOLOv4 improves its IoT, it offers an accurate estimate of the potholes' proportions. Subsequent efforts will involve expanding the system to include surveillance vehicles so that exact automated road condition monitoring is possible. Additionally, a GPS module would be installed in these surveillance trucks so that the precise location of the potholes could be noted. The estimated dimensions of the potholes would be useful in determining the amount of road damage as well as the amount of raw materialsneeded to fill them. As a result, most planning and inspection can be completed remotely.

[2] A. Fox along et al. Explains With the increasing ubiquity of smart automobiles, it is now possible to identify environmental road elements (potholes, road inclination angle, etc.) from embedded sensor data. Crowdsourcing can be used to more accurately detect environmental information by combining data from several cars. The author focuses on locating and identifying potholes on multi-lane roads using such data. Undersampling sensors, sensor mobility, asynchronous sensor operation, sensor noise, vehicle and road heterogeneity, and GPS position error make it difficult to extract information from aggregated vehicle data. Since GPS position error is typically greater than standard lane widths, it is especially problematic in multi-lane situations. In this study, the authors look into these problems and create a crowdsourced system that uses accelerometer data from embedded vehicle sensors to locate potholes in multi-lane situations.

[3] The techniques described by A. Dhiman et al. for identifying potholes on road surfaces are intended to helpoffline data gathering for road maintenance or real-time control of a vehicle (for driver assistance or autonomous driving) by providing strategies for the offline or real-time detection of potholes. For these reasons, pothole detection techniques have been thoroughly investigated in studies conducted globally. This report divides developed strategies into multiple categories after providing a quick overview of the area. Next, author showcase the author's contributions to this subject by putting tactics for pothole identification that are automatically detected into practice. The author constructed two models for deep learning-based pothole detection and researched and produced two methods based on stereo-vision analysis of road conditions ahead of the car. These four created strategies are evaluated experimentally, and specific advantages of these methods are concluded.

Section 2 of this paper reviews relevant prior work, whereas Section 3 describes in depth the current implementation of the idea utilizing the phrase proposed technique. Examine the outcomes in Section 4 of the Results and Discussions section. This study endeavor concludes withthe conclusions and future scope contained in section 5.

II RELATED WORKS

[4] B. Hosking et al. explain One of the most crucial parts of road maintenance is finding potholes. Generally speaking, computer vision techniques are predicated on either 3D road surface modeling or 2D road image analysis. These two groups are, nevertheless, always applied separately. Additionally, the precision of pothole detection is still far fromacceptable. As a result, the authors of this work provide a reliable pothole detecting technique that is effective in terms of computing. Initially, a detailed disparity map is created to help distinguish between sections of damaged and undamaged roads. Golden section search and dynamic programming are used to estimate the transformation parameters in order to obtain higher disparity transformation efficiency. The possibleundamaged road areas are then extracted from the altered disparity map using Otsu's thresholding technique. Using least squares fitting, the differences in the extracted areas are represented by a quadratic surface.

[5] An effective stereo vision-based road surface 3-D reconstruction and pothole detection system was demonstratedby R. Fanet al. The PT algorithm [4] was originally made more broad by the author by using the stereo rig roll angle in the PT parameter calculation procedure. The potholes were clearly visible from the intact road surface thanks to DT. The modified discrepancies were clustered by SLIC into a set of super pixels. Ultimately, by identifying the super pixels—pixels with values below an adaptive threshold established by k-means clustering—potholes were found. Using an RTX 2080 Ti GPU, the suggested pothole detecting method was constructed using CUDA. The experimental findings demonstrated the 98.7% successful detection rate and 89.4% F-score that the author's method is capable of achieving.

[6] According to Dharneeshkar J. et al., When compared to other item detections, such human, automobile, airplane, and so forth, pothole detection is distinct. Potholes are not shaped like other objects are. It is harder to detect as a result. Because of the aforementioned constraint, it is challenging to increase the mean average precision for pothole identification. This research uses different versions of YOLO to train a newly produced dataset of 1500 images. Furthermore, appropriate architectural modifications improve the mean average precision. In the future, a raspberry pi with a camera will be used to implement the system in real-time in a car's dashboard.The road repair crew can greatly benefit from the system's ability to trace the position of potholes that are recognized thanks to an inbuilt GPS.

[7] The pothole detection system, which has excellentaccuracy and enhances the bounding box's precision for

pothole representation, was proposed by C.-W. Kuan et al. and improved the deep reinforcement learning-based pothole avoidance system, which is capable of successfully avoiding potholes. Furthermore, these systems may be operated in real time and are installed on an energy-efficient edge platform.

[8] Extracting accurate features from the input image is the first stage in creating a successful machine learning model for image segmentation, according to H. K. I. S. Lakmal et al. The research that is being presented focuses on the application of computer vision as a driver aid device for water-filled pothole detection. In order to identify the water surfaces and segment the water region in an input image, this study presents a number of different attributes. In addition, the author trained a model for the segmentation of the water surface using the Random Forest Classifier and ranked features. Authors were able to get testing accuracy of 0.877 and training accuracy of 0.998 with the suggested design.

[9] M. Omar et al. explain how the YOLOv4 algorithm, which is based on deep learning, is the primary tool used in the Intelligent Transport system paradigm for pothole detection. This work achieves an average IoU of 38.38% by training a dataset of roughly 200 photos for pothole identification. Video samples are also successfully used to detect potholes using the trained model based on picture datasets. This idea may be usedin the future by the auto industry and road maintenance organizations to identify different types of road damage.

[10] In order to enable autonomous driving under unstructured road conditions, M. Rasib et al. introduce a unique pipeline com binning deeplabV3 based road region recognition and steering angle estimation mechanism for the self-driving automobile. To accomplish the generalization, the author also created a sizable road-based dataset with 15,000 photos and pixel-by-pixel annotations. After that, using a dataset that they had created themselves, the author conducted tests to assess the performance of the suggested pixel level segmentation road identification and steering angle estimation approach. As a result, the technique the author has suggested improves the ability of level-5 autonomous vehicles to maneuver in unstructured road environments without lane lines or in areas where they have faded over time.

[11] According to A. A. Alhussan et al., An essential component of traffic intelligence implementation is the self-driving car. The safety and comfort of self-driving cars are significantly impacted by the smoothness of the road in front of them. Potholes in the roadway can cause a number of issues, such as crashes and vehicle damage. As a result, autonomous vehicles ought to have the ability to adjust their driving style in response to the real-time identification of potholes in the road. This issue is being addressed in a number of ways, such as by reporting findings to the relevant authorities, utilizing vibration-based sensors, and 3D laser imaging. However, these approaches were limited by issues including high setup costs and the risk of detection. As a result, the identification of potholes must be done quickly and precisely by automation. This work presents a novel approach for feature selection and optimization of the random forest (RF) classier, based on adaptive mutation and dipper throated optimization (AMDTO).

[12] Storytelling by D. Chen et al. For smart cities, vehicle- road collaboration is crucial, and one of the key pillars of this collaboration is the detection of potholes. Road pothole detection accuracy has increased recently due to advancements in mapping and surveying technologies. Unfortunately, the convenience of use and real-time observation capabilities of the historical detection technologies prevent the timely mapping of potholes in the road. The author suggested a reflectometry method with vibration signal analysis and spatial-temporal trajectory fusion to provide real-time pothole spotting in order to address this important problem. The author went on to construct a number of prototype gadgets for testing. These prototype devices use geminal processing and spatiotemporal formation fusion. They measure the acceleration signal that is mounted on the wheel steering lever.

[13] A novel virtual environment was created by J.-C. Tsai et al. to train pothole identification. The author's system incorporates a number of contemporary VR and simulation techniques, such as deep learning interface, 3D modeling, VR simulation, and automobile simulation. The author proved thatvirtual images can in fact improve the accuracy of a realpothole detector through a series of tests done on real pothole datasets. under subsequent study, the author plans to experiment with deep reinforcement learning using Carim and train an artificial intelligence agent to automatically modify the suspension system of a car under a variety of weather and road situations.

[14] B.-h. Kang et al. created a pothole detecting system with a camera and 2D LiDAR. A large portion of the road surface can be more precisely scanned by employing two LiDARs. The author then created an algorithm for detecting potholes that included line extraction, gradient of data function, filtering, and clustering. The pothole detecting system's error rate provides insight on the system's developed performance. The author also demonstrated how 2D LiDAR may be usedfor 3D pothole detection. When 2D LiDAR and video data are integrated, pothole identification utilizing the combined data performs more accurately.

[15] According to M. Omar et al., the YOLOv4 algorithm, which is based on deep learning, is the primary tool used in the Intelligent Transport System paradigm for pothole detection. This work achieves an average IoU of 38.38% by training a dataset of roughly 200 photos for pothole identification. Video samples are also successfully used to detect potholes using the trained model based on picture datasets. This idea may be used in the future by the auto industry and road maintenance organizations to identify different types of road damage.

III PROPOSED METHODOLOGY

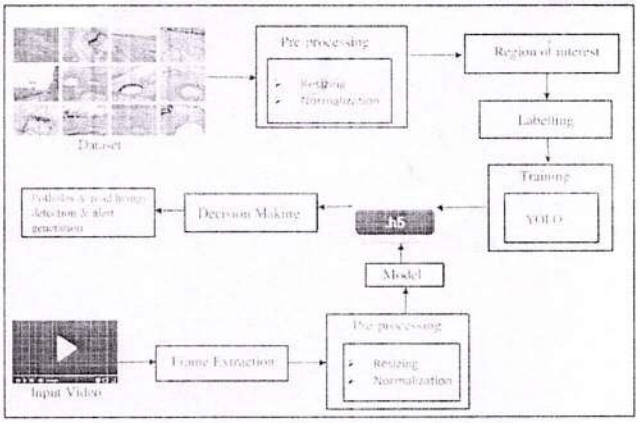


Figure 1: Overview of the proposed model

The method that has been proposed to successfully implement Yolov8's pothole detection capabilities is shown in figure 1. What follows is a detailed description of the many stages that make up the offered method.

Step 1: YOLO V8 Pothole Image Training — In order to successfully identify the pothole in the image, the system is using the image. In order to generate an alert, the initial phase of the approach is to identify the pothole in the image. In order to successfully identify potholes, the pothole identification module employs the Yolov8 method. Prior to using this model for pothole recognition, it must be trained.

Downloading the roboflow dataset and installing the Yolov8 model's ultralytics are the first steps in the training process. To link Roboflow to your API key, go to https://public.roboflow.com/object-detection/pothole and get the dataset for pothole recognition. It efficiently scans the downloaded dataset to retrieve the directory's file list. After that, we may find out how many files are in the directory by using the file list. In all, 465 files will be used for training purposes. After sorting the files alphabetically, the 46 files are transferred to the destination directory and jumbled. Recalculating the number of files in the directory yields 419 for training and 179 for the other directory.

