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TECHMAG

2K24

VOL 12

MESSAGE FROM DIRECTOR

Dr . J .Girish
CHAIRMAN, GOVERNING COUNCIL, GMRIT
DIRECTOR EDUCATION, GMRVF

It gives me an immense pleasure to present TECHMAG 2K24 brought out by the students of GMR Institute of Technology. The magazine covers the focused research areas of the students from various branches of engineering under the guidance of distinguished faculty members. It helps the junior students to know about the emerging areas in science and technology and thereby choosing minor and major projects.

It enables the students to choose and interact with the faculty members based on their areas of interest as their guide. I am happy to mention that the areas covered are extensive and various emerging fields like real-time multi-disease prediction by using deep learning techniques, MIMO antenna for 5G applications, pantographs, smart water supply system, metal matrix composites through powder metallurgy, synthesis of hydroxyapatite from Labeo Rohita fish scale for Biomedical applications etc.The magazine articles illustrate the agility of GMRIT students and distinctiveness of faculty members for guiding the students to learn and become expertise in the niche areas. I congratulate the editor, student coordinators and faculty members for bringing up this excellent magazine. I appreciate all students who have contributed their articles.

MESSAGE FROM PRINCIPAL

Dr .C .L .V .R .S .V .PRASAD
PRINCIPAL,GMRIT

TECHMAG is a technical annual student's magazine with a prime objective of creating a platform to share and bring out innovations in the Technology among the peers. I am very glad to share that GMRIT keeping up its tradition is bringing its Silver Jubilee edition of "TECHMAG" for the year 2023-24.
Innovative skills need to be nurtured among young engineers to provide technical solutions for the sustainability and development

Targeting this TECHMAG allows young talents to exchange novel ideas and global trends in the technological arena in the form of articles. I am greatly impressed that since its inception in 1997, GMRIT is stiving hard in providing an enabling environment contributing to the development of innovative and technical writing skills. I convey my best wishes to the editorial board and the students who have contributed to this Silver Jubilee addition of TECHMAG.

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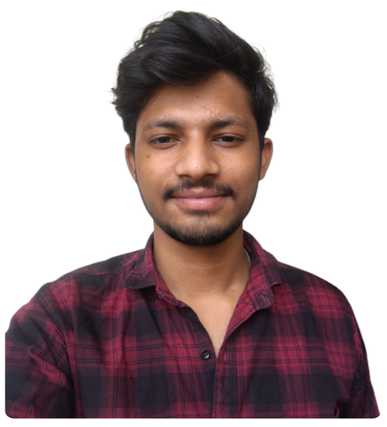

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REVIEW ARTICLES

Enhancing Crop Selection and Yield Forecasting in Indian Agriculture through Advanced Machine Learning Methods

T. Guna Teja – 20341A12B6
P. Thirupathi Reddy – 20341A1289
T. Gowtham –20341A12B4
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ABSTRACT

The agricultural sector's role in ensuring global food security, especially in India, where maximizing productivity and resource utilization is paramount. The proposed paper aims to employ machine learning methods to predict crop yields and offer tailored crop recommendations, effectively addressing significant agricultural challenges. The overarching goal is to equip farmers with data-driven insights to make well-informed decisions and improve agricultural productivity and crop outcomes. The initial phase of the paper involves developing a reliable model for forecasting crop yields using machine learning techniques. Historical data on soil properties, past crop performance, and climate conditions will be analyzed to train the model. This enables farmers to accurately anticipate crop yields based on a variety of environmental factors, thereby enhancing their decision-making capabilities. In addition to yield prediction, the paper includes a crop recommendation system designed to assist farmers in selecting the most suitable crops for their specific conditions. By leveraging information on soil quality, climate, and regional farming practices, personalized recommendations will be provided to optimize crop selection and promote the foeming practices.

Through the integration of tailored recommendations and predictive analytics using Random Forest classifier, decision tree classifier, SVM, and KNN, the paper aims to support farmers in making informed decisions about crop selection. The utilization of Random Forest regressor and decision tree regressor for crop yield prediction is anticipated to enhance agricultural decision-making, potentially leading to increased crop yields, resource efficiency, and overall sustainability in agriculture. The adaptability and scalability of this paper position it as a valuable tool for numerous farming communities in India, contributing to the global imperative of addressing food security crises.

Keywords:
Machine Learning, Decision Tree, Random Forest, Support vector machines (SVMs), K-Nearest Neighbors (KNN)

INTRODUCTION

Modern technology and traditional farming methods share a deep and interdependent relationship that is integral to understanding the intricate landscape of Indian agriculture. The stability of millions of farmers within the country's economy hinges on maintaining this delicate balance, which ultimately ensures food security. Our objective extends beyond mere predictions; it is about providing practical solutions to farmers that harmonize with the intricacies of their daily lives.

This research not only showcases the adaptability and resilience of farmers as they adeptly integrate technology into traditional methods but also transcends mere mathematics and statistics. Our aim is to unite the transformative capacity of machine learning with the enduring traditions of agriculture, thereby bridging the gap between tradition and innovation. The ultimate goal is to foster a sustainable future for Indian agriculture, prioritizing not just optimal crop choices and yield predictions, but also cooperative efforts that amalgamate data, algorithms, and agricultural wisdom. In a world rife with uncertainties and climate change concerns, manual predictions become less dependable. Here, machine learning emerges as a reliable compass that steers forecasts toward accuracy and precision. This journey encompasses more than a scientific exploration; it represents the spirit of adaptability and resilience entrenched in Indian agriculture. As we traverse agricultural landscapes, the significance of technology is quantified not only in numbers but also in abundant yields, improved quality of life, and the potential for a sustainable future in farming. This is more than a mere research endeavor; it serves as a testament to the resilience and ingenuity of Indian rural communities. . The aim of this work is to acknowledge the complexity of agricultural ecosystems and comprehend the nuanced distinctions in climate, soil, and crop types present in each locality. By steering towards sustainable agricultural practices, farmers, researchers, and technologists embark on this journey collectively, instead of navigating it alone. Through the integration of advanced technologies like deep learning and machine learning, the project seeks to empower farmers with actionable insights to effectively navigate dynamic market conditions and environmental shifts.

PROPOSED METHODOLOGY

The aim of this study is to optimize crop selection and yield prediction, which can be achieved by following the workflow depicted in figure1.

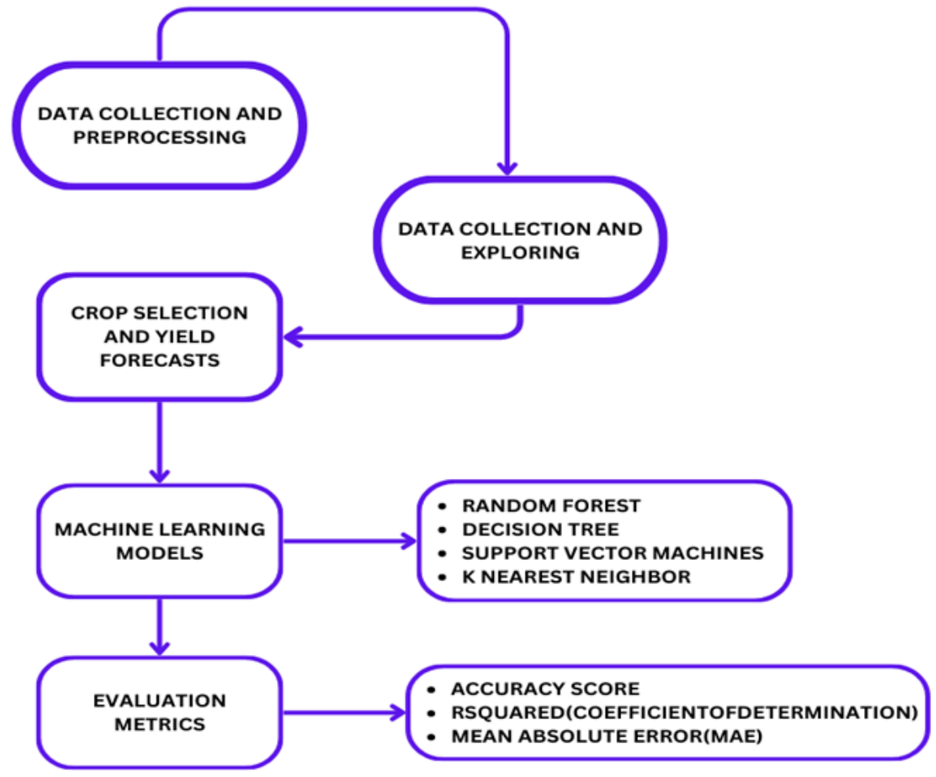

Fig 1. Workflow of the proposed model

Data Collection and Preprocessing :

Our data collection began with the gathering and analysis of a dataset related to Indian farming. This dataset includes columns for State_Name, District_Name, Crop_Year, Season, Crop, Area, Production, N, P, K, temperature, humidity, pH, rainfall, and label. To conduct further analysis, the dataset was loaded into memory using Python's pandas library. Upon loading, the column names were reviewed to understand the dataset's characteristics and structure. Statistical inference provided important insights into the dataset's distribution and key patterns. Additionally, the dataset was meticulously checked for any missing values in its columns. The 'isnull()' function, combined with 'sum()', was used to count the number of missing values in each column. To ensure data consistency and integrity.

Data Preprocessing and Exploration :

A critical aspect of obtaining the dataset for subsequent modeling tasks involved data preprocessing and exploration. Ensuring the completeness of the dataset was achieved by addressing missing values, specifically by removing rows containing null values. Categorical variables within the dataset were encoded using one-hot encoding, making them suitable for use in machine learning models. Different subsets of the dataset were created to facilitate crop selection and yield forecasting. This approach simplified the focused preparation and evaluation of the models. To guarantee a fair assessment of the model's performance, the dataset was divided into training and testing sets using a built-in function.

Crop Selection and Yield Forecasts :

Divide the dataset into training and testing sets for both predicting crop yield and selecting crops. This entails utilizing Random Forest Regressor and Random Forest Classifier models on the respective training datasets for these purposes. In the crop selection process, the model evaluates the optimal crop yield for cultivation based on provided constraints. Factors such as nutrient levels (N, P, K), environmental conditions (temperature, humidity, pH, rainfall), and geographical data (State Name, Region Name) are considered. Through this process, the model determines the most suitable crop for cultivation, assisting farmers in resource allocation and decision-making.

For yield forecasts, the model utilizes data limitations like geographic region, crop details (Harvest Year, Season), and farming locality. By analyzing this information, the model generates predictions regarding crop yields, thereby aiding rural communities in resource allocation and facilitating informed decision-making among farmers.

Machine Learning Models :

The Random Forest algorithm, utilizing collaborative learning techniques, is widely acknowledged for its ability to handle intricate datasets and mitigate overfitting issues. It is commonly applied in both classification and regression tasks due to its capability to enhance predictive accuracy and resilience. By constructing multiple decision trees and combining their predictions, Random Forest emerges as a favored choice across various applications. Decision trees, on the other hand, are valued for their simplicity and interpretability, making them suitable for agricultural decision-making processes. They recursively segment datasets based on feature attributes, aiding in the identification of actionable insights and decision pathways. Support Vector Machines (SVMs) excel in processing intricate datasets with numerous features, particularly in classification scenarios where detecting intricate relationships is crucial. By determining an optimal hyperplane that maximizes the margin between distinct class data points, SVMs deliver exceptional performance. K Nearest Neighbor (KNN) is well-suited for agricultural yield forecasts due to its intuitive approach to classification and regression tasks. Leveraging proximity-based logic, KNN assigns labels to new data points based on the majority class of their nearest neighbors, offering a straightforward yet effective prediction mechanism.

Evaluation Metrics :

The project assessed machine learning models using a variety of evaluation criteria, including accuracy score, R-squared, and Mean Square Error (MSE). These criteria were used to measure the models' performance and consistency across different assignments.

The accuracy (1) score provided a numerical measure of how precise the model was in predicting crop labels. It calculated the percentage of correct predictions by comparing predicted labels with actual labels in the test dataset. Higher accuracy scores indicated better classification accuracy and performance in crop selection tasks.

$$Accuracy = \frac{Total\ number\ of\ Predictions}{Number\ of\ Correct\ Predictions}$$

The R-squared value (2), also known as the coefficient of determination, was crucial for evaluating the accuracy of yield forecasts. It measured the percentage of variation in yield that could be explained by the predictors (features) in the model. A higher R-squared value indicated a stronger relationship between predicted and actual yield values, demonstrating the model's ability to accurately capture variations.

$$R^2 = 1 - \frac{\sum_{i=1}^{n}(y_i - \hat{y}_i)^2}{\sum_{i=1}^{n}(y_i - \bar{y})^2}$$

Mean Square Error (MSE) (3) measured the average deviation between projected yield values and actual observations. It assessed the model's ability to predict yield values accurately, regardless of the direction of errors. A lower MAE reflected greater precision and reliability, indicating a smaller average deviation between predicted and actual yields.

$$\mathrm{MSE} = \frac{1}{n}\sum_{i=1}^{n}(y_i - \hat{y}_i)^2$$

CONCLUSION

The study concludes that Random Forest emerged as the optimal choice for both crop selection prediction and yield forecasting in the project. The superior accuracy and predictive capabilities of Random Forest, as compared to Decision Tree, SVM, and KNN models, demonstrates its efficacy in supporting farmers' decision-making processes. By leveraging Random Forest models, agricultural stakeholders can make informed crop selections based on soil and climate attributes, ultimately leading to improved yield outcomes. Moreover, the ability of Random Forest to effectively handle complex datasets and mitigate overfitting ensures precise forecasts, thereby contributing to the adoption of sustainable farming practices. As a result, the implementation of Random Forest algorithms holds promise for enhancing yield projections and crop selection strategies, consequently fostering productivity and resilience in Indian agriculture.

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GAN-Augmented Deep Learning Approaches for Copy-Move Forgery Detection in Digital Media

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ABSTRACT

Detecting copy-move forgeries is essential in the area of digital image forensics, as it aids in identifying sections of an image that have been duplicated and repositioned within the same image to mislead viewers. This paper offers a comprehensive overview and analysis of the newest advancements in methods for detecting copy-move forgeries, drawing on a collection of 25 research papers published between 2016 and 2023. Our review covers a range of deep learning frameworks, feature extraction techniques, and fusion strategies used to enhance the accuracy of forgery detection and localization. We also explore the advantages, limitations, and potential future research avenues of these approaches, offering valuable insights for both researchers and professionals in digital image forensics.

INTRODUCTION

The ubiquity of digital imagery in contemporary society has rendered it a cornerstone of communication and documentation across various sectors. However, this prevalence has also facilitated the proliferation of digital image manipulation, threatening the veracity of visual information.

One of the most deceptive forms of image manipulation is copy-move forgery occurs when portions of an image are duplicated and moved to various spots within the same image. This technique is commonly used to hide or alter important visual information, making it difficult for viewers to detect any changes. This deceitful practice compromises the integrity of digital content, necessitating robust detection mechanisms. Effective identification and localization of copy-move forgeries are pivotal in safeguarding the authenticity of visual data, vital for fields ranging from journalism to criminal investigations.

Additionally, handcrafted features such as texture descriptors, color moments, and geometric invariants have been effectively utilized in conjunction with deep learning models to improve detection accuracy.

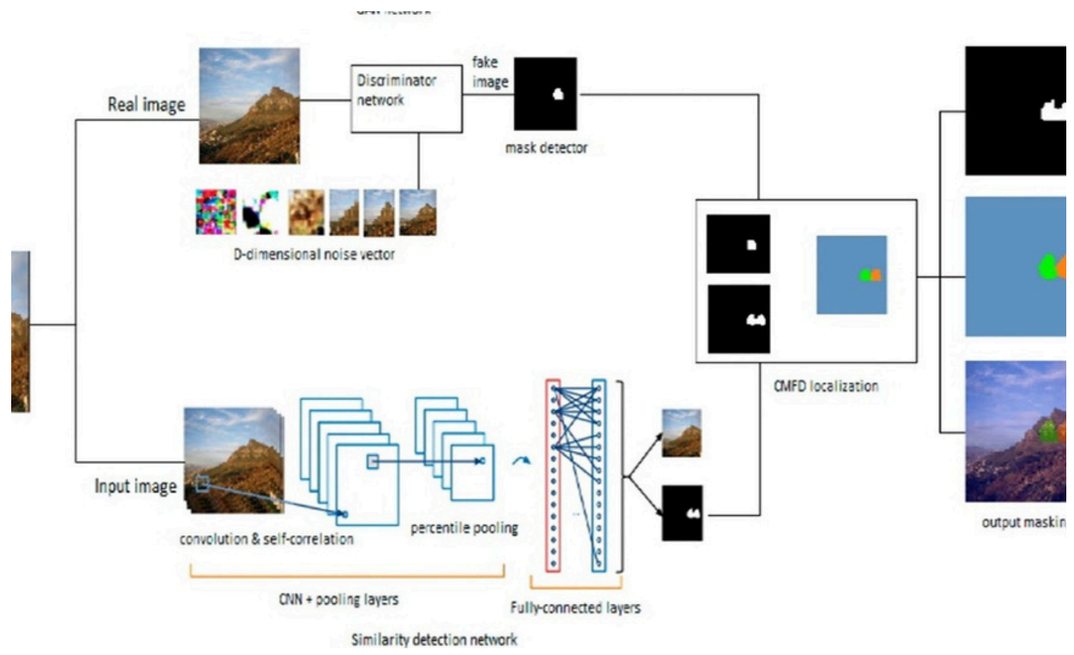

Fig 1. Workflow of the Project

Deep Learning-Based Approaches:

A significant portion of the selected papers leveraged deep learning architectures for detecting copy move forgeries. These approaches encompassed various Neural network models, such as Convolutional Neural Networks (CNNs) and Convolutional Long Short-Term Memory (ConvLSTM) networks

D., and Dense-InceptionNet. However these models were trained on large set of datasets of manipulated and authentic images to learn discriminative features indicative of copy-move forgeries. Additionally, novel architectures such as DOA-GAN and RobusterNet introduced attention mechanisms and generative adversarial networks to enhance detection and localization accuracy.

Handcrafted Feature Extraction Techniques:

Several papers explored handcrafted feature extraction methods as complementary approaches to deep learning. These techniques involved extracting features such as color moments, texture descriptors, and geometric invariants from image patches. Feature vectors were then fed into traditional machine learning classifiers or used as inputs to hybrid architectures combining deep learning and handcrafted features. The combination of deep features and handcrafted, illustrated in "Fusion of Handcrafted and Deep Features for Forgery Detection in Digital Images," aimed to leverage the strengths of each approach to achieve better detection performance

Hybrid Approaches and Fusion Strategies:

Hybrid approaches combining deep learning and handcrafted feature extraction emerged as a promising direction in copy-move forgery detection.Techniques such as parallel feature fusion and multi-scale, multi-stage deep learning models integrated the complementary strengths of different methodologies. Fusion of multiple deep learning algorithms with ELA showcased the efficacy of combining diverse neural network architectures to improve detection robustness. Furthermore,. papers like An Effective A method for detecting copy-move forgeries that uses adaptive watershed segmentation, AGSO, and hybrid feature extraction highlighted the importance of incorporating domain-specific knowledge and adaptive segmentation techniques.

Challenges and Future Directions:

Despite the remarkable progress in our copy-move forgeries detection, several challenges persist in the field. Addressing these challenges requires ongoing research efforts focused on improving robustness, computational efficiency, and generalization to diverse forgery types. Future directions may involve exploring novel architectures capable of handling complex forgery scenarios, devising efficient feature representation schemes, and developing .

By tackling all these challenges, researchers aim to advance the state-of-the-art in detecting forgeries of images and bolster the integrity of digital visual content in an increasingly digitized world.

CONCLUSION

The GAN-enhanced deep learning strategy for detection of copy-move forgery and localization in digital images integrates Generative Adversarial Networks (GANs) with forgeryNASnet architecture, demonstrating superior accuracy and robustness over traditional methods. Experimental validations confirm improved detection and localization accuracy, resilience against adversarial attacks, and adaptability to diverse datasets. Output masking techniques refine the process, providing precise forensic analysis. Challenges include addressing the diversity and sophistication of image manipulation techniques, ensuring robustness across various datasets and scenarios, interpreting model decisions, and addressing ethical concerns. Despite challenges, the approach offers promising advancements in digital image forensics, empowering the detection and localization of copy-move forgeries in real-world applications. Continued research, collaboration.

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Secure File Storage System using Hybrid Cryptographic mechanisms

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ABSTRACT

Keeping information secure and organized has grown to be a difficult task in the modern world. Hackers were able to get beyond every security precaution that had been put in place and still access the data. A security level cannot be established for data that is completely vulnerable. Cryptography was developed to ensure the CIA trinity in every application. By applying standard techniques to reverse-engineer the algorithms, attackers gained access to private information. This hypothesis states that using hybrid solutions would protect the resources and data to some extent. By making these techniques more complex, it is possible to prevent confidential data from leaving any database or application. This research recommends using hybrid cryptography to protect the files. This method employs the encryption techniques ECC (Elliptical Curve Cryptography) and AES (Advanced Standard Encryption) to increase file secrecy and SHA-3 for file integrity. KDF (Key Derivation Function) adds an additional salt to the key used for file encryption to make it resistant to dictionary and brute-force attacks. Adversaries won't be able to use traditional techniques to decode the passwords because to the integration of these techniques. Because the encryption key was produced randomly, hackers cannot decode it even if they get to access the files stored in the database without authority.

Keywords

Cryptography, reverse-engineering, ECC, AES, KDF, Brute force attacks, Dictionary attacks.

INTRODUCTION

A basic foundation in information security is the CIA Triad, which stands for Confidentiality, Integrity, and Availability. Information is only available to those who are allowed to access it, thanks to confidentiality. Integrity guarantees that data is reliable and accurate throughout the duration of its existence. Information must always be constantly available to authorized users when they need it. The art and science of using mathematical methods to secure information and communication is known as cryptography. It entails utilizing algorithms and keys to encode plaintext into cipher text. Transmitting data with secrecy, integrity, and validity is guaranteed by cryptography. Systems for storing and managing digital data files are either hardware or software solutions. They put files in an orderly hierarchy so they may be managed and retrieved with ease.To meet a range of storage requirements, these systems frequently come with features like redundancy, scalability, and access controls. Distributed file systems, cloud storage, and network-attached storage (NAS) are a few examples. Ransomware assaults on cloud storage platforms, improper access restrictions, and storage solution vulnerabilities are current trends in file storage attacks. Phishing attacks frequently try to get login credentials for cloud storage accounts in order to grant unauthorized users access to private data. Attacks using file-less malware circumvent conventional detection techniques by taking advantage of flaws in file storage protocols or software.

For centralized storage inside enterprises, local file servers and network-attached storage (NAS) devices are also frequently utilized. Using removable storage devices, such as USB flash drives and optical discs (such as CDs and DVDs), for sharing and portable file storage is another conventional technique. A cryptographic method that blends symmetric and asymmetric encryption techniques is called hybrid cryptography. It makes use of asymmetric encryption's security for key exchange and symmetric encryption's speed for data transport. To establish secure communication, a symmetric session key is usually encrypted using an asymmetric public key and given to the receiver, who then decrypts it using their private key. Because hybrid cryptography can balance efficiency and security, it is very helpful for file storage. While symmetric encryption lacks the reliable key exchange method required for safe transmission, asymmetric encryption can be computationally demanding when encrypting and decrypting big files. Hybrid cryptography ensures secure key exchange using asymmetric encryption and allows for efficient file encryption using symmetric encryption

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2.Under each heading we have noted which paragraph style to use – for example)." Again, those notes are not part of the headings

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METHODOLOGY

Symmetric Cryptography:

Utilizing a single key for both encrypting and decrypting data, symmetric encryption is a form of cryptographic technique. This indicates that communication can only be encoded and decoded if both the sender and the receiver possess the identical secret key.

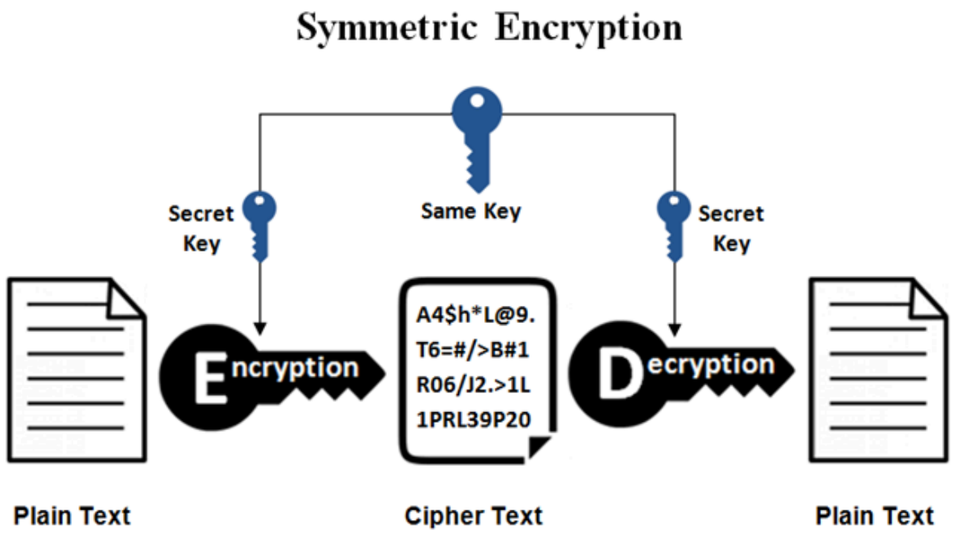

Fig 1. Symmetric Encryption

Asymmetric Cryptography:

Asymmetric encryption, also referred to as public-key encryption, involves the encryption and decryption of data using a set of keys. This encryption method offers greater security compared to symmetric encryption because it is infeasible for an individual without the private key to decode the data, even when possessing the public key.