We can start the yolov8 model for the yolo object identification challenge after you've successfully integrated the roboflow data and effectively shuffled the potholes dataset. With a batch size of 32 and an image size of 640, the detection model is trained for 200 epochs using the trained weights. After training the yolov8 model, the project runs are saved as a zip file in the provided directory.

A Convolutional Neural Network (CNN) variant, the YOLOv8 is its offspring. It achieves object identification with improved accuracy by using the CNN technique components in a unique and effective manner. To prevent overfitting and regularize the model, the Yolo design uses 24 convolutional layers with different parameters, a max pooling layer, and a number of dropout and batch normalizations. Two fully connected layers are the model's apex.

The channels are max-pooled after the first convolutionallayers decompose and reduce them; the kernel size is 2x2 andthe stride is 2. All of the model's layers use the same maxpooling algorithm. To handle the increase in data, the kernelsizes of the succeeding convolutional layers get progressivelylarger. This layer architecture makes use of the ReLUactivation function. With the exception of the fully connectedlayers, which use a linear activation function to generate the.ptfile—Yolo8's trained data file—all of the layers' activationfunctions are same. In the following steps, this.pt file will beutilized to notify the presence of the pothole. The sameprocedure is applied on the road humps dataset also which isobtained from the URL https://universe.roboflow.com/detection-system/humps- bumps-potholes-detection/dataset/8. Table 2 provides detailsabout the Yolov8 model.

S. no	Layer Type	Parameters
1	Convolutional Layer	7x7x64 Stride-2
2	Maxpool Layer	2x2 Stride 2
3	Convolutional Layer	3x3x192
4	Maxpool Layer	2x2 Stride 2
5	Convolutional Layer	1x1x128
6	Convolutional Layer	3x3x256
7	Convolutional Layer	1x1x256
8	Convolutional Layer	3x3x512
9	Maxpool Layer	2x2 Stride 2
10	Convolutional Layer	1x1x256
11	Convolutional Layer	3x3x512
12	Convolutional Layer	1x1x256
13	Convolutional Layer	3x3x512
14	Convolutional Layer	1x1x256
15	Convolutional Layer	3x3x512
16	Convolutional Layer	1x1x256
17	Convolutional Layer	3x3x512
18	Convolutional Layer	1x1x512
19	Convolutional Layer	3x3x1024
20	Maxpool Layer	2x2 Stride 2
21	Convolutional Layer	1x1x512
22	Convolutional Layer	3x3x1024
23	Convolutional Layer	1x1x512
24	Convolutional Layer	3x3x1024
25	Convolutional Layer	3x3x1024
26	Convolutional Layer	3x3x1024 Stride 2
27	Convolutional Layer	3x3x1024
28	Convolutional Layer	3x3x1024
29	Fully Connected Layer	
30	Fully Connected Layer	

Figure 2: Model Summary for YOLOv8

Step 2: Testing the model for pothole: Here, we've provided the video input for the pothole and are extracting frames to feed in real-time. To find the pothole in the live streaming frames, we use the trained model file.pt. We get their upper left rectangular locations from this file. At this vantage point, we can see the frames' stability being monitored; we can also see the red and white markings of road humps and potholes. The confidence values of red potholes imply that they are more extensive, while those of white potholes indicate that they are shallower.

IV RESULTS AND DISCUSSIONS

To test the developed model, we use a Windows PC withan Intel (n
expresses the confusion matrix's accuracy score parameter, which is uti d
Road humps. The followingequation shows the values of Precision and F

$$\text{Precision}(P) = \frac{TP}{TP + FN} \quad -(1)$$

$$\text{Recall}(R) = \frac{TP}{TP + FP} \quad -(2)$$

Here, TP is True positive cases, TN is True Negative cases, FPis False positive cases and FN is False Negative cases. Below we can see the precision and Accuracy graphs that we obtained during the process of training the model in figure 3 and 4 along with the snaps of obtained results in figure 5 and6.

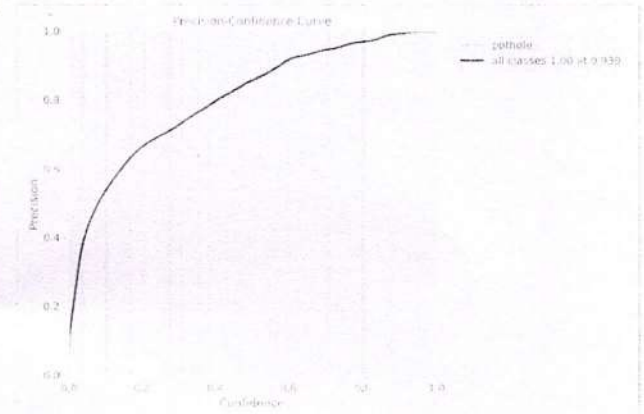


Figure 3: Precision Curve

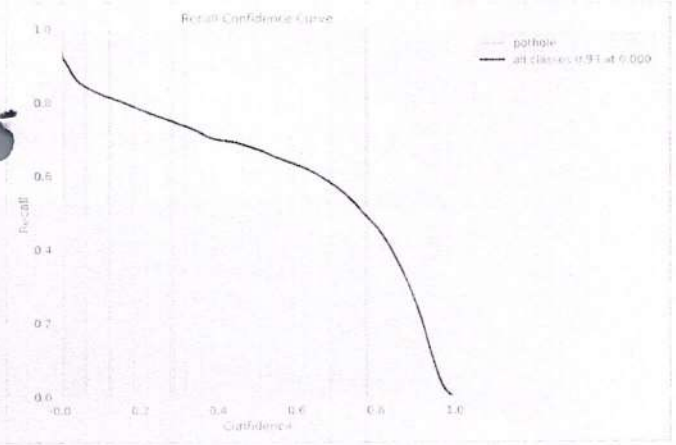


Figure 4: Recall Curve

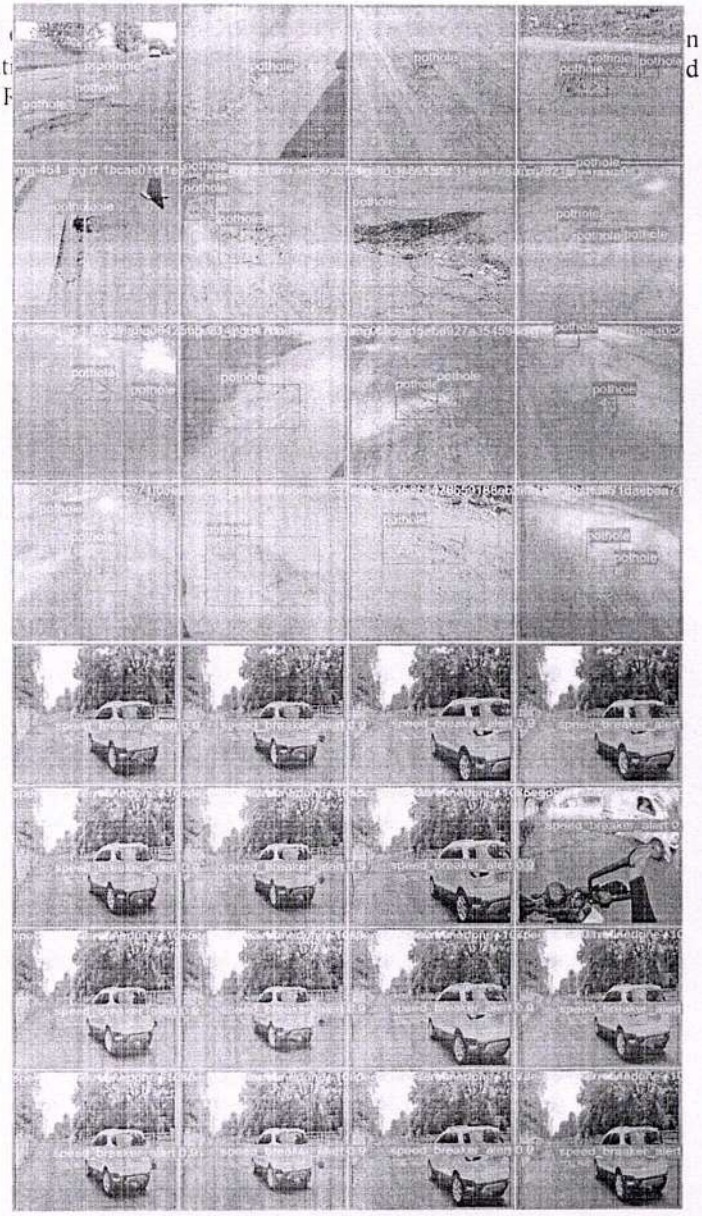


Figure 5: Obtained results for Road humps detection

The obtained graphs in figure 3 and 4 indicates that system is yielding good precision of almost 100% and recall of 93%, this eventually indicates the model is deployed in best way to detect potholes and road humps.

V. CONCLUSION AND FUTURE SCOPE

In order to train the YOLO model, the first step of the process is to realize the input dataset. Following its creation, the dataset will undergo shuffling program. The input images are resized and normalized by the YOLO module to expedite the training of the neural network model. After they've been preprocessed, these images are utilized to assess potential areas of interest that can be labeled to extract potholes from the original images. Prior to providing the model with the images to train on, they will be efficiently tagged with the regions of interest. Training is taking place on the YOLO network, while testing is taking place in real-time input video to detect the potholes and road humps efficiently. Less dense potholes and road humps are denoted as white color, on the other hand bit heavy potholes and road humps are shown in red color to distinguish both of them clearly.

A future expansion of the system will include surveillance cars, allowing for precise autonomous road condition monitoring. Additionally, these monitoring vehicles would have GPS modules installed so that they could pinpoint precisely where the potholes and roadhumps were. By estimating the sizes of the holes, we can estimate the amount of road damage and the quantity of raw materials needed to repair the potholes. As a result, most inspections and planning may be done remotely.

REFERENCES

[1] P. A. Chitale, K. Y. Kekre, H. R. Shenai, R. Karani and J. P. Gala, "Pothole Detection and Dimension Estimation System using Deep Learning (YOLO) and Image Processing," 2020 35th International Conference on Image and Vision Computing New Zealand (IVCNZ), Wellington, New Zealand, 2020, pp. 1-6, doi: 10.1109/IVCNZ51579.2020.9290547.

[2] A. Fox, B. V. K. V. Kumar, J. Chen and F. Bai, "Multi-Lane Pothole Detection from Crowdsourced Undersampled Vehicle Sensor Data," in IEEE Transactions on Mobile Computing, vol. 16, no. 12, pp. 3417-3430, 1 Dec. 2017, doi: 10.1109/TMC.2017.2690995.