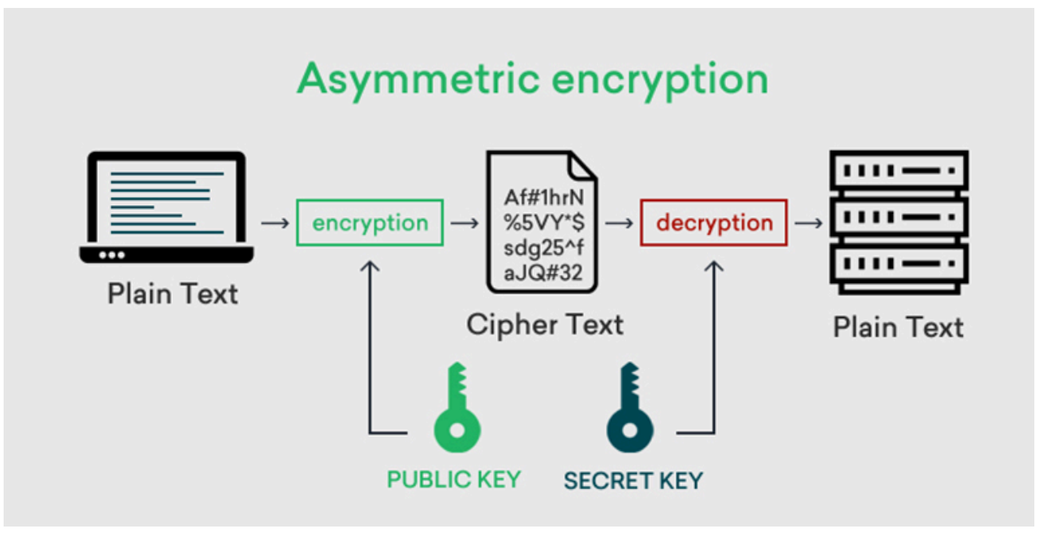

Fig 2. Asymmetric Encryption

Advanced Encryption Standard (AES) algorithm:

The Advanced Encryption Standard (AES) is a cryptographic algorithm designed to encrypt and decrypt data securely using a shared key. Unlike simpler encryption methods, AES employs multiple rounds of substitution, transposition, and mixing operations to enhance its resistance against attacks. This guide provides an in-depth overview of AES, covering its fundamental principles, operational mechanisms, and significance in safeguarding online security.

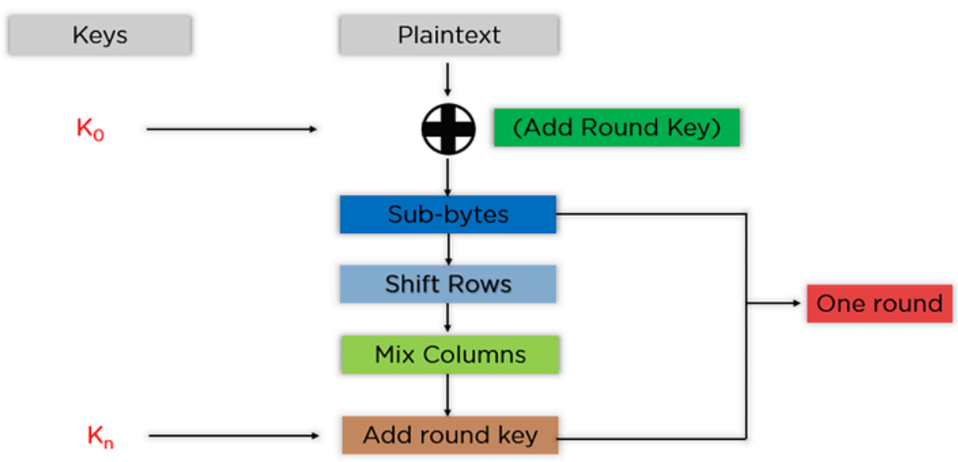

Fig 3. Flow of AES Encryption

Secure Hashing Algorithm (SHA):

The term secure hashing algorithm is SHA. A tweaked variant of MD5, SHA is used to hash certificates and data. A hashing algorithm employs bitwise operations, modular additions, and compression functions to reduce the input data into a compact and incomprehensible form. The primary difference between hashing and encryption lies in the fact that hashing is unidirectional, implying that after data is hashed, breaking the resulting hash digest necessitates a brute force attack.

Bcrypt Algorithm:

A cryptographic hash function called Bcrypt is intended to hash passwords and securely store them in the backend of apps so as to reduce their vulnerability to dictionary-based intrusions.

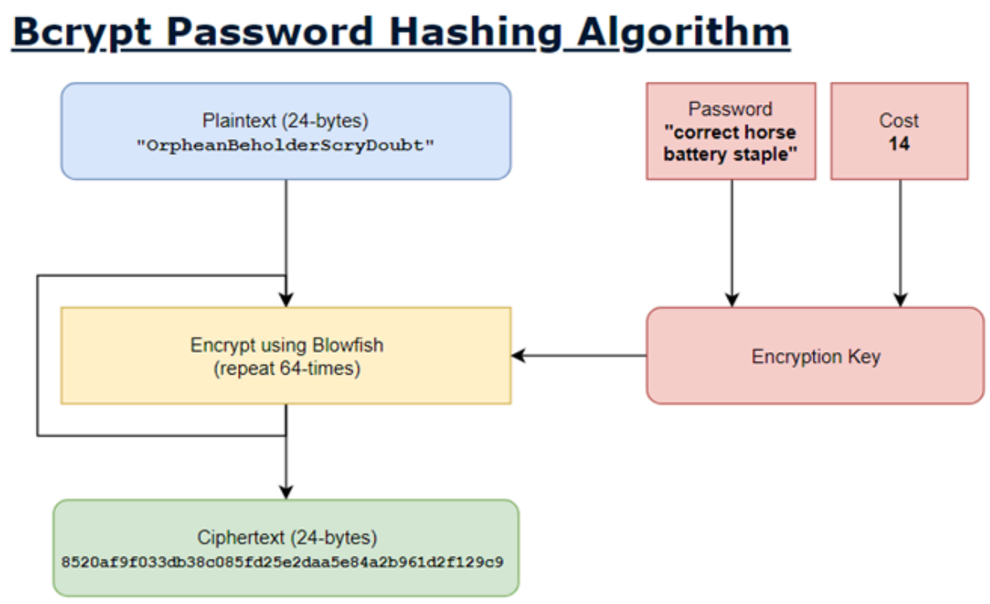

Fig 4. Flow of bcrypt algorithm

We found that, despite current methods and strategies, file securities are not secure against confidentiality and integrity threat. This combines the research to create a novel method that employs hybrid use of powerful and standard encryption methods. The modules that comprise a secure file storage system are as follows:

Shared Secret Key Generation:

The password is sent to the server in clear text when a user register using three-factor authentication. The creation of public and private keys for the user and server will be the first thing to do. Of the asymmetric techniques, Elliptical Curve Cryptography (ECC) is the most favored for better security and embedding. The creation of public and private keys for the user and server by this procedure signifies the start of a session. Since the keys were different for each session, they will be kept in the server database. The server now uses the Elliptical Curve Diffie Hellman (ECDH) method to create a shared secret key. This key is required for additional calculations.

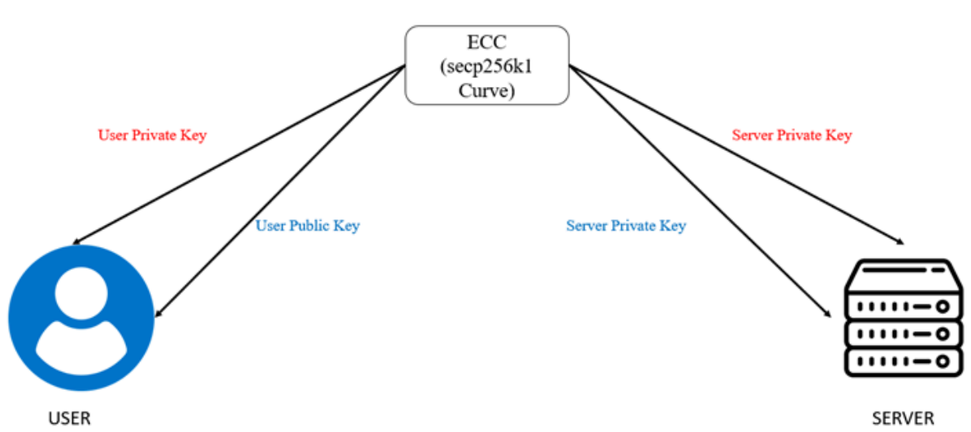

Fig 5. ECC share of keys

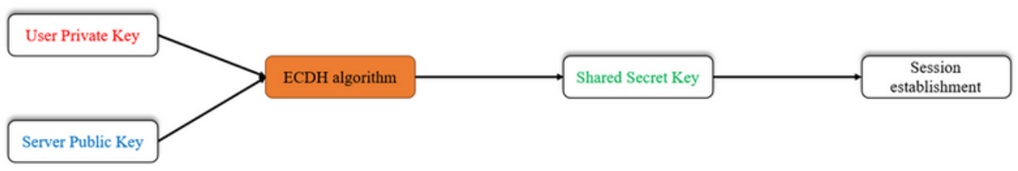

Fig 6. Generation of Shared Secret Key and session establishment

Key Derivation:

Encrypting files using the password in plain text would leave up the possibility of attack. Consequently, randomization ought to be required for file encryption. In this case, the parameters are used to produce keys via the Key Derivation Function (KDF). Among the algorithms that compute key derivations are bcrypt and PBKDF. Salt, the number of iterations, the hash algorithm, and plain text are mandatory arguments. Based on the number of repetitions, the Bcrypt algorithm generates a random hashed key called "salt." The number of iterations that the password goes through in order to hash itself using the salt is specified. Therefore, Bcrypt gives us a derived key after requesting the number of iterations, plain text, and hash algorithm.

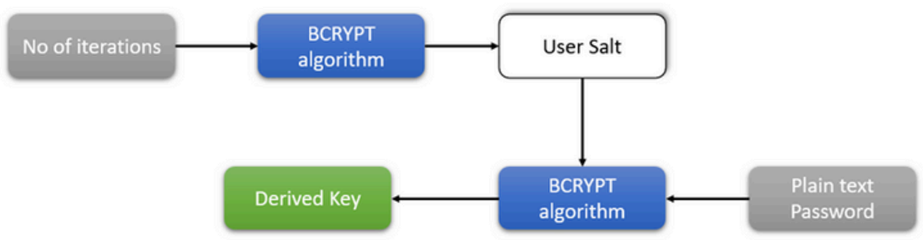

Fig 7. Derived Key Generation from bcrypt

Cutdown to 256 bits:

Once the keys are combined, the Advanced Encryption Standard (AES) Symmetric technique may be used to encrypt the data. Nevertheless, the maximum bit size that the AES method allows for data encryption is 256 bits, therefore the key may be larger. We utilize the SHA-3 hash technique, which uses the user's salt to build a 256-bit hash key, to reduce it to 256 bits. File encryption with AES is accomplished via SHA-3, which generates the final symmetric key after receiving the combined password and user salt.

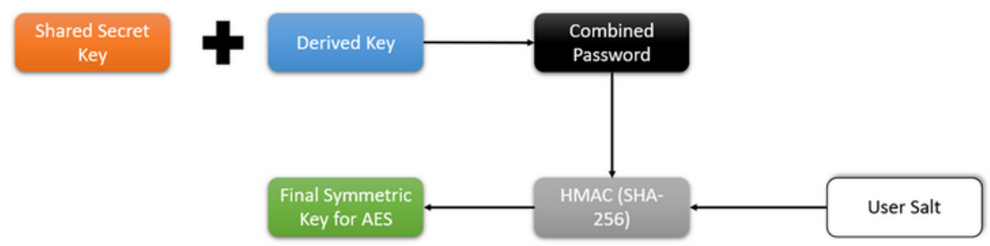

Fig 8. Final AES key from shared and derived keys

CONCLUSION & FUTURE SCOPE

In conclusion, the comparison between bcrypt, Argon2, and PBKDF2 reveals their distinct characteristics in terms of security, resistance to attacks, computational cost, and ease of implementation. Bcrypt stands out for its strong security features and resistance to GPU-based attacks, making it suitable for a wide range of applications. Argon2 offers even higher levels of security but comes with increased memory and computational requirements, which may be justified for applications requiring the utmost protection. Meanwhile, PBKDF2, although still viable, falls short in security compared to bcrypt and Argon2. Moving forward, future research and development efforts are essential to discovering even more secure hashing methods. Standardization initiatives can help establish uniform security practices across different platforms, while the integration of newer algorithms into popular frameworks and libraries can facilitate their widespread adoption. Educating users about the benefits of modern hashing techniques is also crucial for enhancing overall security awareness. Moreover, as technology continues to evolve, hashing algorithms must adapt to emerging threats such as quantum computing, underscoring the importance of ongoing research in this area to develop future-proof solutions.

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Chat Analyzer: Real–time Sentiment and Language Analysis

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ABSTRACT

The Chat Analyzer project develops an advanced tool for real–time sentiment and language analysis of chat conversations. Using cutting–edge natural language processing (NLP) techniques and machine learning algorithms, the Chat Analyzer provides comprehensive insights into sentiment, emotion, and linguistic patterns. Integrated with Streamlit, it offers a user–friendly web interface for interactive visualization of analysis results.The system accurately detects sentiment, identifies emotions, and extracts important entities from chat data. With applications in customer support, social media monitoring, and community management, the Chat Analyzer empowers businesses to understand customer sentiment, track trends,and ensure a respectful environment. The Chat Analyzer revolutionizes chat conversation analysis by combining advanced NLP algorithms with real–time analysis and intuitive visualization.

Keywords

Chat Analyzer, Linguistic Patterns, Stream Lit interface.

INTRODUCTION

The process of using the Chat Analyzer is straightforward. Users input the chat data into the system or connect it to existing chat systems via APIs. The systemthen processes the datain real time, performing sentiment analysis to classifythe chat messages as positive, negative,or neutral. . It goes beyond sentiment analysis to identify the underlying emotions expressed in the text, providinga deeper understanding of the conversations.

The Chat Analyzer extracts important entities from the chat, such as names,locations, and dates, enhancing the contextual understanding of the chat content. The usage of the Chat Analyzer is diverse. In customer service, it allows businesses to monitor customer sentiment and gauge customer satisfaction levels. Social media managerscan leverage the tool to track publicopinion and identify emergingtrends. Community moderators benefit from the Chat Analyzer's ability to detect offensive or inappropriate language, maintaining a respectful and inclusive environment.

The Chat Analyzer simplifies the process of analyzing chat conversations by providingreal–time sentiment and language analysis. With its user–friendly interface and powerful NLP capabilities, the tool enables users to gain valuable insights, make informed decisions, and enhance their chat–based interactions.

Problem Statement :

Develop an effective solution for WhatsApp chat analysis to extract meaningful insights and patterns from conversations, enabling users to gain valuable information and improve their understanding of the communication dynamics within the chat groups or individual conversations.

Existing System :

In the past,analyzing chat conversations was done manually, which was slow and time–consuming. Existing tools for sentiment analysis lacked the ability to detect complex emotions in chats. Visualizing the results was limited and difficult to understand. However, the Chat Analyzer has changed the game. It uses advanced technology to analyze chats in real time, capturing the dynamic nature of conversations. Its user–friendly interface presents the analysis results in an easy–to–understand way. The Chat Analyzer is more accurate,efficient

METHODOLOGY

The Chat Analysis application represents an innovative approach to understanding and deriving insights from chat conversations. This application utilizes cutting-edge Natural Language Processing (NLP) techniques to provide real-time sentiment and language analysis of chat data. By combining powerful NLP algorithms with user-friendly interactive visualizations built using Streamlit, the application empowers users to explore and uncover valuable insights from uploaded chat files. The application encompasses various features including sentiment and emotion analysis, activity patterns, communication trends, entity extraction, and user interaction metrics. Through this comprehensive analysis, businesses, socialmedia managers, and community moderators can gain deep insights into user sentiment, communication patterns, and engagement levels.With a focus on user-friendliness and effective visualization, the Chat Analysis application transforms chat data into actionable insights, fostering informeddecision-making and enhancedinteractions in various domains.

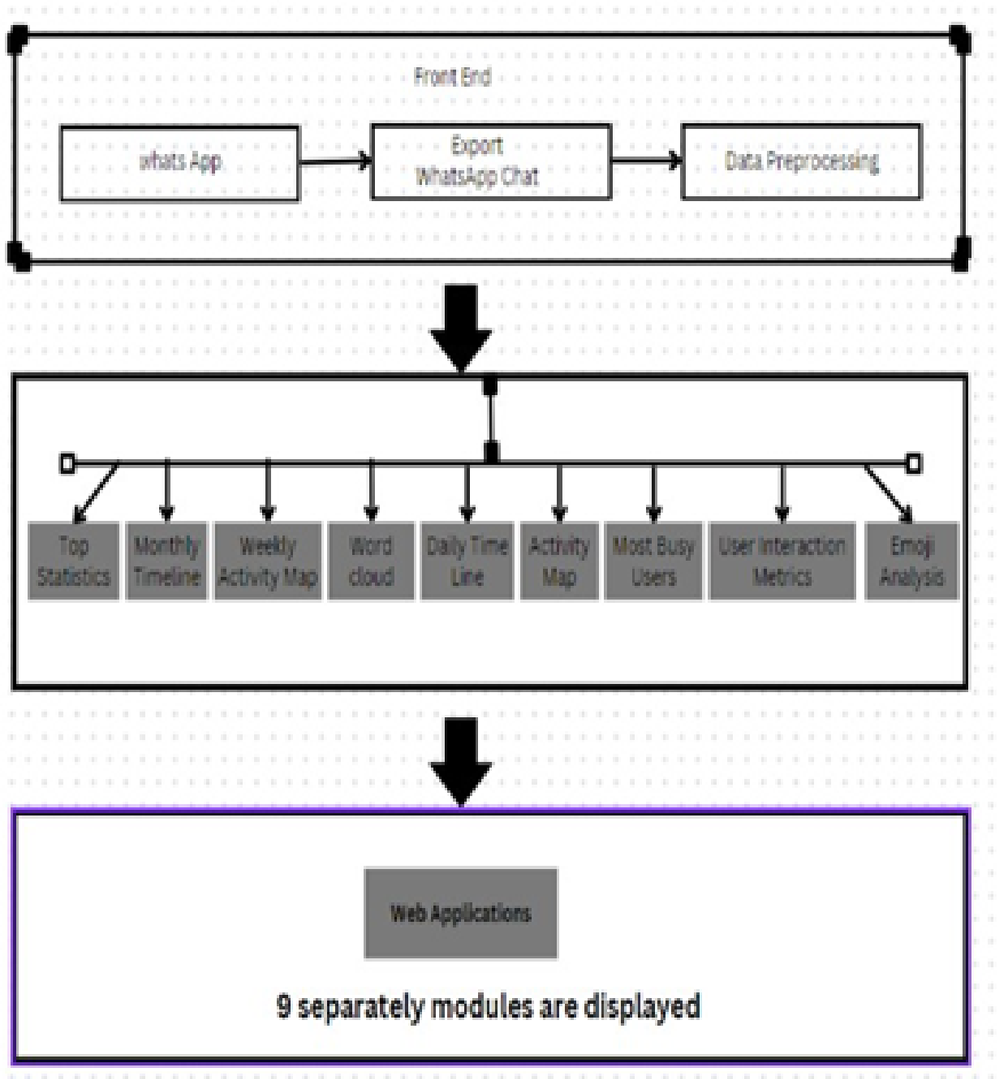

Fig 1 Flow Chart Of Chat Analysis

User Interaction and Data Input:

Users upload chat files containing chat conversations through the user-friendly interface. These files can be in various formats, including text files or CSV.

Data Pre-processing:

The uploaded chat data is processed and cleaned. This involves techniques like tokenization, lowercasing, and removing special characters to prepare the text data for analysis.

Sentiment and EmotionAnalysis:

The application performs sentiment analysis on the pre- processed text, classifying messages as positive, negative, or neutral. Emotion analysis identifies underlying emotional tones expressed in the conversations.

Content Analysis:

Entity Extraction: Identifying important entities like names, locations, and dates, enhancing contextual understanding.

Emoji Analysis: Recognizing and categorizing emojis used in chat conversations.

Activity and Timeline Analysis:

The application conducts monthly and daily timeline analyses to identify trends in chat activities over time. This analysis helps visualize patterns and peaks of interaction.

Communication Patterns:

This step includes:

Word Cloud: A visual representation showcasing frequently used words, providing insights into conversation themes.

Most Common Words: Identifying and highlighting key terms that appear frequently

User Interaction Insights:

The application calculates and presents user interaction metrics, including engagement, session duration, and interactions per user. These metrics provideinsights into user behavior and application usage.

Interactive Visualization:

The application combines the results of sentiment, emotion, content, timeline, communication pattern analysis, and user interaction metrics into interactive visualizations. This step enhances the accessibility and understanding of insights.

User Exploration:

Users interact with the visualizations to explore andanalyze the chat data. They can select specifictime frames, filterdata, and focus on relevant insights

CONCLUSION

In conclusion, the Chat Analyzer project marks a significant advancement in real-time sentiment and language analysis for chat conversations. This innovative tool, driven by state-of-the- art Natural Language Processing (NLP) techniques and machine learning algorithms, offers a comprehensive set of features for extracting valuable insights from chat data. The user-friendly interface, powered by Streamlit, ensures accessibility for a wide range of users, while robust data pre-processing guarantees data integrity. Beyond traditional sentiment analysis, the Chat Analyzer delves into emotions, entities, and timeline trends, providing a holisticview of chat conversations. With applications spanning customer support, social media management, and community moderation, this tool empowers businesses to make informeddecisions and cultivate respectful online environments. It exemplifies the fusion of cutting-edge technology with user- centric design principles and addresses ethical considerations in chat analysis. In essence, the Chat Analyzer project represents a significant step forwardin chat conversation analysis, promising boundless possibilities for enriched interactions and data-driven decision-making across diverse domains.

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AI-Powered Alzheimer's Care: Smart Face Recognition, Medicine Reminders, and Location

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RamPrasad Chippada-21341A053

ABSTRACT

Alzheimer's disease is a progressive neurological disorder characterized by a decline in cognitive functions, memory loss, and behavioural changes. This disease is the most communal cause of dementia, affecting primarily older individuals. Currently, there is no cure for Alzheimer's disease. Treatment mainly aims to manage symptoms and enhance the person's quality of life for the affected individuals. So, for helping them a web application that will incorporate with a Medicine reminder system, Location tracking system and Face recognition system utilizing deep learning models is Formulated. When an Alzheimer's patient interacts with someone, the facial recognition system can quickly identifythe individual and provide relevant information about them, such as their name, relationship to the patient, and any important details. For this a model is created using MTCNN to detect facesand FaceNet for recognizing thosefaces. This technology can help Alzheimer's patients maintain social connections and reduce feelings of confusion or anxiety when interacting with unfamiliar people. Additionally, the web application will include a medicine reminder system, that will send reminders to the patients, ensuring they take their medication on time and in the correct dosage. Location tracking system for patients who may wander or get lost.This feature can help caregivers locate the patient in case they wander away from home. The goal of the project is to support individuals with Alzheimer's disease.

Keywords

Alzheimer's disease, Deep Learning, Face Recognition, MTCNN, FaceNet, Medicine Remainder System, Location Tracking

INTRODUCTION

Alzheimer's disease presents a significant challenge to healthcare systems worldwide, characterized by its progressive nature and profound impact on cognitive functions and daily life. Currently there is no cure, the main focus is on managing symptoms and making life better for those affected. individuals are paramount. In response to this pressing need, a novel approach has been introduced for leveraging advanced technology to support Alzheimer's patients – a comprehensive web application integrating three vital systems:facial recognition, medicinereminder, and location tracking is proposed.

The cornerstone of the application lies in its ability to provide real-time assistance to Alzheimer's patients during social interactions. Utilizing state-of-the-art deep learning models, such as MTCNN for face detection and FaceNet for face recognition, the system swiftly identifies individuals the patient interacts with, offering pertinent information, including their name, relationship, and relevant details.This innovative technology aims to alleviate the challenges faced by Alzheimer's patients, facilitating smoother social interactions and reducing feelings of confusion or anxiety [11].

Beyond social interaction support, the web application incorporates a robust medicine reminder system. Timely medication adherence is crucial for managing Alzheimer's symptoms effectively. The system ensures patients receive timely reminders, aiding in medication compliance and dosage accuracy.

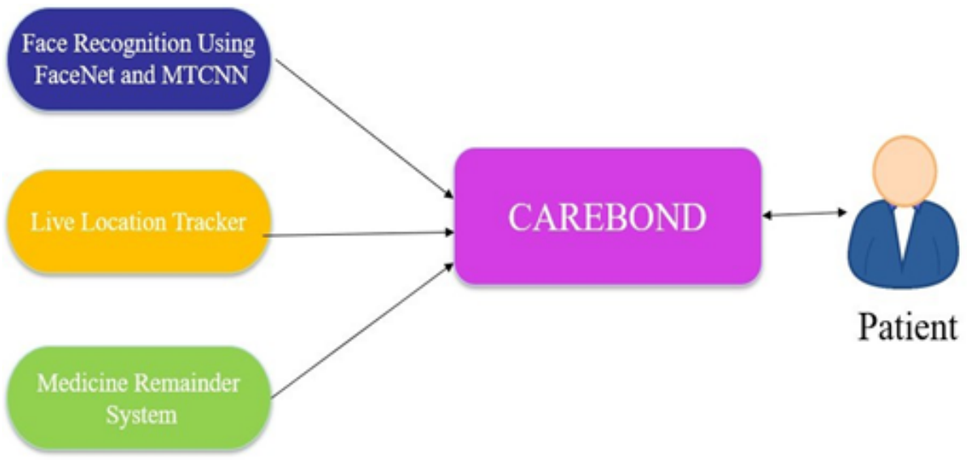

Fig 1. Carebondapplication features

Furthermore, acknowledging the propensity of Alzheimer's patients to wander or get lost, so a reliable location tracking system is integrated to the application. Caregivers can effortlessly monitor the patient's whereabouts, swiftly locating them in case of wandering incidents. This feature not only enhances patient safety but also provides caregivers with peace of mind.