[3] A. Dhiman and R. Klette, "Pothole Detection Using Computer Vision and Learning," in IEEE Transactions on Intelligent Transportation Systems, vol. 21, no. 8, pp. 3536-3550, Aug. 2020, doi: 10.1109/TITS.2019.2931297.

[4] R. Fan, U. Ozgunalp, B. Hosking, M. Liu and I. Pitas, "Pothole Detection Based on Disparity Transformation and Road Surface Modeling," in IEEE Transactions on Image Processing, vol. 29, pp. 897-908, 2020, doi: 10.1109/TIP.2019.2933750.

[5] R. Fan, U. Ozgunalp, Y. Wang, M. Liu and I. Pitas, "Rethinking Road Surface 3-D Reconstruction and Pothole Detection: From Perspective Transformation to Disparity Map Segmentation," in IEEE Transactions on Cybernetics, vol. 52, no. 7, pp. 5799-5808, July 2022, doi: 10.1109/TCYB.2021.3060461.

[6] D. J, S. D. V, A. S A, K. R and L. Parameswaran, "Deep Learning based Detection of potholes in Indian roads using YOLO," 2020 International Conference on Inventive Computation Technologies (ICICT), Coimbatore, India, 2020, pp. 381-385, doi: 10.1109/ICICT48043.2020.9112424.

[7] C. -W. Kuan, W. -H. Chen and Y. -C. Lin, "Pothole Detection and Avoidance via Deep Learning on Edge Devices," 2020 International Automatic Control Conference (CACS), Hsinchu, Taiwan, 2020, pp. 1-6, doi: 10.1109/CACS50047.2020.9289701.

[8] H. K. I. S. Lakmal and M. B. Dissanayake, "Pothole Detection with Image Segmentation for Advanced Driver Assisted Systems," 2020 IEEE International Women in Engineering (WIE) Conference on Electrical and Computer Engineering (WIECON-ECE), Bhubaneswar, India, 2020, pp. 308-311, doi: 10.1109/WIECON-ECE52138.2020.9398036.

[9] M. Omar and P. Kumar, "Detection of Roads Potholes using YOLOv4," 2020 International Conference on Information Science and Communications Technologies (ICISCT), Tashkent, Uzbekistan, 2020, pp. 1-6, doi: 10.1109/ICISCT50599.2020.9351373.

[10] M. Rasib, M. A. Butt, F. Riaz, A. Sulaiman and M. Akram, "Pixel Level Segmentation Based Drivable Road Region Detection and Steering Angle Estimation Method for Autonomous Driving on Unstructured Roads," in IEEE Access, vol. 9, pp. 167855-167867, 2021, doi: 10.1109/ACCESS.2021.3134889.

[11] A. A. Alhussan, D. S. Khafaga, E. -S. M. El-Kenawy, A. Ibrahim, M. M. Eid and A. A. Abdelhamid, "Pothole and Plain Road Classification Using Adaptive Mutation DipperThroated Optimization and Transfer Learning for Self Driving Cars," in IEEE Access, vol. 10, pp. 84188-84211, 2022, doi: 10.1109/ACCESS.2022.3196660.

[12] D. Chen, N. Chen, X. Zhang and Y. Guan, "Real-Time Road Pothole Mapping Based on Vibration Analysis in Smart City," in IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, vol. 15, pp. 6972-6984, 2022, doi: 10.1109/JSTARS.2022.3200147.

[13] J. -C. Tsai, K. -T. Lai, T. -C. Dai, J. -J. Su, C. -Y. Siao and Y. -C. Hsu, "Learning Pothole Detection in Virtual Environment," 2020 International Automatic Control Conference (CACS), Hsinchu, Taiwan, 2020, pp. 1-5, doi: 10.1109/CACS50047.2020.9289740.

[14] B. -h. Kang and S. -i. Choi, "Pothole detection system using 2D LiDAR and camera," 2017 Ninth International Conference on Ubiquitous and Future Networks (ICUFN), Milan, Italy, 2017, pp. 744-746, doi: 10.1109/ICUFN.2017.7993890

IJCSPUB.ORG ISSN : 2250-1770

IJCS PUBLICATION (IJCSPUB.ORG)

INTERNATIONAL JOURNAL OF CURRENT SCIENCE (IJCSPUB)

An International Open Access, Peer-reviewed, Refereed Journal

E-voting System Using Blockchain

[1]Ram Danave, [2]Aniket Dalvi, [3]Pratik Bansode , [4]Sudam Ghavate, [5]Prof. Neeta Gade

[1,2,3,4]Student,Shri Chhatrapati Shivaji Maharaj College of Engineering,
[5]Prof, Shri Chhatrapati Shivaji Maharaj College of Engineering,
[1]Department Of Computer Engineering,
[1] Shri Chhatrapati Shivaji Maharaj College of Engineering, Ahmednagar,India

Abstract

Web-based online voting is a trend that is gaining momentum in modern society. It has great potential to decrease organisational costs and increase voter turnout. It eliminates the need to print ballot papers or open polling stations, voters can vote from [illegible] an Internet connection. Despite these benefits, online voting solutions are viewed [illegible] of caution because they introduce new threats. A single vulnerability can lead to [illegible]ipulations of votes. Electronic voting systems must be legitimate, accurate, safe, and convenient when used for elections. Nonetheless, adoption may be limited by potential problems associated with electronic voting systems. Blockchain technology came into the ground to overcome these issues and offers decentralized nodes for electronic voting and is used to produce electronic voting systems mainly because of their end-to-end verification advantages. This technology is a beautiful replacement for traditional electronic voting solutions with distributed, non-repudiation, and security protection characteristics. The most often mentioned issues in blockchain applications are privacy protection and transaction speed. For a sustainable blockchain-based electronic voting system, the security of remote participation must be viable, and for scalability, transaction speed must be addressed.

Keywords: e-Voting, Secure, Blockchain, Decentralized, Encryption, Consensus, Peer-to-Peer, Wallets, Smart contracts, Ethereum.

Introduction

Voting can whether conducted through the traditional ballot or via electronic means forms the basis on which democracy depends. With therise in technological impact on the youth of the country and the various anomalies faced by the current electoral process, using technology to modify the existing process is necessity of the hour. However, for any new technique to take the place of current voting system, the said system needs to satisfy certain minimum criteria.

Electronic Voting has taken centre place in research with the intention of minimizing thecost associated in setting up the voting process, while ensuring the electoral integrity is maintained by fulfilling privacy, security, and compliance requirements.

The current method ,whether electronic or not has proved to be unsatisfactory with respect to transparency[1]. It can be very difficult for the voters to be assured that the vote he/she hascasted during the election reflects in the election result. Electronic voting using Direct Recording Electronic do not generate receipt on successful casting of votes. No record of election except vote count is made public by the government, which means that the voters are not assured of any external interference in case of government

conducting the process of vote recounting.Replacing the traditional method with electronic method using Blockchain techniquecould prevent potential frauds that may take place during election.

Blockchain technology is a distributed network of interconnected nodes. A copy of distributed ledger is assigned to each node, each of which contains a complete history of all the transactions that have been processed by the network[2]. Each transaction processed generated a hash. The hash created depends not only on the current transaction but also on the hash of the previous transaction. Thus, any smallchange on the data will impact the hash of the transaction. If a transaction is approved by most nodes it is written to the block. This allows the users to remain autonomous while using the system. A basic analysis of Blockchain suggests that it provides the potential of making the voting process more secure and reliable.

A blockchain, originally block chain, is a growing list of records, called blocks, that are linked using cryptography. Each block containsa cryptographic hash of the previous block, a timestamp, and transaction data (generally represented as a Merkle tree).

By design, a blockchain is resistant tomodification of the data. It is "an open, distributed ledger that can record transactions between two parties efficiently and in a verifiable and permanent way". For use as a distributed ledger, a blockchain is typically managed by a peer-to-peer network collectively adhering to a protocol for inter-nodecommunication and validating new blocks. Oncerecorded, the data in any given block cannot be altered retroactively without alteration of all subsequent blocks, which requires consensus of the network majority. Although blockchain records are not unalterable, blockchains may be considered secure by design and exemplify a distributed computing system with high Byzantine fault tolerance. Decentralized consensus has therefore been claimed with a blockchain.

Objective

In this current paper we shall present how the blockchain technology can overcome, improve, and make the e-voting system efficient than ever.Blockchain voting is like analogue voting that we're used to. The same concepts and processes apply. To cast a digital vote, a citizen would need to register and prove their citizenship in each jurisdiction. We could then record that identity and citizenship on the blockchain associated with that user's key.

Next, a citizen needs a ballot to cast a vote. Inthe blockchain, this would likely take the formof a special voting token that would be depositedin the user's account. This token would also likely have a time limit in which it could be used to vote, after which it would burn itself via a smart contract or become useless.

Casting a vote on the blockchain would involve sending the voting token (the ballot) to a specific address. Voters would know which address aligns with which candidate or referendum. Sending a token to that address would representa vote.

Technically, that sounds simple enough. The vote gets registered on the blockchain where its immutable, verifiable, and transparent. We can easily count the votes to declare a winner to the election. In addition, we can build nice user interfaces that automate and hide the process of sending a token to a specific address. Instead, voters would see a simple online interface for them to select a candidate or proposal and click submit.

Related Work

As Bruce Schneier describes it, technology adds more steps to the process and thus increases the possibility of error with each additional step, all of which are largely unseen by the voter. Put Murphy's Law of 'whatever can go wrong, will go wrong' into play, and one can surmise that technology will most likely falter. Not only does the technology create more errors in the electronic workings, but the voters can also commit mistakes due to confusion with the user interface. The terminology is confusing, differentmachines,

International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Trustworthy E-KYC Systems Using Blockchain

Mr. Suryakant Auti[1], Mr. Kshitij Bhondave[2], Miss. Namodevi Gore[3], Miss. Gitanjali Bhoge[4], Prof. Neeta Gade[5]

[1,2,3,4]Student, Shri Chhatrapati Shivaji Maharaj College of Engineering,
[5]Asst. Professor, Shri Chhatrapati Shivaji Maharaj College of Engineering,

Abstract:
In today's world, Leveraging technological advancements, such as digital identity verification and biometric authentication, has streamlined and modernized KYC processes. These innovations not only enhance efficiency but also contribute to a more user-friendly experience for customers. In this contemporary landscape, staying informed about evolving regulations and industry-specific practices is indispensable for effective KYC implementation. Financial institutions must continuously adapt to the changing regulatory environment and leverage technological solutions to maintain the integrity of their KYC processes. This proactive approach is crucial not only for compliance but also for building trust between customers and stakeholders in an era where financial security and transparency are paramount. KYC procedures have been simplified and brought up to date by utilizing technology innovations like biometric authentication and digital identity verification. These advancements contribute to a more user-friendly experience for customers in addition to increasing efficiency. Keeping up with changing laws and sector-specific procedures is essential for implementing KYC successfully in the modern world. It is imperative for financial institutions to consistently adjust to the dynamic regulatory landscape and utilize technological advancements to uphold the integrity of their KYC procedures. This proactive strategy is essential for both compliance and fostering stakeholder and customer trust in a time when financial stability and openness are critical.

Index Terms – KYC - know your customer, AML - anti-money laundering, CTF - counter-terrorism financing

Keywords – KYC, blockchain, etherium, encryption, compression

I. INTRODUCTION

In the dynamic realm of technology, our final-year engineering project represents an exciting foray into innovation. As ambitious students, we are dedicated to implementing an eKYC system using blockchain technology and advanced cryptographic algorithms to expedite identity verification and fortify the security of critical documents. By embracing the potential of blockchain, we create a decentralized, tamper-proof ledger for the secure storage and sharing of user data. This groundbreaking solution is poised to significantly reduce verification times, enhancing efficiency, and protecting user data from unauthorized access and tampering.

While we are not yet experts, we are passionate learners, enthusiastic about the potential of this project. With limited resources and the support of our academic institution, we aim to deliver a functional eKYC

system that demonstrates our commitment to innovative engineering solutions. This system will provide valuable insights into the intersection of blockchain and identity verification, offering a glimpse into the future of secure and efficient data management.

II. Motivation

The motivation behind our endeavor is multifaceted. First and foremost, we are driven by the need to provide a more efficient and streamlined experience for our clients. By reducing document verification time, we aim to make their interactions with our organization smoother and more convenient. Additionally, we are deeply committed to safeguarding the sensitive documents and personal information entrusted to us. The security and immutability offered by blockchain technology align with our unwavering dedication to data protection and privacy.

Furthermore, as regulatory landscapes evolve, staying compliant with ever-changing requirements is paramount. Our project will not only expedite the onboarding process but also ensure that we remain in full compliance with the latest regulations. Ultimately, our motivation is rooted in the pursuit of excellence, striving to offer a secure, efficient, and compliant eKYC system that enhances the overall experience for both our clients and our organization.

III. Objectives

The project focuses on the development of a blockchain-based e-KYC system with an integrated live video verification component. The primary objective is to establish a secure and decentralized blockchain infrastructure that ensures the tamper-proof storage and verification of customer data. The inclusion of live video verification aims to enhance identity authentication in real-time, preventing impersonation and bolstering the overall security of the e-KYC process. Regulatory compliance is a key consideration, and the project aims to align with relevant standards, particularly those related to data privacy and financial regulations. The user experience is a focal point, and the project endeavors to create an intuitive interface for both customers undergoing the e-KYC process and administrators managing the system. Seamless integration with financial institutions is a priority, and the development of APIs and integrations is planned to enable efficient and secure data sharing. Smart contracts on the blockchain will be leveraged to automate authorization processes, controlling access to e-KYC data based on predefined criteria. Security measures, including encryption, will be implemented to safeguard sensitive customer information stored on the blockchain. The live video verification process will be optimized for efficiency, ensuring a smooth experience for both customers and verification agents. Rapid customer onboarding is another objective, with a focus on streamlining the e-KYC process to reduce the time and effort required for identity verification. The project also emphasizes scalability, designing the e-KYC system to handle a growing user base and increasing transactions without compromising performance. Regular evaluation of progress against these objectives is deemed essential for the successful development and implementation of the blockchain-based e-KYC system with live video verification.

IV. System Architecture

The architecture of the blockchain-based e-KYC system, featuring integrated live video verification, is designed to establish a secure, decentralized, and user-friendly environment. At its core is a blockchain infrastructure ensuring tamper-proof storage of e-KYC data, with smart contracts automating authorization processes. The user interface is intuitively crafted to provide a seamless experience,

e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Issue 11, November 2023

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.423

9940 572 462 | 6381 907 438 | ijirset@gmail.com | www.ijirset.com

International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET)

|e-ISSN: 2319-8753, p-ISSN: 2347-6710| www.ijirset.com | Impact Factor: 8.423| A Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 11, November 2023 ||

| DOI:10.15680/IJIRSET.2023.1211052 |

An Analytical Review of Deep Learning-Based Pothole Detection System

Gaurav Nawale, Shubhangi Ghongade, Sukeshini Chemate, Prof.Rachcha S.P

U.G. Student, Department of Computer Engineering, SCSMCOE Engineering College, Nepti, Ahmednagar, Maharashtra, India

Associate Professor, Department of Computer Engineering, SCSMCOE Engineering College, Nepti, Ahmednagar, Maharashtra, India

ABSTRACT: The quality of the roads that automobiles are driven on is essential to ensuring that every vehicle, manual or automatic, can complete its journey satisfactorily. Road defects such as potholes and speed bumps can lead to car wear and even fatal traffic accidents. As a result, recognizing and characterizing these anomalies helps to reduce the likelihood of crashes and vehicle damage. The identification of street abnormalities is made more difficult by the fact that street pictures are intrinsically multivariate because of significant amounts of duplicated data and heavily contaminated measurement noise. This study offers the automatic color image processing of potholes on highways using a YOLO Deep learning model, either from the video frames or from photos taken with a smartphone camera. Lightweight architecture was chosen to facilitate training and usage more quickly. This is composed of seven properly coordinated and interconnected layers. Every pixel in the original image is used, no resizing involved. We used the conventional stride and pooling procedures to get as much data as we could. This enhances the developed model's capability to identify potholes and alert drivers to the need for cautious driving. In order to accomplish this, the suggested approach examines past research to compile crucial data for pothole detection.

KEYWORDS: Street anomalies, deep neural network, synchronized layers, Pothole detection, YOLO Neural network.

I. INTRODUCTION

The number of vehicles on the road is always growing, which increases the likelihood of traffic and accidents. Road safety is crucial for everyone since it is typically caused by a driver's error or a problem with the structure of the road. A pothole is a section of the road surface where fissures have grown until they create a hole larger than 150 mm in diameter. Potholes pose a serious risk to both pedestrians and automobiles. Roads that are utilized every day may not be inspected as part of every nation's road maintenance program.

When a pothole occurs, fast-moving vehicles would rarely detect it or have time to react. Different drivers respond differently to impending potholes. This could involve the driver making a quick maneuver to avoid a pothole or braking suddenly, which could result in the car rolling over or in a rear-end collision. An investigation was conducted into a pothole detection system to alert drivers ahead of time and prevents unintentional collisions and property damage. Numerous studies and technological advancements have been made to identify and report potholes utilizing a range of tools and methods. A few of these methods make use of vibration-, vision-, and laser-scanning techniques. The purpose of this study is to compare the speed and accuracy of two object identification algorithms: YOLO and SSD, in order to identify road potholes before they become problems. For every algorithm, many models will be trained, and the top performing model will be shrunk to fit on devices with less processing capability. This makes it possible for the models to function properly on embedded systems like Raspberry Pi, which can be utilized in cars or on the driver's mobile device. Based on the findings, transportation companies might equip their vehicles with this technology to lessen the amount of accidents and pothole-related vehicle damage. Alternatively, automakers may implement a system in which the driver is alerted to a pothole and the car slows down while modifying the suspension to avoid it, reducing impact and improving ride quality.

The world's second-largest road network is found in India. As a result, the road system is crucial to the social and economic development of India. As to the research, throughout the past ten years, the GDP and the Road Transport

|e-ISSN: 2319-8753, p-ISSN: 2347-6710| www.ijirset.com | Impact Factor: 8.423| A Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 11, November 2023 ||

| DOI:10.15680/IJIRSET.2023.1211052 |

multivariate because of significant amounts of duplicated data and heavily contaminated measurement noise. This study offers the automatic color image processing of potholes on highways using a YOLO Deep learning model, either from the video frames or from photos taken with a smartphone camera. We used the conventional stride and pooling procedures to get as much data as we could. This enhances the developed model's capability to identify potholes and alert drivers to the need for cautious driving. In order to accomplish this, the suggested approach examines past research to compile crucial data for pothole detection.

The system will be expanded in the future to incorporate surveillance cars, enabling accurate autonomous road condition monitoring. These surveillance vehicles would also be equipped with GPS modules so they could track the exact positions of the potholes. The amount of road damage and the quantity of raw materials required to patch the potholes could both be approximated using the expected sizes of the holes. The majority of planning and inspection can therefore be finished remotely.

REFERENCES

[1] B. -h. Kang and S. -i. Choi, "Pothole detection system using 2D LiDAR and camera," *2017 Ninth International Conference on Ubiquitous and Future Networks (ICUFN)*, Milan, Italy, 2017, pp. 744-746, doi: 10.1109/ICUFN.2017.7993890.

[2] P. Ping, X. Yang and Z. Gao, "A Deep Learning Approach for Street Pothole Detection," *2020 IEEE Sixth International Conference on Big Data Computing Service and Applications (BigDataService)*, Oxford, UK, 2020, pp. 198-204, doi: 10.1109/BigDataService49289.2020.00039.

[3] A. Kumar, Chakrapani, D. J. Kalita and V. P. Singh, "A Modern Pothole Detection technique using Deep Learning," *2nd International Conference on Data, Engineering and Applications (IDEA)*, Bhopal, India, 2020, pp. 1-5, doi: 10.1109/IDEA49133.2020.9170705.

[4] N. Camilleri and T. Gatt, "Detecting road potholes using computer vision techniques," *2020 IEEE 16th International Conference on Intelligent Computer Communication and Processing (ICCP)*, Cluj-Napoca, Romania, 2020, pp. 343-350, doi: 10.1109/ICCP51029.2020.9266138.

[5] P. A. Chitale, K. Y. Kekre, H. R. Shenai, R. Karani and J. P. Gala, "Pothole Detection and Dimension Estimation System using Deep Learning (YOLO) and Image Processing," 2020 35th International Conference on Image and Vision Computing New Zealand (IVCNZ), Wellington, New Zealand, 2020, pp. 1-6, doi: 10.1109/IVCNZ51579.2020.9290547.

[6] D. J, S. D. V, A. S A, K. R and L. Parameswaran, "Deep Learning based Detection of potholes in Indian roads using YOLO," *2020 International Conference on Inventive Computation Technologies (ICICT)*, Coimbatore, India, 2020, pp. 381-385, doi: 10.1109/ICICT48043.2020.9112424.