In summary, the research endeavors to address the multifaceted challenges encountered by Alzheimer's patients and their caregivers through the development of a comprehensive web application. By harnessing the power of cutting-edge technology, the aim is to empower individuals with Alzheimer's disease, enriching their lives, promoting safety, and fostering meaningful social connections [10].

METHODOLOGY

What is Face Recognition?

Face recognition is a technology that identifies or verifies individuals by analysing their facial features. It works by capturing facial images, extracting unique characteristics, and comparing them with known faces to determine a perfect match. It is commonlyused for authentication, identification, and classification purposes in various industries [10].

There are mainly 3 stages of face recognition:

1.Face Detection

2.Feature Extraction (Face Embeddings Extraction)

3.Classification

A.FACE DETECTION

Face detection is the technique used to locate and identify human faces within images or video frames. The primary goal is to determine whether or not a face is present in a given image or frame, and if so, to locate its position and size [16][19].

There are many architectures are available but out of these MTCNN is more conventional in terms of computational and accuracy.

Reasons for usingMTCNN are:

·Achieves high accuracy in detecting faces under challenging conditions like varying lighting, pose, and occlusion.

·Performs face detection, bounding box regression, and facial landmark localization simultaneously, improving overall performance.

·Can detect faces even when partially occluded by objects or other people, making it usefulin crowded scenes.

·Accurately locates eyes, nose, and mouth in the image, enabling advanced applications like facial expression detection and estimation of pose [25].

Multi-task Cascaded Convolutional Neural Networks (MTCNN)

MTCNN is a highly effective face detection algorithm that operates through three distinct stages, each facilitated by its own neural network. In the Proposal Network (P-Net), the initial stage, the input image undergoes convolutional layers to extract features, followed by ReLU activation for introducing non-linearity, and max-pooling layers to down sample feature maps [25].

This stage culminates in predicting the probability of a face'spresence and refiningbounding box proposals. Subsequently, the Refinement Network (R-Net) further enhances face classification and adjusts boundingbox proposals based on the refined predictions from P-Net. Finally,in the Output Network (O-Net), refined bounding box proposals are processed along with facial landmark localization to further refine face classification and predict facial landmark coordinates within each bounding box. This cascaded approach ensuresthe progressive refinement of face detection, optimizing accuracy and robustness across conditions [6].

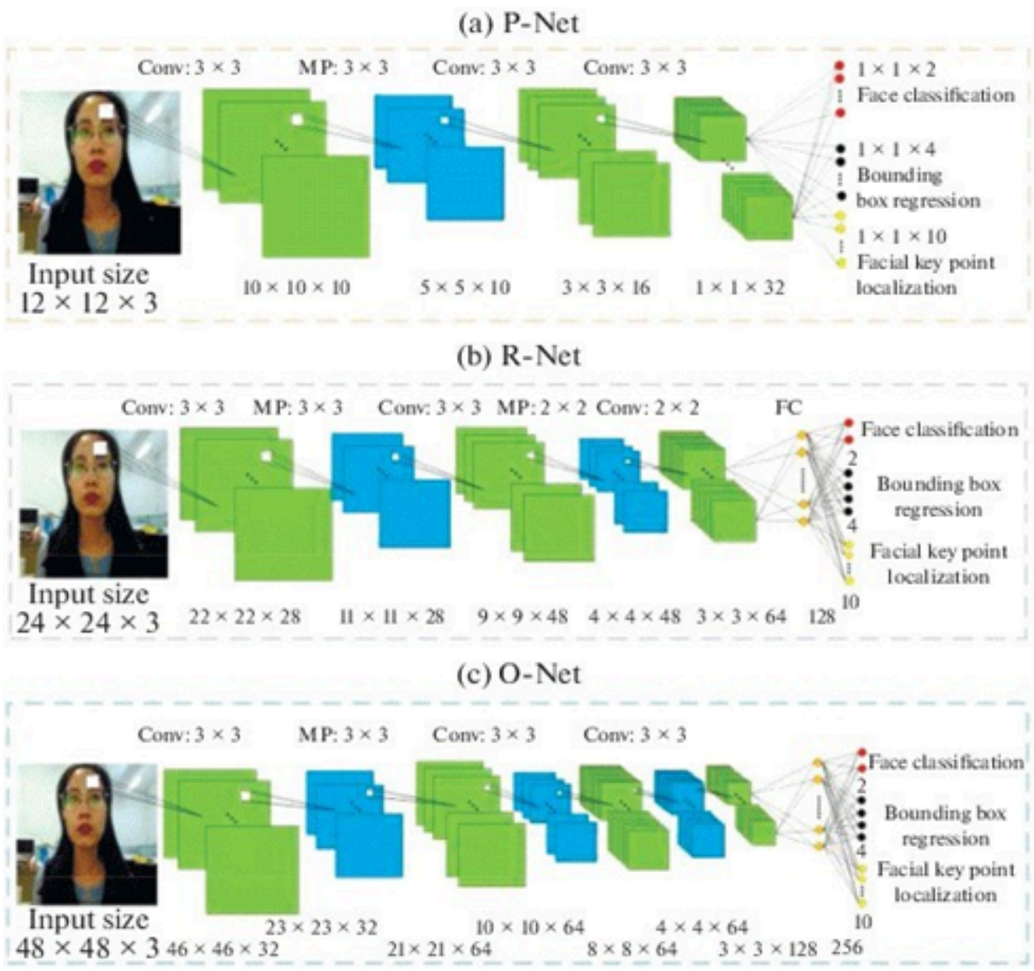

Fig. 2. MTCNNArchitecture [1]

MTCNNemploys a multi-stage approach to processinput data for face detection. The initial stage involves the Proposal Network (P-Net), which analyses the input image using convolutional layersto extract featuresand identify candidate face regions. These regions undergo refinement in the subsequent Refinement Network (R-Net), where convolutional layers further enhance face classification and adjust bounding boxes for greater accuracy. Finally.

This iterative process enables MTCNN to achieve high accuracy in detecting faces across diverse conditions, making it well-suited for real-time applications requiring robust facial recognition capabilities [25].

B.FEATURE EXTRACTION :

FaceNet, introduced by Google Researchers in 2015 in their paper titled FaceNet: A Unified Embedding for Face Recognition and Clustering, is a facialrecognition system.

It gained recognition for its exceptional performance in various face recognition benchmarks like Labeled Faces in the Wild (LFW) and the Youtube Face Database. [26]

Their approach involves generating detailed face mappings from images using advanced deep learning architectures like ZF-Net and Inception Network. Subsequently, they employed a method called triplet loss as a training mechanism for this architecture. Let's look at the architecture in more detail [7].

Fig 3. Working Of FaceNet [4]

FaceNet uses deep learning models like Inception Network to create embeddings of face images. These embeddingsare normalized and then compared using a special loss function called Triplet loss. The goal is to make embeddings of the same person's face close together and embeddings of different people's faces far apart. This helps the model accurately recognize faces, regardless of variations in image conditions and poses [21] [19].

ARCHITECTURE OF FACENET

The FaceNet model's architecture relies on a deep convolutional neural network(CNN)The key components of the FaceNet model.

Inception ResNet V1 Architecture

The Inception–ResNet–v1 architecture combines the strengths of the Inception module from GoogLeNet and the residual connections from ResNet. By doing so, it aims to capture complex features effectively while maintaining ease of training. In best case, it utilize the Inception Network v1, also known as GoogLeNet (Inception v1), which emergedas the winner of the ImageNet Large Scale Visual Recognition Competition in 2014. Unlikeother CNN modelsthat transfer the output of previous layers to subsequent layers [5][13].

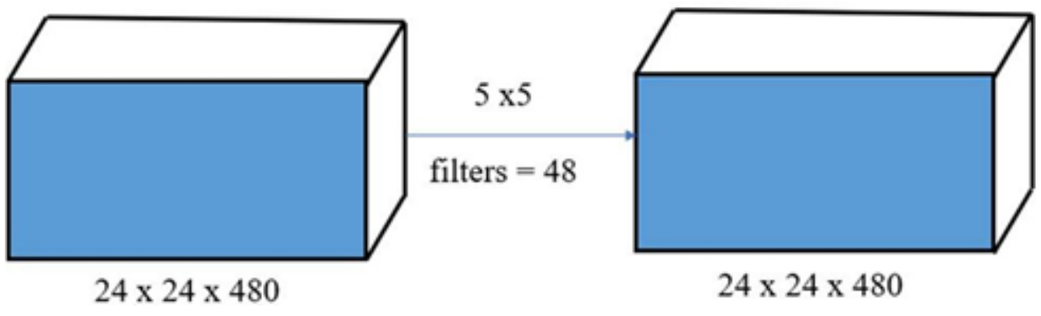

Fig 4. No of Parameters for normal conv layer

Normal convolution layer:
Number of operations involvedhere is
(24×24×48) × (5×5×480) = 331.1M **(1)**

Inception Network employs 1x1, 3x3, and 5x5 convolution layers for feature extraction, optimizing performance while addressing computational challenges. This approach enables efficient feature extraction and transfer to subsequent layers, enhancingthe model's capabilities without overwhelming computational demands.

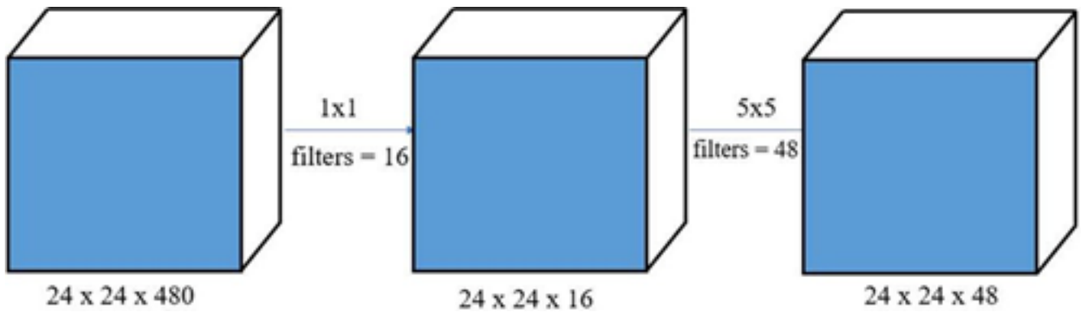

Fig 5. No of Parameters after using 1x1 conv layer

After addition the result is 15.4M (4.4M + 11.0M)
Major Components in the architecture are Inception Modules, Residual Connections, Global Average Polling,FC layers, Output Layer [11].

Inception Module:

The Inception module acts as the foundation of the architecture, featuring several modules stacked consecutively. Each Inception module comprises parallel convolutional branches with distinct filter sizes (1x1, 3x3, 5x5) alongside poolingoperations. Moreover, dimensionality reduction, often facilitated by 1x1 convolutions, is employed to mitigate computational complexity while enhancing feature representation. Inception Networkv1 is composed of nine of these Inception modules arranged sequentially, forming a hierarchical structurethat facilitates the extraction of diverse and meaningful features across different scales [24].

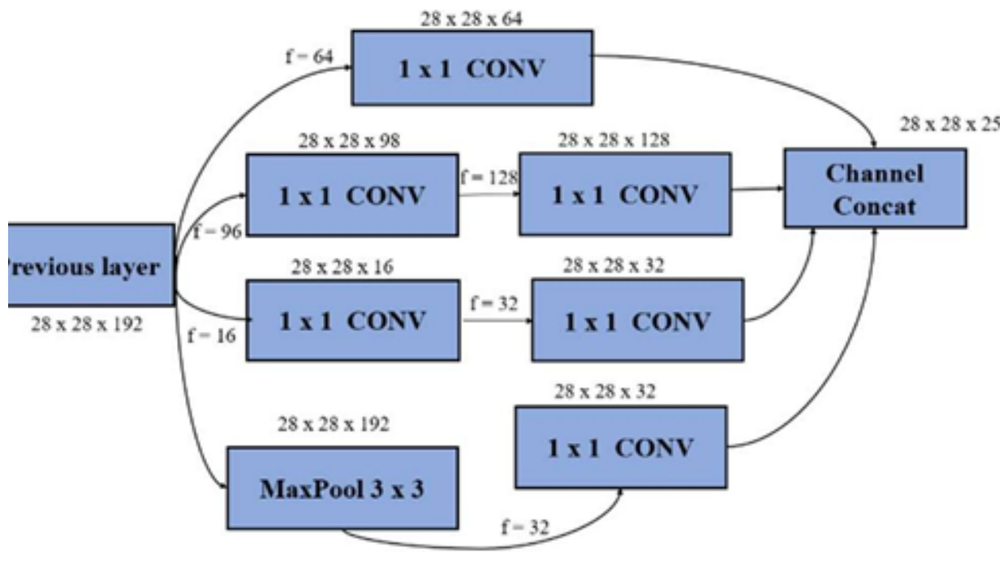

Fig 6. Architecture of one Inception Module

Here's a breakdown of the typical components within an Inception module:

1x1 Convolution: This convolutional layer with a small filter size (e.g., 1x1) is used to perform dimensionality reduction. It helps reduce the number of input channels, thereby reducing computational cost and model complexity. Additionally, it introduces non-linearity to the network.

3x3 Convolution: Another branch in the Inceptionmodule employs a convolutional layer with a larger filter size (e.g., 3x3). This layer captures spatial features in the input feature maps.

5x5 Convolution: Similar to the 3x3 convolution, this branch utilizes a convolutional layer with an even largerfilter size (e.g., 5x5). It aims to capturemore global spatialpatterns in the input feature maps.

Max Pooling: In some versions of the Inception module, max poolingis also appliedas an alternative to convolutional operations. Max pooling helps capture dominant features in the input and reduces spatial dimensions.

Concatenation: The outputs from all branches (1x1, 3x3, 5x5 convolutions, and max pooling, if used) are concatenated along the channel dimension. This creates a multi-scale picture of the input feature maps, capturing features at different levels of abstraction.

Residual Connections:

Between some of the Inception modules, residual connections are added.These connections allow the gradients to flow more directlyduring training, improving the vanishing gradient problem and allowing the training of very deep networks.

Global Average Pooling:

At the end of the network, global average pooling is applied to reduce the spatial dimensions of the feature maps to a vector.

Fully Connected Layer:

A fully connected layer is often added to record the extracted features to the desired output dimensionality. For classification tasks, this layer typically outputs class probabilities

Output Layer:

Outputs the final predictions or embeddings dependingon the task (e.g., classification or feature extraction) [11].

Embedding Layer:

The embedding layer in the architecture receives the output from the Global Average Pooling stage. It typically consists of a Fully Connected or Dense Layer, where the number of neurons determines the dimensionality of the embedding space. Commonly, these embeddings have dimensions of 128 or 512. The role of the embedding layer is to transform the input face data into a compact and semantically meaningful representation within a high- dimensional embedding space. This representation enables efficient comparison and analysis of facial features, facilitating tasks such as face recognition and similarity measurement [15].

A.TRIPLET LOSS FUNCTION

The triplet loss function is a cornerstone in training neural networks for tasks like face recognition and similarity learning, particularly valuable when embeddings of data points need specific properties like proximity for similar instances and distance for dissimilar ones.

Operating on triplets comprising an anchor, a positive example, and a negative example, the triplet loss function guides the network to map anchorand positive imagesclosely in the embedding space, while pushing anchor and negative images fartherapart. In face recognition scenarios, these data points typically represent images of faces, with the anchor image denoted as A, the positive image as P (another image of the sameperson as the anchor),and the negative image as N (an image of a different person). This encourages the network to effectively learn embeddings that accurately capture the intrinsic similarities and differences between faces, enabling robust classification and recognition tasks [23].

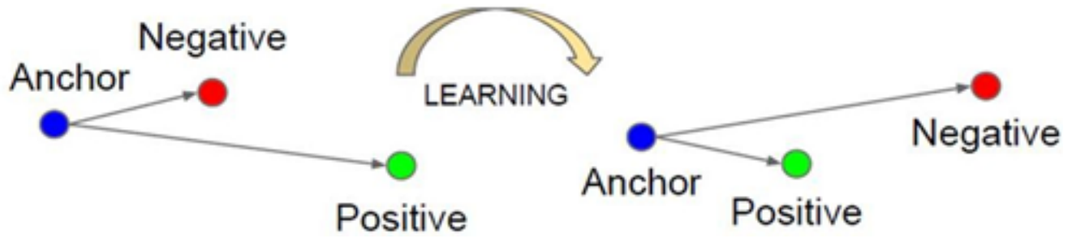

Fig 7. Triplet–loss and learning [4]

In the triplet loss function, the Euclidean distance between embeddings of the anchorand positive images(d (A, P)) and the Euclidean distance between embeddings of the anchor and negative images (d (A, N)) are crucial. These distances, typically measuredusing metrics like Euclidean or cosine distance, determine the similarity or dissimilarity between the images

$$L(A, P, N) = \max(0, d(A, P) - d(A, N) + \alpha)$$

The margin parameter(α) plays a key role in definingthe minimum acceptable difference between the distances of a positive pair and a negative pair. It ensures that similar instances are embedded close together while maintaining a sufficient separation between dissimilar instances [2].

The objective of the triplet loss function is to minimize the loss across the entire training dataset. By doing so, the network learns embeddings in which the distance between similar instances is minimized relativeto the distance between dissimilar instances by at least the margin α. This encourages the network to effectively discriminate between different classes or categories represented by the embeddings.

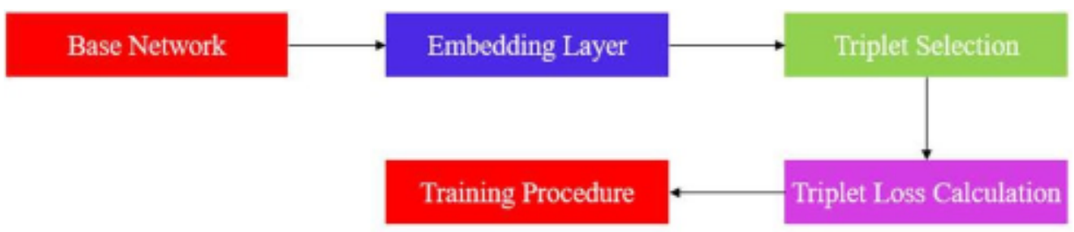

Fig 8. Triplet Loss Function Working

A. FACE CLASSIFICATION

Once the face embeddings are obtained from the images, they are fed into a Support Vector Classifier (SVC) for classification. SVC is a type of machine learning algorithm that is effective for classification tasks.

The parameters of the SVC can fine–tune, such as by selecting kernel type (linear, radial basis function (rbf), polynomial, etc.) and the regularization parameter (C), to optimize performance based on the characteristics of the dataset and specific requirements [22].

Using SVC for classification often yields more accurate results compared to other methods such as K–Nearest Neighbors (KNN), Decision Trees, Logistic Regression, Naïve Bayes, among others. This is because SVC is particularly well–suited for tasks involving high–dimensional data like face embeddings and is capable of capturing complex relationships within the data for accurate classification [9].

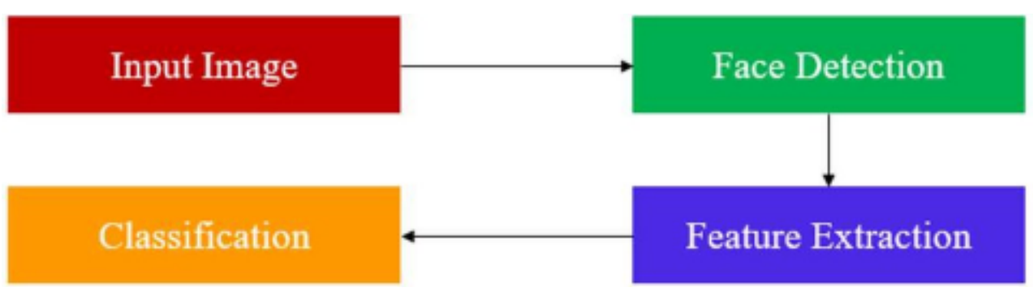

Fig 9. Face Classification Working

MEDICINE REMAINDER SYSTEM

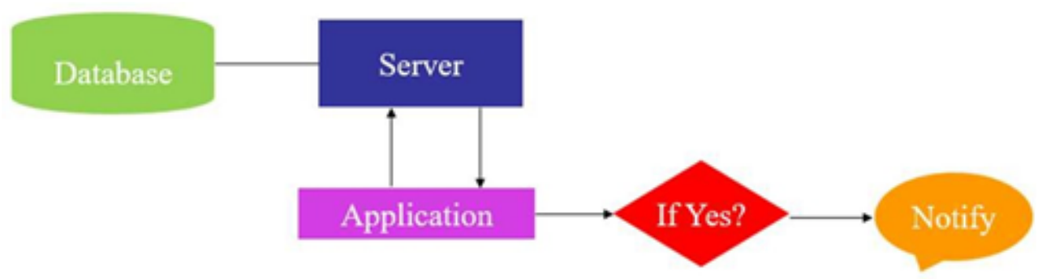

Fig 10. Working of Medicine Remainder System

The medication reminder system utilizes a database to store medication information, including name, dosage, and schedule. It continuously checks the current time against scheduled intake times, triggering notifications when it matches [8]. Upon notification, the system generates a voice command specifying the medication name and dosage, effectively alerting the user about the medication to take. By employing voice–based reminders.

A.LOCATION TRACKER USING GPS

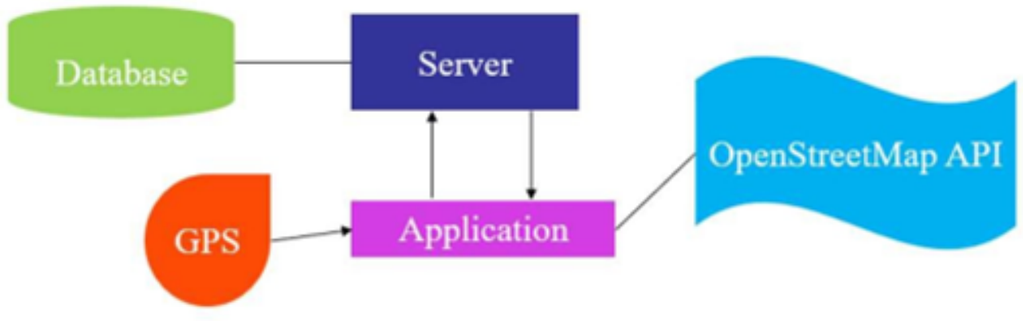

Fig 11. Working of Location Trackerusing GPS

The location trackingsystem maintains a database to store location data in longitude and latitude format.It periodically fetches location data through server requests and responses, enabling real-time tracking [18]. The retrieved path data is then displayed on a user interface using the OpenStreetMap API, accessible to both the patient and their guardian [28]. This system enhancessafety by allowingconstant monitoring of the patient's whereabouts, providing peace of mind to both parties involved.

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Tackling Road Hazards: Classification and Detection of Crack and Potholes using deep learning

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ABSTRACT

Road Surfaces are the major transportation infrastructure, facilitating economic activities and enabling the smooth mobility of people, goods, and services. Potholes and cracks are significant road hazards that pose risks to road users and vehicles, causing discomfort, vehicle damage, and even leads to accidents. To overcome these issues, a model for classifying road hazards will be developed. Additionally, detection is performed for potholes and cracks. The datasets on which we will be working contain images of normal road surfaces, potholes, and cracks. This model comprises of two key phases. Initially, the ResNet50 algorithm will be used for the classification of road conditions, distinguishing between plain roads, potholes, and cracks. Following this, a YOLOv8 detection algorithm will be implemented to find specific locations of potholes and cracks on the road surface. The existing work for multi classification using ResNet50 got 90% accuracy, which has to be improved by the developed model.

Keywords: Road Hazards, Potholes, Cracks, ResNet50, YOLOv8

INTRODUCTION

Roads are an essential because they facilitate people's travel. They contribute to the economy by enabling the transportation of goods and services [19]. be damaged by various factors, including weather, traffic, and aging. Potholes and cracks are some of the most common

These are caused by a combination of factors, including traffic and weather [5]. Deep learning techniques can be employed to classify and detect potholes and cracks, which can help to increase road safety [16]. Pothole classification is the process of identifying whether an image contains a pothole or not. Pothole detection is the process of identifying the location of a pothole in an image

By using the deep learning models and CNN's, the proposed model provides a novel solution for the problem of identifying potholes and cracks on road surfaces [18]. We used a diverse dataset containing samples of normal road sections, potholes, and cracks to achieve this.

We integrated two powerful deep learning architectures: ResNet–50 for classification and YOLOv8 for detection. Through extensive training on our dataset, ResNet–50 acquires the ability to accurately classify road segments into distinct categories, including normal road sections, potholes, and cracks [12]. Meanwhile, YOLO model excels at the task of detection by effectively pinpointing the exact positions and dimensions of potholes and cracks within images [7].

This integration ensures that our model not only classifies road sections correctly but also provides precise information about the location and extent of road hazards. By doing so, our approach enhances road safety for both vehicles and pedestrians, and contributes to the overall resilience of road infrastructure [17].

The model's effectiveness is measured by the use of various assessment metrics namely accuracy for classification, mean average precision(MAP) for detection [3]. These metrics provide an objective assessment of our model's ability to accurately classify potholes in a diverse range of road images.

METHODOLOGY

1.1 Dataset :

The classification dataset on which we will be working is a “pothole detection dataset” containing both normal road surfaces and potholes. It is taken from Kaggle. To make classification for cracks, we've integrated data from the "Concrete Crack Images for Classification" dataset. Specifically, we've incorporated crack images from this dataset to enhance our classification performance.