[7] C. -W. Kuan, W. -H. Chen and Y. -C. Lin, "Pothole Detection and Avoidance via Deep Learning on Edge Devices," *2020 International Automatic Control Conference (CACS)*, Hsinchu, Taiwan, 2020, pp. 1-6, doi: 10.1109/CACS50047.2020.9289701.

[8] H. K. I. S. Lakmal and M. B. Dissanayake, "Pothole Detection with Image Segmentation for Advanced Driver Assisted Systems," 2020 IEEE International Women in Engineering (WIE) Conference on Electrical and Computer Engineering (WIECON-ECE), Bhubaneswar, India, 2020, pp. 308-311, doi: 10.1109/WIECON-ECE52138.2020.9398036.

[9] M. Omar and P. Kumar, "Detection of Roads Potholes using YOLOv4," 2020 International Conference on Information Science and Communications Technologies (ICISCT), Tashkent, Uzbekistan, 2020, pp. 1-6, doi: 10.1109/ICISCT50599.2020.9351373.

[10] R. Rastogi, U. Kumar, A. Kashyap, S. Jindal and S. Pahwa, "A Comparative Evaluation of the Deep Learning Algorithms for Pothole Detection," 2020 IEEE 17th India Council International Conference (INDICON), New Delhi, India, 2020, pp. 1-6, doi: 10.1109/INDICON49873.2020.9342558.

[11] E. J. Reddy, P. N. Reddy, G. Maithreyi, M. B. C. Balaji, S. K. Dash and K. A. Kumari, "Development and Analysis of Pothole detection and Alert based on NodeMCU," 2020 International Conference on Emerging Trends in Information Technology and Engineering (ic-ETITE), Vellore, India, 2020, pp. 1-5, doi: 10.1109/ic-ETITE47903.2020.347.

[12] A. Srivastava, A. Goyal and S. S. Ram, "Radar Cross-Section of Potholes at Automotive Radar Frequencies," 2020 IEEE International Radar Conference (RADAR), Washington, DC, USA, 2020, pp. 483-488, doi: 10.1109/RADAR42522.2020.9114858.

[13] J. -C. Tsai, K. -T. Lai, T. -C. Dai, J. -J. Su, C. -Y. Siao and Y. -C. Hsu, "Learning Pothole Detection in Virtual Environment," 2020 International Automatic Control Conference (CACS), Hsinchu, Taiwan, 2020, pp. 1-5, doi: 10.1109/CACS50047.2020.9289740.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:05/May-2024 Impact Factor- 7.868 www.irjmets.com

ADVANCEMENT IN THE PHYTOREMEDIATION TREATMENT SYSTEM

Satpute Harshada[*1], Nikam Prasad[*2], Shirsath Vaishnavi[*3], Kadam Namrata[*4], Kusalkar Shreyas[*5]

[*1,3,4,5]BE Civil Engineering, Shri. Chhatrapti Shivaji Maharaj College Of Engineering Nepti, Ahmadnagar, Maharashtra, India.

[*2]Assistant Professor, Department Of Civil Engineering, Shri. Chhatrapati Shivaji Maharaj College Of Engineering Nepti, Ahmadnagar, Maharashtra, India.

ABSTRACT

A soil and water are mainly polluted by effluent discharges from industries, which are broadly classified into metallic and nonmetallic pollutant-bearing effluents. In order to tackle this problem, a plant-based technology called phytoremediation is used to clean contaminated lands. Phytoremediation is based upon several processes such as phytodegradation, phytovolatilization, phytoaccumulation and phytoextraction. These methods are efficient, eco-friendly and economic. This paper reviews the methods and mechanisms involved in phytoremediation of heavy metals, and enhancement processes. The potential of sugarcane for remediation of soil contaminated with As, Pb, Cd, Cu, and Zn total and available heavy metal concentrations in the contaminated soils were analyzed before and after the phytoremediation application with the help of sugarcane plants. The heavy metal concentration with phytoremediation was reduced compared with the sugarcane treatments. Elements showed low mobility, which was related to their total concentration in soil and water.

Keywords: Heavy Metal, Contaminated Soil, Investigation, Sugercane, Phytoremediation.

I. INTRODUCTION

Heavy metal-contaminated soil has emerged as a significant environmental problem globally. Irrespective of their sources in the soil, accumulated heavy metal can degrade soil quality and reduce crop yield and quality of agricultural products, and thus negatively impact the health of humans, animals, and the ecosystem. Heavy metal accumulation in surface soils, which is considered as a chemical time bomb, may pose a potential threat to the environment and human health as per the literatures referred. For example, it can affect the respiratory tract, skin, liver, cardiovascular, and nervous systems. In addition, it can cause cancer risks for skin and various viscera, including the lung, bladder, kidney, and liver. Moreover, Cr, Cd, Cu, Pb, and Zn have been considered to be related to various types of cancer. In contaminated farmlands, heavy metals accumulate in the edible parts of crops to levels that exceed food safety standards. These metals can enter the food chain through food production and threaten the health of animals and humans. Thus, the remediation of contaminated farmland soil is dramatically important to ensure food safety and public health. Remediation of soils contaminated with heavy metal is mainly based either on the extraction or the stabilization of the contaminants. In this study, the effectiveness of a sugarcane with low heavy-metal accumulation to remediate a soil that is moderately contaminated with As, Cd, Cu, Pb, and Zn was assessed by the variance of heavy metal concentration. The total concentration and available forms of the trace metals in the contaminated sugarcane soil were determined. The effects of sugarcane on the trace element availability and total concentration were investigated. In addition, the relationship between the heavy metal concentration of soil and sugarcane was established through different assessment criteria.

II. PHYTOREMEDIATION

Phytoremediation basically refers to the use of plants and associated soil microbes to reduce the concentrations or toxic effects of contaminants in the environment. Phytoremediation is widely accepted as a cost-effective environmental restoration technology. The definition of phytoremediation is the technology that utilizes green plants for the detoxification of pollutants from soil, water, and air components of the environment. With an unprecedented acceleration in human-influenced activities, restoration of degraded venation of water bodies, and purification of air, it is the need of the hour. The sources of such include effluents from industries, acid-mine drainage, and chemical fertilizers from agricultural

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:05/May-2024 Impact Factor- 7.868 www.irjmets.com

practices that contribute to — but are not limited to — heavy metal, volatile organic compound, oxides of nitrogen, and sulfur pollution.

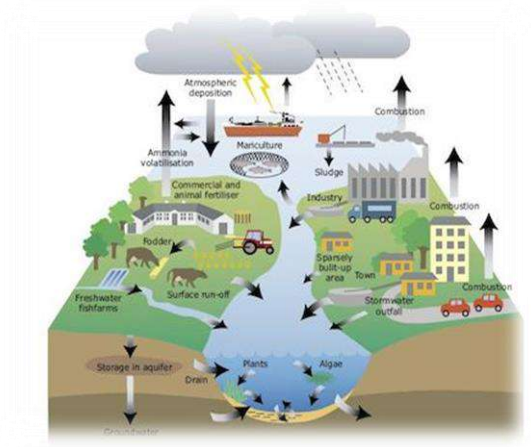


Figure 1: Sources of Pollution (source-www.eea.europa.eu)

Phytoremediation, a type of bioremediation, refers to utilizing the ability of green plants to stabilize, uptake (or bioaccumulate), and release a lesser toxic form of pollutants to clean up soil, water, or air. The plant and its root-zone-associated microbes also play a crucial role in this process (Salt et al. 1998). Soil here refers to the surface as well as sediments, while water refers to the surface as well as groundwater.

What is phytoremediation Technique?

Plants have developed mechanisms over a period of time that have helped them survive in organic as well as inorganic pollutant-rich soil or water. This is based on the alleviation of stress caused by heavy metal and organic pollutants on plants. Selection of the cleanup technique is primarily based on the nature of the pollutant, the medium in which it is present, and the expected end result of the process.

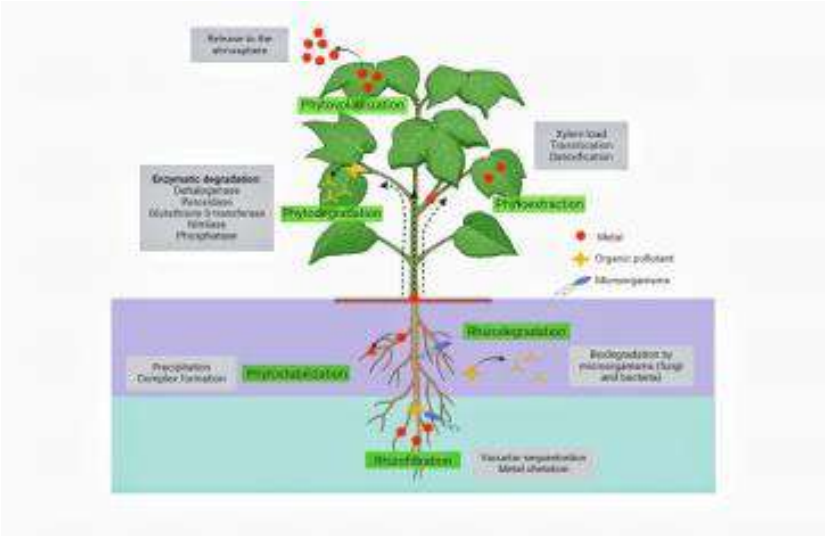


Figure 2: Phytoremediation Technique (source-www.study.com)

Types of phytoremediation

There are several options of phytoremediation to choose from for environmental detoxification based on various parameters. These are rhizofiltration, phytodegradation, rhizosphere biodegradation, phytoextraction, phytostabilization, and phytovolatilization.

Rhizofiltration

- Rhizofiltration is a method of removing harmful chemicals and surplus nutrients from water by filtering it through a mass of roots.
- Pollutants are absorbed by the roots or transferred on them.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:05/May-2024 Impact Factor- 7.868 www.irjmets.com

- This method is frequently used to clean up contaminated groundwater by either planting directly in the contaminated area or extracting the contaminated water and delivering it to these plants off-site.

Phytoextraction / Phytoaccumulation

- Phytoextraction / phytoaccumulationis the process by which plants accumulate pollutants in their roots, shoots, or leaves above ground.
- The roots absorb elements from the soil or water and concentrate them in the plant biomass above ground.
- Hyperaccumulators are organisms that have a high capacity for absorbing pollutants.
- For the past twenty years or so, phytoextraction has been rapidly gaining popularity around the world. Heavy metals and other inorganics are commonly extracted via phytoextraction.
- Contaminants are often concentrated in a significantly smaller volume of plant matter at the time of disposal than in the initially contaminated soil or silt.