The detection dataset consists of images of roads containing potholes and cracks annotated in YOLOv8 format. It is taken from roboflow. It had 1457 images. It is split into train, valid, and test datasets in the ratio 70:20:10. This dataset also contains a data.yaml file for loading the above dataset.

The reason for using different datasets for classification and detection is due to the number of class labels and the presence of YOLOv8 annotation files along with image files in the detection dataset.

1.2 Classification workflow using ResNet50

Importing Libraries: This allows to use predefined methods and classes throughout the code.

Data Collection: This includes collecting and organizing images of potholes, normal roads, and cracks in roads.

I**mage Preprocessing**: This is to remove unwanted noise from the data and format the data as suitable for training.

Some image preprocessing techniques used are:

1.**Image Resizing:** Resize all images in the dataset to a consistent input size suitable for model training.

2.**Data Splitting**: Splitting datasets into train, valid, and test datasets in the ratio of 70:15:15.

3.**Data Augmentation**: Expanding the size of training dataset by applying different transformations.

Define the model:

Initially, a lambda layer is used to apply the preprocess_input function to preprocess the input images compatible with the ResNet50 model. Then the pretrained weights of the ResNet50 model are loaded by freezing these base weights without including the last classification layer, which is added later based on the number of classes.

Finally, additional custom layers like BatchNormalization, GlobalAveragePooling2D, and Dense layers are added to the final model.

Compile the model: This step is essential before model training to specify the loss function, optimizer, and evaluation metrics that will be used for training and validation.

Model Training: This involves training the model on the training data until a specified number of iterations.

Model Evaluation: Then this model is evaluated on a validation dataset for calculating the model’s performance.

Classification: Finally, the model classifies the given input image as either a normal road, pothole, or crack image.

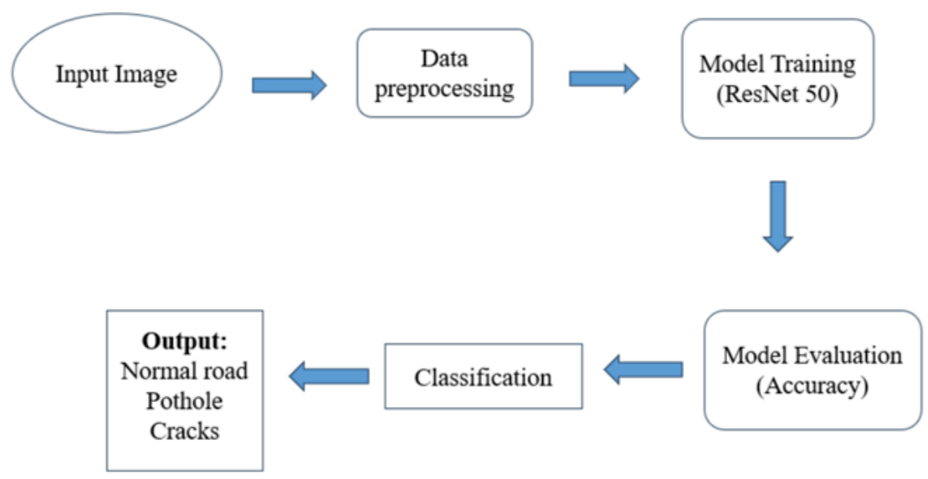

Fig 1. Classification Workflow

The above fig. 1. represents the classification workflow where an input image undergoing data preprocessing to make it suitable for model training. This undergoes model training using ResNet50 algorithm and this model’s performance is evaluated using accuracy. Finally, this model is ready for classification of images into either normal roads or potholes or cracks.

1.3 Detection Workflow using YOLOv8

Install Ultralytics: This installs the Ultralytics library for using predefined methods for YOLOv8 model training.

Importing Libraries: This allows to use predefined methods and classes throughout the code.

Data Collection: This includes collecting and organizing potholes, normal roads, and cracks in roads images and corresponding labels.

Create .yaml file: This file contains data paths, the number of classes, hyperparameter settings etc.

Initialize the model: This creates an instance of the YOLOv8 model based on the provided configuration file.

Model Training: This involves training model on the training data until a specified number of iterations for making predictions using the settings in the .yaml file.

Model Evaluation: The trained model is evaluated on the validation dataset for calculating model's performance and evaluation metrics.

Loading the model: The best weights of the trained model are loaded for running inference or further fine-tuning on images.

Model Inference: Performing predictions on unseen data or the test dataset images.

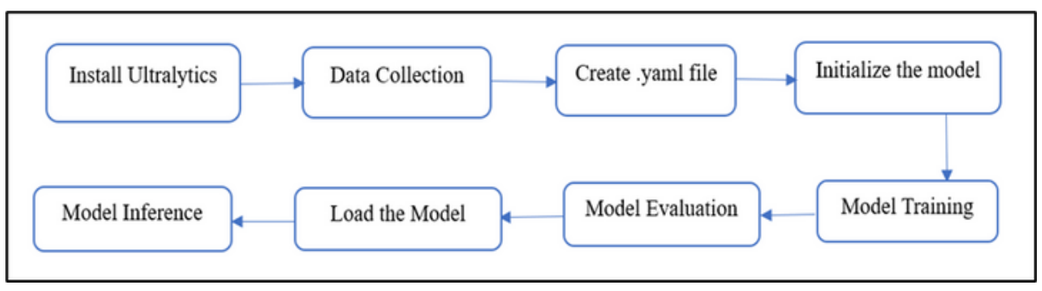

Fig 2. Detection Workflow

The fig. 2. represents detection workflow, which begins by installing the Ultralytics library and the data is collected for detection. The .yaml file is used to initialize the model and this model undergoes training and its performance is evaluated. The model is further loaded for future inference.

CONCLUSION

Road hazards on the surface of roads pose severe challenges, including road accidents and disruptions in transportation of people and goods. To overcome these challenges, this study utilizes various methods to locate those road damages. Initially, to classify road conditions, we combined the "pothole detection dataset" containing normal road surfaces and potholes with the "Concrete Crack Images for Classification" dataset for crack detection. We employed the ResNet50 model to categorize images into normal roads, cracks, and potholes. For detection, we utilized the "Pothole and Crack Annotation" dataset. Here, we used the YOLOv8 model to identify and draw bounding boxes around these hazards in images. The integration of these two models improved the model's effectiveness. The classification model's accuracy is 97%, and the mAP value for detection is 62%.

Future work involves expanding our dataset to include additional classes for various types of road damages, which will further enhance the model's performance and applicability in addressing a wider range of road hazards.

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Robust Face Liveliness Detection for Secure Digital Authentication

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ABSTRACT

This project aims to enhance security in digital authentication systems by developing an advanced face-liveness detection solution. The primary objective is to ensure that the system can accurately distinguish between a live user and spoofing attempts using photos or videos. The solution is implemented as a browser-based tool that is compatible across various devices, including computers, mobile phones, and tablets. The model is lightweight and optimized for fast performance, ensuring that it operates smoothly without causing any delays on the website. Using OpenCV and the YOLO v8 algorithm, the system achieves high accuracy and efficiency in face liveness detection. This project delivers a secure, efficient, and user-friendly tool that significantly enhances the reliability and security of digital identity verification.

INTRODUCTION

In recent years, face recognition systems have become an integral part of various authentication platforms, from mobile devices to high-security areas. However, these systems are vulnerable to spoofing attacks, where unauthorized users attempt to deceive the system by presenting photographs, videos, or 3D masks. To mitigate this risk, Face Liveliness Detection has emerged as a vital security enhancement. This technology differentiates between real, live human faces and spoofed versions by analyzing various characteristics like movement, texture, and patterns.

Add a little bit of boLeveraging state-of-the-art deep learning models, specifically YOLO (You Only Look Once), our system detects faces in webcam input, analyzes the blur and motion features of the detected faces, and classifies them into "real" or "fake." The system aims to prevent spoofing attacks through effective detection, with real-time processing ensuring immediate feedback. The dataset used for this project consists of labeled images, categorized as "real" or "fake," where fake images represent spoofing attempts via printed images, cut-outs, or video replays. The data collection module captures real-time video frames, applies blurriness thresholds to ensure quality, and saves both images and associated metadata. The dataset is split into training, validation, and testing sets, ensuring a robust evaluation of the model's performance. For model training, the YOLOv8 architecture was utilized, which is known for its efficiency in object detection tasks. The model was trained on the dataset, with annotations indicating face bounding boxes and class labels (real or fake). The trained model is then deployed to a live detection pipeline, where it processes input from a webcam, detects faces in real-time, and outputs a liveliness score, thereby identifying the authenticity of the face.

METHODOLOGY

YOLOv8 algorithm:

YOLOv8 Architecture Components:

Backbone: This part is responsible for feature extraction. The backbone is often a CNN (Convolutional Neural Network) that processes the input image and creates feature maps. The backbone in YOLOv8 follows a similar structure to previous YOLO versions but with enhancements. Layers consist of convolution (Conv), C2f (Cross Stage Partial Networks), and Bottleneck layers. The Conv layers are responsible for feature extraction through filters.

Neck: The neck aggregates and merges multi-scale feature maps from different stages of the backbone using concatenation and upsampling operations. This allows YOLOv8 to detect objects at multiple scales. C2f blocks are used in the neck to improve information flow across the network. Spatial Pyramid Pooling (SPPF) further improves the receptive field, allowing the model to understand global features by pooling information from multiple scales.

Head: The head is responsible for producing the final object detection predictions. It contains Convolution layers and detection layers that perform the final predictions for bounding boxes, class labels, and confidence scores. YOLOv8 outputs predictions at multiple feature map scales, enabling it to detect small and large objects within the same image.

Detailed Layer Description:

Convolutional Layers (Conv): Perform convolution operations to extract spatial features from input images. They are parameterized by kernel size (k), stride (s), padding (p), and number of output channels (c).

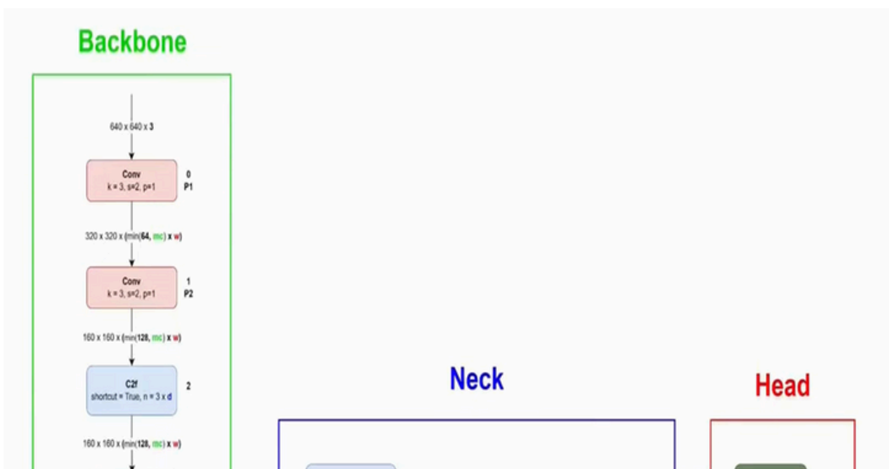

Fig 1.Architecture of the YOLOv5 object Detection Model

- C2f (Cross Stage Partial Block): Contains multiple Bottleneck layers with partial residual connections. This allows better gradient flow and efficient feature reuse, making the network deeper without losing performance.
- Bottleneck: Used for reducing the number of parameters in the model by using a shortcut if the number of input and output channels matches. If they don't, the shortcut is omitted.
- SPPF (Spatial Pyramid Pooling – Fast): Increases the receptive field without adding extra parameters or computation cost. It pools features at different scales (like a pyramid) and concatenates them, enabling better detection of objects of various sizes.
- Upsample: Increases the resolution of the feature maps in the neck to combine high-level semantic information with lower-level fine-grained details.

YOLOv8 Detection Head:

- **Bounding Box Prediction**:
- The network predicts bounding boxes for each object in the image. These predictions include the coordinates (x, y), width, and height of the bounding boxes, as well as the confidence score (how likely an object exists in the predicted box).
- Class Prediction:
- The model also predicts the class label for each detected object using convolutional layers.
- Multi-Scale Detection:
- Predictions are made at different scales (usually at 3 levels: large, medium, and small feature maps), making it effective at detecting objects of various sizes.

YOLOv8 Algorithm Flow for Face Liveness Detection:

1. Preprocessing: The picture or video outlines are to begin with resized and normalized some time recently bolstering them into the YOLOv8 show. YOLOv8 works well with diverse input sizes, which is vital for taking care of different confront sizes and picture resolutions.

2. Confront Location: The YOLOv8 show is prepared particularly to identify faces instep of common objects. The confront bounding boxes and certainty scores are anticipated by YOLOv8's discovery head. YOLOv8 yields different bounding boxes over the picture, each with its related certainty score, course name (i.e., "face"), and coordinates.