Phytotransformation/ Phytodegradation

- Phytotransformation, also known as phytodegradation, is the transformation of organic pollutants from soil, sediments, or water into a more stable, less hazardous, and less mobile form.
- The plant roots secrete enzymes that break down the organic chemicals, which are subsequently taken in by the plant and expelled by transpiration.
- Herbicides, trichloroethylene, and methyl tert-butyl ether are among the organic pollutants that this method works best with.

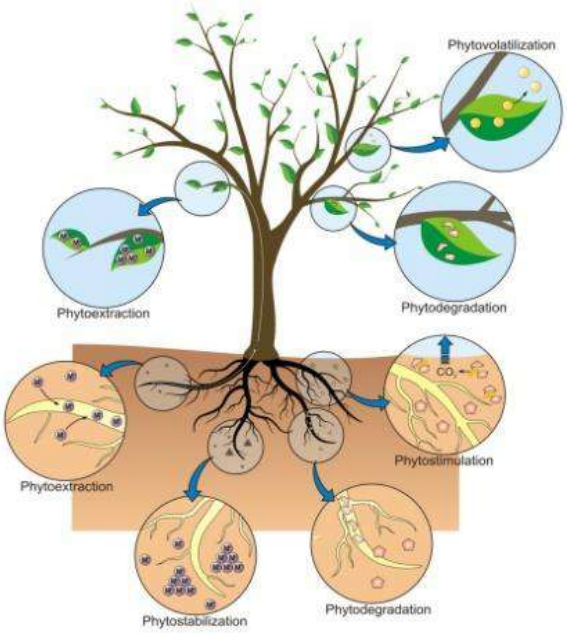


Figure 3: Types of Phytoremediation (Source : https://www.researchgate.net)

III. METHODOLOGY

1.1 Study area

Our local area was located in the Ahmednagar city along the Sina River.Sina River is a large tributary of the Bhimariver which is starting near Ahmednagar city. It has two chief sources, one near Jamgaon about 20 km. west of the town of Ahmednagar and the other near Sasewadi,Jeur about 16 km. to its north-east.The condition of Sina River in the Ahmednagar city is very bad and very polluted by industial as well as commercial &residential waste water. To clean the River we studied the factors which affects the quality of Sina River water. In the bank of river lot of encroachment causing a very short stream path and during rainy season the adjoining residential area and roads get flooded. To tackle all these problems & to make pollution free Sina we have to take some initiatives for that, rebirth of sina is essential. In this project we have analised and studied all the aspects which are contributing pollution to river. We have conducted some lab test to find the characteristics of water e.g. BOD, COD, DO, pH also we have studied &then suggested the methods which will be

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:05/May-2024 Impact Factor- 7.868 www.irjmets.com

helpful to remove the over burden of sina river with its bank to get clear & sparkling water of Sina . The soil pollution and water pollution in this area was due to the leakage and spills from industrial areas heavy metals like Pb, Zn, As, Cu , Cd. Other waste water sources like agricultural land, domestic area, public places also contributes large amount of waste contaminants to the river water.

1.2 Modelling and analysis

An experiment open set up there is, to monitor the growth of sugercane in the half cut water tank. In late November we plant sugarcane and applied Sina river waste water. In the tank we designed the rapid sand filter for the percolation of water the water should pass through the layers of gravel 20mm, gravel 10mm, sand and soil at the top. In the bottom of the water tank there is a small structure like pipes are placed to collect the upper layer of waste water which was now purified with the help of phytoremediation technique .Sugercane absorb the heavy metals as a nutrition . The experiment lasted until mid-January, and the water was changed several times. The measuring of the parameters of growth to determine biomass production was carried out at the beginning and the end of the experiment. The efficiency of indian shoot in the removal of heavy metals was tested in an experiment under laboratory conditions. In early March we conduct the chemical analysis of waste clean water.

Figure 4: Base of model and outlet

Figure 5: For the storage of percolated wastewater

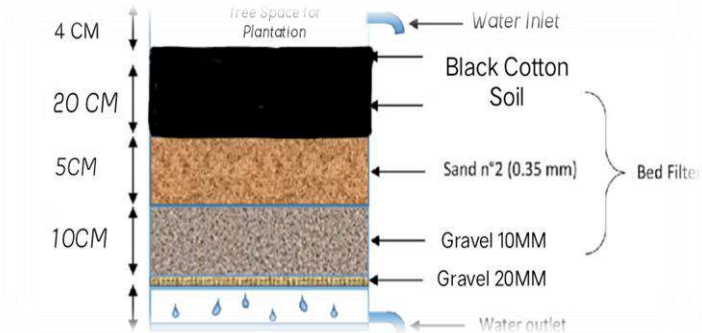


Figure 6: Bed filter

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:05/May-2024 Impact Factor- 7.868 www.irjmets.com

Figure 7 : Plantation of plant (sugarcane)

Figure 8: Final model

IV. CHEMICAL ANALYSIS TEST AND RESULTS

For the process of phytoremediation the waste water changed in a month 3 - 4 times. The sugercane plant absorbs the heavy metals as a nutrition which are present in the water. The chemical test conducted on the waste clean water, which are Dissolved Oxygen, pH, Biochemical Oxygen Demand, Chemical Oxygen Demand and the parameters like heavy metals Cu, Cd, Pb, As, Zn before and after phytoremediation treatment process.

Table 1. Test Result Before Phytoremediation treatment process

Sr. No.	Parameter	Result	Unit	Method
1	Dissolved Oxygen (DO)	4.3	mg/L	IS 3025 (Part 38) Method No :4 : 1989
2	Biological Oxygen Demand (3 days, 27°C)	46	mg/L	IS 3025 (Part 44) :1993
3	Chemical Oxygen Demand	160	mg/L	APHA 24th , Ed.. 5220, B544 ,B,544:2023.
4	Copper (as Cu)	BLQ(LOQ:0.02)	mg/L	IS 3025 (part 2) : 2019 /ISO 11885 : 2007
5	Lead (as Pb)	BLQ(LOQ:0.08)	mg/L	IS 3025 (part 2) : 2019 /ISO 11885 : 2007
6	Cadmium(as Cd)	BLQ(LOQ:0..02)	mg/L	IS 3025 (part 2) : 2019 /ISO 11885 : 2007
7	Zinc (as Zn)	BLQ(LOQ:0.05)	mg/L	IS 3025 (part 2) : 2019 /ISO 11885 : 2007
8	Arsenic (as As)	BLQ(LOQ:0.05)	mg/L	IS 3025 (part 2) : 2019 /ISO 11885 : 2007

Table 2. Test Results After Phytoremediation treatment process

Sr. No.	Parameter	Result	Unit	Method
1	Dissolved oxygen	4.9	mg/L	IS 3025 (Part 38) Method

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:05/May-2024 Impact Factor- 7.868 www.irjmets.com

				1989
2	Biological Oxygen Demand (3 days, 27°C)	25	mg/L	IS 3025 (Part 44) :1993
3	Chemical Oxygen Demand	90	mg/L	APHA 24th , Ed.5220 ,B,544:2023.
4	Copper (as Cu)	BLQ(LOQ:0.02)	mg/L	IS 3025 (part 2) : 2019 /ISO 11885 : 2007
5	Lead (as Pb)	BLQ(LOQ:0.08)	mg/L	IS 3025 (part 2) : 2019 /ISO 11885 : 2007
6	Cadmium(as Cd)	BLQ(LOQ:0.02)	mg/L	IS 3025 (part 2) : 2019 /ISO 11885 : 2007
7	Zinc (as Zn)	BLQ(LOQ:0.05)	mg/L	IS 3025 (part 2) : 2019 /ISO 11885 : 2007
8	Arsenic (as As)	BLQ(LOQ:0.05)	mg/L	IS 3025 (part 2) : 2019 /ISO 11885 : 2007

Figure 9: Water before and after phytoremediation system

V. CONCLUSION

From the test result it is observed that sugarcane canna plant can also be effectively use to treat waste water by using phytoremediation method. Heavy metals can also be effectively removed with the help of sugarcane. There is a notable decrease in BOD and COD demands. COD demand have decreased by 70mg/L from the experimental setup.

VI. REFERENCES

[1] Manta D, Angelone M, Bellanca A, Neri R, Sprovieri M. 2002. Heavy metals in urban soils: a case study from the city of Palermo (Sicily), Italy. Sci Total Enviro 300: 229–243.

[2] Hu Y N, Liu X P, Bai J M, Shih K M, Zeng E Y, Cheng H F. 2013. Assessing heavy metal pollution in the surface soils of a region that had undergone three decades of intense industrialization and urbanization. Environ SciPollut Res 20: 6150–6159.

[3] Takashi F, Hidetaka T. 2014. Pollution distribution of heavy metals in surface soil at an informal electronic-waste recycling site. Environ Geochem Health 36: 159–168.

[4] Benhaddy L M, Hadjel M. 2014. Spatial distribution and contamination assessment of heavy metals in surface soils of HassiMessaoud, Algeria. Environ Earth Sci 71: 1473–1486.

[5] Sekhar K C, Chary N S, Kamala C T, Vairamani M, Anjaneyulu Y, Balaram V, Sorlie J E. 2006. Risk communications: around the world-environmental risk assessment studies of heavy metal contamination in the industrial area of Kattedan, India a case study. Hum Ecol Risk Assess 422.

[6] Lin M C, Liao C M. 2008. Assessing the risks on human health associated with inorganic arse from groundwater-cultured milkfish in southwestern Taiwan. Food ChemToxicol 46: 701–70

[7] Wang L J, Lu X W, Ren C H, Li X X, Chen C C. 2014. Contamination assessment and health ris metals in dust from Changqing industrial park of Baoji, NW China. Environ Earth Sci 71: 2095

[8] Stigliani W M, Doelman P, Salomons W, Schulin R, Smidt G R B, Seatm V D Z. 1991. Chemical time bombs-predicting the unpredictable. Environment 33: 4–30.
[9] Rmalli S W A, Harrington C F, Ayub M, Haris P I. 2005. A biomaterial based approach for arsenic removal from water. J Environ Monit7: 279–282.
[10] Kurz H, Schulz R, Romheld V. 1999. Selection of cultivars to reduce the concentration of cadmium and thallium in food and fodder plants. J Plant Nutr Soil Sci 162: 323–328.
[11] Adriano D C, Wenzel W W, Vangronsveld J, Bolan N S. 2004. Role of assisted natural remediation in environmental cleanup.Geoderma 122, 121–142.
[12] Liu W T, Zhou Q X, An J, Liu Y B, Liu R. 2010. Variations in cadmium accumulation among Chinese cabbage cultivars and screening for Cd-safe cultivars. J Hazard Mater 173: 737–743.
[13] Wang X L, Chen T B, Lei M, Li X X, Chen C C. 2012. Selection of sugar cane varieties with a low heavy metal accumulation ability for the ecological remediation of contaminated farmland. J ResourEcol 3: 373–378.
[14] Wang K R. 2002. Tolerance of cultivated plants to cadmium and their utilization in polluted farm land soils. ActaBiotechnol 22: 189–198.
[15] Tiryakioglu M, Eker S, Ozkutlu F, Husted S, Cakmak I. 2006. Antioxidant defense system and cadmium uptake in barley genotypes differing in cadmium tolerance. J Trace Elem Med Bio 20: 181–189.
[16] Zhu C, Luan Z, Wang Y, Shan X. 2007. Removal of cadmium from aqueous solutions by adsorption on granularred mud (GRM).Sep PurifTechnol 57: 161–169.
[17] Liu W T, Zhou Q X, Liu Y B, Liu R. 2009. Identification of Chinese cabbage genotypes with low cadmium accumulation for food safety. Environ Pollut 157: 1961–1967.
[18] Corbi J J, Froehlich C G, Trivinho-Strixino S, Dos-Santos A. 2011. Evaluating the use of predatory insects as bioindicators of metals contamination due to sugarcane cultivation in neotropical streams. Environ Monit Assess 177: 545–554.
[19] Li X L, Shen Z G, Wai W H, Li Y S. 2001. Chemical forms of Pb, Zn and Cu in the sediment profiles of the Pearl River Estuary. Mar Pollut Bull 42: 215–223.
[20] Rauret G, López-Sanchez J F, Sahuquillo A, Rubio R, Davidson C, Ure A, Quevauliller P H. 1999. Improvement of the BCR three step sequential extraction procedure prior to the certification of the new sediment and soil reference materials. J Environ Monit 1: 57–61.
[21] Madejo´n P, Murillo J M, Marano´n T, Cabrera F, Lo´pez R. 2002. Bioaccumulation of As, Cd, Cu, Fe and Pb in wild grasses affected by the aznalcollar mine spill (SW Spain).Sci Total Enviro 290: 105–120.
[22] K., Miss J. D., et al. "Analysis of Sina River Water in Ahmednagar City." JournalNX, 2018, pp. 305-309.
[23] Solse, Anjali A., et al. "Geopolymeric Building Material by Using Synergistic Utilization of Industrial Waste." JournalNX, 2019, pp. 122-125.
[24] Nikam, Prasad G., and Girish S. Patil. "Review of India's Solar Energy."JournalNX, 2019, pp. 38-41.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:05/May-2024 Impact Factor- 7.868 www.irjmets.com

ANALYSIS OF MICROPLASTIC POLLUTION IN THE RIVER WATER AND IN THE SEDIMENTS OF THE RIVER

Tanuja M. Gaikawad[*1], Shweta R. Kharpude[*2], Ayush Y. Pokharna[*3], Tejas D. Khedkar[*4], Prasad G. Nikam[*5]

[*1,2,3,4]BE Civil Students, Department Of Civil Engineering, Shri Chhatrapati Shivaji Maharaj College Of Engineering, Nepti, Ahmednagar, Maharashtra, India.

[*5]Assistant Professor, Department Of Civil Engineering, Shri Chhatrapati Shivaji Maharaj College Of Engineering, Nepti, Ahmednagar, Maharashtra, India.

ABSTRACT

This study has been undertaken to investigate the Microplastic content in a surface water source. Microplastics, which are tiny plastic particles less than 5mm in size, can be found in rivers, lakes, and oceans. They pose a threat to aquatic life as they can be ingested by animals and can accumulate in the food chain. Additionally, micro plastics in water as well as sediment in river can transport harmful chemicals and pollutants, impacting water quality, toxic chemicals, habitat alteration reduced, water quality ingestion through food and water, respiratory exposure, chemical exposure. Efforts to reduce microplastic pollution and its consequences are crucial to protect surface water and aquatic ecosystems. We are using Grab Sampling in which collecting water samples at various locations using bottles or containers. These samples were filtered to capture microplastic. We have analyzed the collected samples with the objectives to determine the concentration and distribution of microplastics in water and sediment and to study the effects of microplastics on sediment and water ecosystems. Both the samples from water and sediment are studied and microplastic samples are analyzed by FTIR (Fourier-Transform infrared) method and found presence of microplastics in surface river water source.

Keywords: Microplastic, River Pollution.

I. INTRODUCTION

The concentration of microplastics the concentration of microplastics (MPs) in water ecosystems increases as plastic production gradually increases every fiscal year. From referred literature, almost 71% of plastic waste is directly absorbed by the environment, and the remaining waste is reused in a different format, resulting in higher microplastic pollution. In 2016, approximately 335 million metric tons of plastic products were manufactured, whereas, in 2017, this amount increased up to 348 million metric tons. Thus, global plastic production increased by approximately 4% within only 1-year tons. There are more than 5.25 trillion macro and micro pieces of plastic in the oceans up to end of 2023. The first studies regarding microplastic contamination in oceans appeared in the 1970s and since then, Microplastics are defined directly in the literature, either as plastic particles smaller than 5 mm, or smaller than 1 mm.

II. METHODOLOGY

2.1 Site Selection:

For our research work we have selected the Sina River, often referred to as the Suna River, is a significant waterway in the Ahmednagar district of Maharashtra, India. It originates near the town of Jamgaon in the Balaghat range and flows southward, eventually joining the Bhima River. The river is crucial for irrigation, supporting the agricultural activities in the region. Historically, the Sina River has also been vital for local settlements, contributing to the socioeconomic development of Ahmednagar. Despite seasonal fluctuations in its flow, the river remains a lifeline for the surrounding communities. We selected total 4 locations at which sina river flows i.e Shendi (R1), Navnagaur Bridge (R2), Katvan Khandoba (R3), and Sina Dam (D1).

2.2 Sampling:

At the selected sites we have collected three sediment samples and three water samples from each Water samples are collected in a closed airtight plastic containers and sediment samples in a tray. sampling we have used grab sampling method and for sediment sampling we have collected san

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:05/May-2024 Impact Factor- 7.868 www.irjmets.com

15cm x 15 cm, area by clearing top surface and took sediment sample up to depth 3cm. For sediment sample we sieved the sediment sample from 5mm sieve and particles passed from 5mm sieves are taken for this study.

2.3 Digestion and Density Separation:

For digestion and density separation we have prepared two solutions. 1st solution is of 30% Hydrogen Peroxide was prepared to digest the presence of organic material present in the samples. 2nd solution is of Sodium Chloride (NaCl) and distilled water. The NaCl solution of 1.3 g ml-1 was prepared for density separation and to obtain microplastics in the water samples.

For density separation of water sample, we kept it for 24 hours for separation of plastic particles from water sample. After 24 hours we have observed that the plastic particles are floating on the surface of the water.

For sediment samples to remove organic material from the sediment sample we took 500 gm of sample and then added 250 ml of hydrogen peroxide solution. After 24 hours we have added NaCl solution and kept it for 4 hours. After 4 hours we observed that a top layer of water which was then separated from the sediments and filtered.

2.4 Filtration Process:

For the filtration process we used whatsman filter paper of 125 mm of diameter and vacuum filtration apparatus.

2.4.1 Filtration of water sample:

For filtration of water sample we take 500 ml of water sample collected from each location. Then with the help of whatsman filter paper and vacuum filtration we filtered the water sample.

2.4.2 Filtration of sediment sample:

For filtration of sediment sample we took water sample which was formed above the sediment during density separation. Then with the help of whatsman filter paper and vacuum filtration apparatus we have filtered the sediment sample. After filtration of water and sediment sample we have observed the layer on the filter paper which contains microplastics.

2.5 Observation of filter paper under microscope:

After the filtration process we observe each filter paper under the microscope. After observing it we separate microplastics on the basis of different colours such as pink, blue, yellow and white.

2.6 Analysis of microplastic:

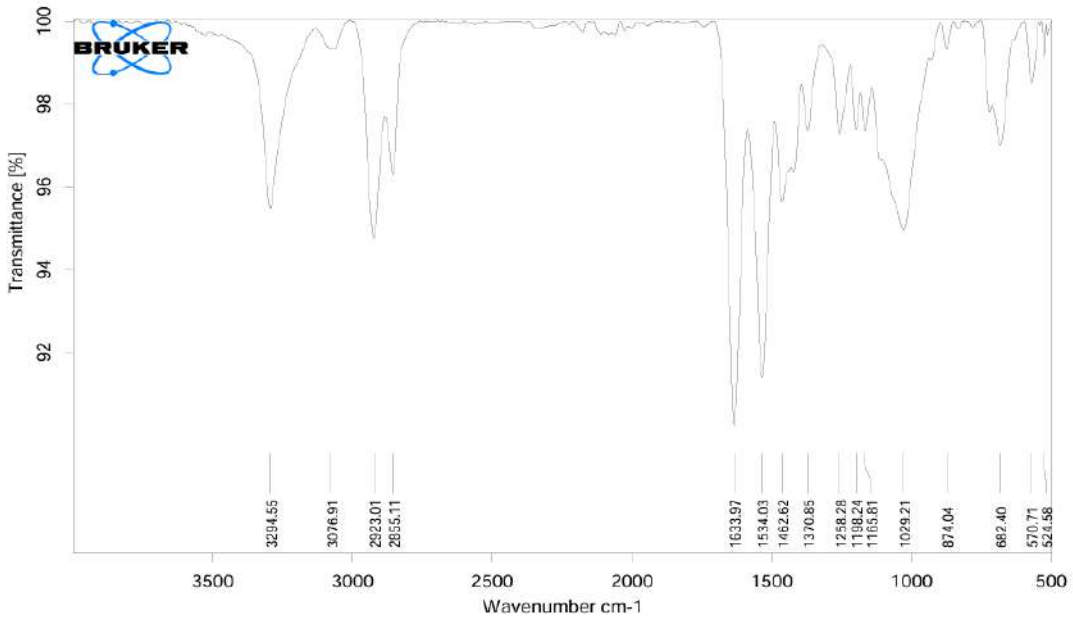
For analysis of microplastic we used FTIR (Fourier Transfer Infra-Red) spectroscopy.

FTIR Spectroscopy:

Fourier-transform infrared (FTIR) spectroscopy is an analytical technique used to obtain an infrared spectrum of absorption or emission of a solid, liquid, or gas. It works by measuring how infrared radiation is absorbed by a sample at different wavelengths, generating a spectrum that represents the molecular fingerprint of the sample. The technique utilizes an interferometer to collect all spectral data simultaneously, which is then transformed using Fourier transformation to produce the spectrum. FTIR is widely used in various fields such as chemistry, materials science, and pharmaceuticals for identifying functional groups, studying molecular structures, and monitoring chemical reactions. Its advantages include high sensitivity, rapid data collection, and the ability to analyze complex mixtures.

After FTIR spectroscopy analysis the results obtained in graphical form and as follows.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:05/May-2024 Impact Factor- 7.868 www.irjmets.com



Graph 1 - shows FTIIR Result

III. RESULTS AND DISCUSSION

Floating microplastics were present in all surface water and sediments of river and dam also present in surrounding of them. The details are shown in Table 3.1.

Table 3.1 . FTIR identification of selected microplastics (5 mm-300µm).

Sr. No	Locations	Microplastic Numbers			
		5mm – 300µm	300µm – 100µm	100µm – 20µm	Total Number
1	R1	3	2	0	05
2	R2	12	11	10	33
3	R3	17	19	16	52
4	D1	9	11	3	23

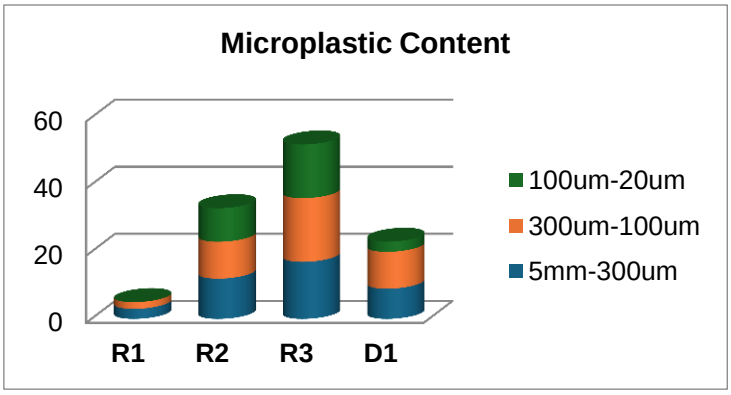


Chart 1 - shows size distribution of Microplastics.

IV. EFFECT ON ECOSYSTEM

The ecosystem of the Sina River, like many other river systems, is vulnerable to the impacts of microplastic pollution. Microplastics affect the Sina River ecosystem in several significant ways:

4.1 Accumulation in Sediments

Microplastics accumulate in the sediments of the Sina River, altering the physical and chemical properties of the riverbed. This accumulation can disrupt the natural habitats of benthic organisms, leading to changes in

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:05/May-2024 Impact Factor- 7.868 www.irjmets.com

sediment structure and composition. These changes can affect the availability of nutrients and oxygen, crucial for the survival of various microorganisms and invertebrates that live in the sediment.

4.2 Chemical Contamination

Microplastics can adsorb toxic chemicals such as heavy metals and persistent organic pollutants (POPs) from the surrounding water. This process increases the concentration of these harmful substances in the river ecosystem. When organisms ingest microplastics, they can be exposed to these toxic chemicals, which can bioaccumulate and biomagnify up the food chain, affecting predators at higher trophic levels, including fish and birds.

4.3 Impact on Aquatic Life

Aquatic organisms in the Sina River, including fish, invertebrates, and amphibians, may ingest microplastics, mistaking them for food. This ingestion can cause physical harm, such as blockages in the digestive tract, reducing the organisms' ability to feed and absorb nutrients effectively. The presence of microplastics in the digestive systems of these organisms can also lead to decreased growth rates, lower reproductive success, and increased mortality rates.

4.4 Disruption of Food Webs

The ingestion of microplastics by lower trophic level organisms can lead to the transfer of microplastics up the food chain. Predatory species that feed on smaller organisms can accumulate microplastics in their bodies, disrupting the entire food web. This trophic transfer can have cascading effects, ultimately impacting the biodiversity and health of the entire river ecosystem.

4.5 Alteration of Microbial Communities

Microplastics provide a surface for microbial colonization, which can alter the composition and function of microbial communities in the Sina River. These changes can impact the river's nutrient cycling processes, affecting the overall health and balance of the ecosystem. The colonization of microplastics by pathogenic microbes can also pose additional health risks to aquatic life and potentially to humans who depend on the river for water and food.

V. CONCLUSION

The average number and concentration of the microplastics for 4 stations as in average is found R1=05., R2=33, R3=52 and D1=23 number at respective stations. The highest concentration of microplastics were found at R3 with 52 pieces. The lowest concentration of microplastics found was as D1 with 05 number. Major polymer structure of microplastic found Polystyrene (PS), Polyethylene or polythene (PE) and Polypropylene (PP).

The presence of microplastics in the Sina River ecosystem leads to various detrimental effects, including physical and chemical alterations of the sediment, chemical contamination, harm to aquatic organisms, disruption of food webs, and changes in microbial communities. Addressing microplastic pollution in the Sina River is essential to preserving its biodiversity and maintaining the health and functionality of its ecosystem. This requires comprehensive monitoring, research, and the implementation of effective pollution control measures.

ACKNOWLEDGEMENT

We express our sincere gratitude to our advisor, Prof. P. G. Nikam, for their expert guidance and support. We appreciate the funding and resources from Shri Chhatrapati Shivaji Maharaj College of Engineering, Nepti, Ahmednagar and the technical support from Civil Department. Special thanks to our colleagues, for their assistance. Lastly, heartfelt thanks to our families and friends for their encouragement.

VI. REFERENCES

[1] Zike huang, Bo Hu, Hui Wang. “Analytical methods for microplastics in the environment: a review”,2022

[2] Wenfeng wang, Wenke Yuan, Yuling Chen, Jun Wang. “Microplastics in surface waters of D and Hong Lake” JournalNX 2018, pp`

[3] Yi Liu, Bei Wang, Vince Pileggi, Sheng Chang.Yi Liu, Bei Wang,Vince Pileggi, Sheng Chang. recover and characterize microplastics in water”,2022

[4] Emma Faltstrom, Kristina Borg Olesen,Stefan Underberg."Microplastic types in wastewater system- A comparision of material Flow- based source estimates and the measurement- Based Load to a Wastewater Treatment Plant",2021

[5] Salonge Magalhaes, Bruno Mendronho, Luis Alves, Anabela romano. "Microplastic in Ecosystem from current trends to bio-based removal stratergies" JournalNX,,2022

[6] Mansi Vaid, Komal Mehra, Kiranmay Sarma, Anshu Gupta. "Investigation on the co-occurrence of microplastics and other pollutants in the River Yamuna", 2022

[7] Agung Dhamar Syakti , Nuning Vita Hidayati ,Sofyan Husein Siregar Laurence Asia. "simultaneous grading of microplastic size sampling in the small Islands of Bintan water, Marinr Pollution Bulletin 137(2018) 593-600

[8] Alliah A. Abdullah, Aleja Alyssa Macapodi, Louvill Ozarraga, Abdani Bandera. "An imposing Communication to the Aquatic Ecosysytem and Its Removal Strategies in Waste Water Treatment Plants" JournalNX,, 2022

[9] Yolanda Pico, and Damia Barcelo. "Analysis and prevention of microplastics pollution in water: current perspectives and future directions" JournalNX,,2017

[10] Mohammed S. M.,Simone Kefer,Julia Reichel. "Validation of Sample Preparation Methods for Microplastic Analysis in Wastewater Matrices Reproducibility and Standardization", 2020.

[11] K., Miss J. D., et al. "Analysis of Sina River Water in Ahmednagar City." JournalNX, 2018, pp. 305-309.

[12] Cole, M., Lindeque, P., Halsband, C., Galloway, T.S., 2011. Microplastics as contaminants in the marine environment: a review. Mar. Pollut. Bull. 62, 2588–2597.

[13] Gorokhova, E., 2015. Screening for microplastic particles in plankton samples: how to integrate marine litter assessment into existing monitoring programs? Mar. Pollut. Bull. 99, 271–275.

[14] Solse, Anjali A., et al. "Geopolymeric Building Material by Using Synergistic Utilization of Industrial Waste." JournalNX, 2019, pp. 122-125.

INTELLECTUAL PROPERTY INDIA
PATENTS | DESIGNS | TRADE MARKS
GEOGRAPHICAL INDICATIONS

सत्यमेव जयते

ORIGINAL
क्रम सं/ Serial No. : 172178

पेटेंट कार्यालय, भारत सरकार The Patent Office, Government Of India

डिजाइन के पंजीकरण का प्रमाण पत्र | Certificate of Registration of Design

डिजाइन सं. / Design No. : 404768-001

तारीख / Date : 17/01/2024

पारस्परिकता तारीख / Reciprocity Date* :

देश / Country :

प्रमाणित किया जाता है कि संलग्न प्रति में वर्णित डिजाइन जो *CONCRETE CUBE TESTING MOULD* से संबंधित है, का पंजीकरण, श्रेणी 25-99 में 1.Atul Balasaheb Jondhale 2. Rushikesh Vilas Kolhe 3.Akshay Gavnath Tambe 4.Varsha Vitthal Yewale के नाम में उपर्युक्त संख्या और तारीख में कर लिया गया है।

Certified that the design of which a copy is annexed hereto has been registered as of the number and date given above in class 25-99 in respect of the application of such design to *CONCRETE CUBE TESTING MOULD* in the name of 1.Atul Balasaheb Jondhale 2. Rushikesh Vilas Kolhe 3.Akshay Gavnath Tambe 4.Varsha Vitthal Yewale.

डिजाइन अधिनियम, 2000 तथा डिजाइन नियम, 2001 के अध्यधीन प्रावधानों के अनुसरण में।

In pursuance of and subject to the provisions of the Designs Act, 2000 and the Designs Rules, 2001.

जारी करने की तिथि :
Date of Issue : 06/06/2024

उन्नत की चंडिव

महानियंत्रक पेटेंट, डिजाइन और व्यापार चिह्न
Controller General of Patents, Designs and Trade Marks

*पारस्परिकता तारीख (यदि कोई हो) जिसकी अनुमति दी गई है तथा देश का नाम। डिजाइन का स्वत्वाधिकार पंजीकरण की तारीख से दस वर्षों के लिए होगा जिसका विस्तार, अधिनियम एवं नियम के निबंधनों के अधीन, पाँच वर्षों की अतिरिक्त अवधि के लिए किया जा सकेगा। इस प्रमाण पत्र का उपयोग विधिक कार्यवाहियों अथवा विदेश में पंजीकरण प्राप्त करने के लिए नहीं हो सकता है।

The reciprocity date (if any) which has been allowed and the name of the country. Copyright in the design will subsist for ten years from the date of Registration, and may under the terms of the Act and Rules, be extended for a further period of five years. This Certificate is not for use in legal proceedings or for obtaining registration abroad.