3. **Post-processing (for each identified face):**

A. Confront Trim: The confront locale is edited from the picture utilizing the bounding box arranges given by YOLOv8.

B. Liveness Location: After identifying and trimming the confront, extra modules are connected to decide liveness:

C. **Texture-based Discovery**: A surface classifier analyzes the facial locale for irregular surfaces or designs. A partitioned CNN demonstrate or conventional strategies like LBP can be utilized to distinguish whether the confront has genuine skin surface or is falsely smooth like a printed image.

Blink Location or Worldly Highlights: In the case of video input, confront liveness is decided by identifying eye squints or other inconspicuous developments over time. YOLOv8 makes a difference with frame-by-frame confront discovery, whereas an extra eye-tracking calculation watches for flickering or other developments (e.g., head tilt, gestures).

Depth Estimation: By analyzing 3D facial highlights utilizing a profundity estimation organize, fake faces (like photographs) are separated from genuine ones. YOLOv8 localizes the confront, and the profundity data for the identified locale is handled, making a difference to affirm if it's a 2D parody endeavor or a genuine 3D face.

Motion Investigation through Optical Stream: In the video, movement investigation through optical stream can distinguish if the confront is moving actually or if the picture is inactive.A person's head and facial expressions marginally move actually in a live video, whereas a parody endeavor like a replayed video or printed picture would show a need of movement.

CONCLUSION

The project successfully developed an anti-spoofing detector for face recognition, enhancing security by accurately distinguishing real users from spoofing attempts. It involved dataset collection, model training with TensorFlow and OpenCV, and implementing real-time detection. Diverse datasets improved model robustness, covering various angles, lighting, and spoofing techniques. The YOLOv8 architecture, while primarily used for object detection, can be adapted and combined with various liveness detection techniques to build a robust face-liveness detection system. YOLOv8 offers fast and accurate face detection, which is then followed by specialized liveness detection methods to determine whether the detected face is real or a spoof. Customization allows tailoring the model for specific use cases. Future improvements could include adding liveness detection and exploring alternative algorithms.

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Design an Autonomous Vehicle through Image Processing and Machine Learning algorithm for Lane Detection

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ABSTRACT

In the last ten years, driverless cars have become a major focus of interest, leading to the development of prototype models by various companies. These vehicles are equipped with a range of sensors and actuators that generate large amounts of live data, which must be processed and analyzed rapidly to enable informed decision-making.

The primary goal of this project is to create a self-driving vehicle capable of making decisions independently without human intervention. This will be achieved using image processing technology to detect lanes, ensuring safety, efficient transportation, and infrastructure optimization in response to the growing population and increasing number of vehicles. Speed adjustments will also be enabled through system integration.

These intelligent vehicles demonstrate autonomy by incorporating features such as environmental sensing, real-time decision-making, autonomous navigation, adherence to safe driving practices, and other automated functionalities. An autonomous car is a computer-controlled vehicle that can navigate, familiarize itself with its surroundings, make decisions, and operate entirely without human interaction.

The key drivers behind the emergence of autonomous cars include the need for enhanced driver and passenger safety, growing population demands, expanding infrastructure, the increasing number of vehicles, the necessity for efficient time management, and the optimization of resources.

METHODOLOGY

The image provided depicts a flowchart in figure 1 is illustrating the steps involved in capturing a picture with a webcam and processing it to detect the angle of the steering wheel.

1. Start: Marks the beginning of the process.
2. Capture the image using an IP webcam: Captures an image using the webcam.
3. Access the image through lane detection: Processes the captured image to detect lanes.
4. Calculate the angle of the steering wheel: Determines the steering wheel's angle based on lane detection information.
5. Decision-making: Refers to making decisions based on the calculated steering wheel angle. For instance, the system might issue an alert if the steering angle exceeds a certain threshold.
6. Transfer command to the slave processor: Sends a command to the slave processor to execute an action based on the decision.
7. Slave processor executes the command: The slave processor carries out the command received in the previous step.
8. While $t < t_f$: Represents a loop indicating that the process continues as long as this condition is satisfied, where t is time and t_f is the final time.
9. Stop: Signifies the end of the process.

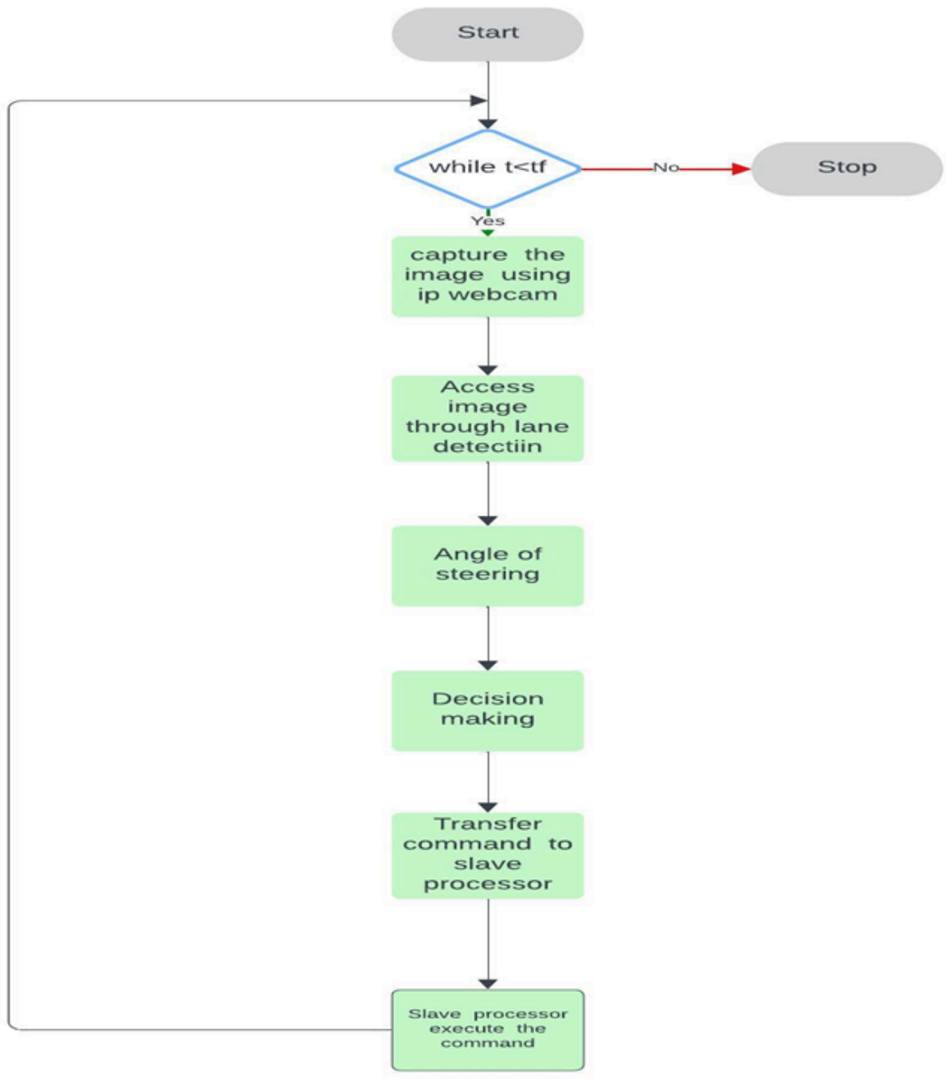

Fig 1. Flow Chart for Lane Detection

Algorithm for Database Creation :

1. Start
2. Capture an image and identify its class number.
3. Train and test the image based on its classification.
4. Connect MATLAB to the Wi-Fi module.
5. Control the motor driver (vehicle) using Wi-Fi instructions.

This figure 2 showcases the bot developed for the project. It highlights the physical structure and key components integrated into the bot, including sensors, actuators, and other hardware used to perform its designated tasks.

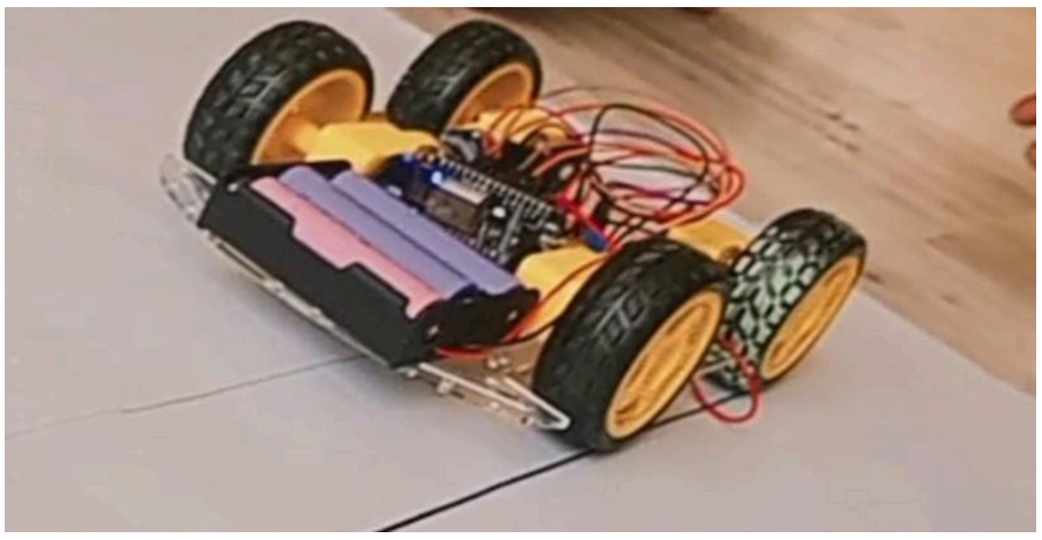

Fig 2. The Bot for Lane Detection

CONCLUSION

Automated track-guided vehicles are a widely used type of material handling equipment in today's manufacturing industries due to their flexibility and adaptability. These vehicles are driverless and programmed for path selection and precise positioning. They can be easily modified and expanded to accommodate various path-guiding techniques, making them versatile for different applications. These vehicles represent the future of smart, driverless, efficient, and crash-avoiding urban transportation.

A driving algorithm has been designed using deep learning and reinforcement learning, and its performance has been tested to ensure accurate knowledge of surrounding vehicles. Autonomous vehicles are capable of sensing their environment and navigating without human intervention, making them a critical component of future transportation systems.

Autonomous vehicles are closely associated with Industrial IoT (Internet of Things). One of the primary tasks of any machine learning algorithm in self-driving cars is the continuous rendering of the surrounding environment and predicting potential changes. Artificial intelligence-based decision-making has proven highly effective in handling complex calculations and delivering reliable results in dynamic situations.

The development of image-processing-based implementations for navigation in track-guided vehicles further enhances their functionality. A mobile video camera is used as a sensor to collect necessary data, and the algorithms are implemented on a PC using the MATLAB environment.

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Analysis of residential building impact on environment using building information modeling and life cycle assessment

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ABSTRACT

The carbon emissions produced by construction of a building can be significantly impacts the environment. As per studies 40 percent of annual worldwide CO_2emissions are produced by the built environment. In construction industry cement is a one of the commonly used building materials and a key component in concrete mix. In world cement is responsible for around 7% of global carbon emissions. Climate change is mostly caused by carbon emissions. The carbon emissions from the building can be reduced by using replacing the high carbon emission materials with sustainable building materials and less environmental impactive materials. Also, employing energy–efficient design and building techniques can lower carbon emissions over the life cycle of the building. In this paper we study about impact analysis of a building materials on environment by determining the carbon emissions analysis was performed by changing several parameters to identify the parameters with largest impact on a building. A comparison of the life cycle carbon emissions for each material can be done by using BIM and One Click LCA software. The combination of BIM and LCA can be useful to determine the carbon emissions at the early design stage of the building by taking material quantities from a designed G+1 building model.

Keywords

Building Information Modelling, OneClick LCA, Life cycle assessment. Modelling

INTRODUCTION

First create a new project in revit and select Architectural template. After that go to any one of the elevations i.e., North, South, East or West and go to architecture tab and assign the required no of levels as per the g+1 building requirements. Go to the starting level (level 0) and drawing the grid lines. Now in architecture tab click on wall command and in properties browser go to edit type and setting the required wall thickness is 300mm. After that drawing the walls as per the required ground floor plan. After completion of ground floor plan go to level 1 and by using the floor command in architecture tab start drawing floor plan. After completion of drawing the plan by using door command and window command in architecture tab select the required doors and windows from the default one or else give the required dimensions by clicking on edit type in properties browser. For drawing floor in architecture tabs click on floor command and edit the properties as per the requirement and draw at the level 1 and click on finish. Now go to architecture tab click on stairs command and draw the stairs to the ground plan and floor plan. Now select the whole floor plan and go to modify tab and click on copy option and then click on paste option and assign it to the remaining levels except the top most level and click ok. The floor plan is assigned to the selected levels. Now go to the top most level of the building, go to architecture tab and click on roof command and draw the roof for the top level. Now go to ground floor and draw the basement by using floor command and leaving some space to parking, walking and small playground as per our requirements. Now add the railing to the top of the building by using railing command in architectural tab.

Plans of G+1 Residential Building:

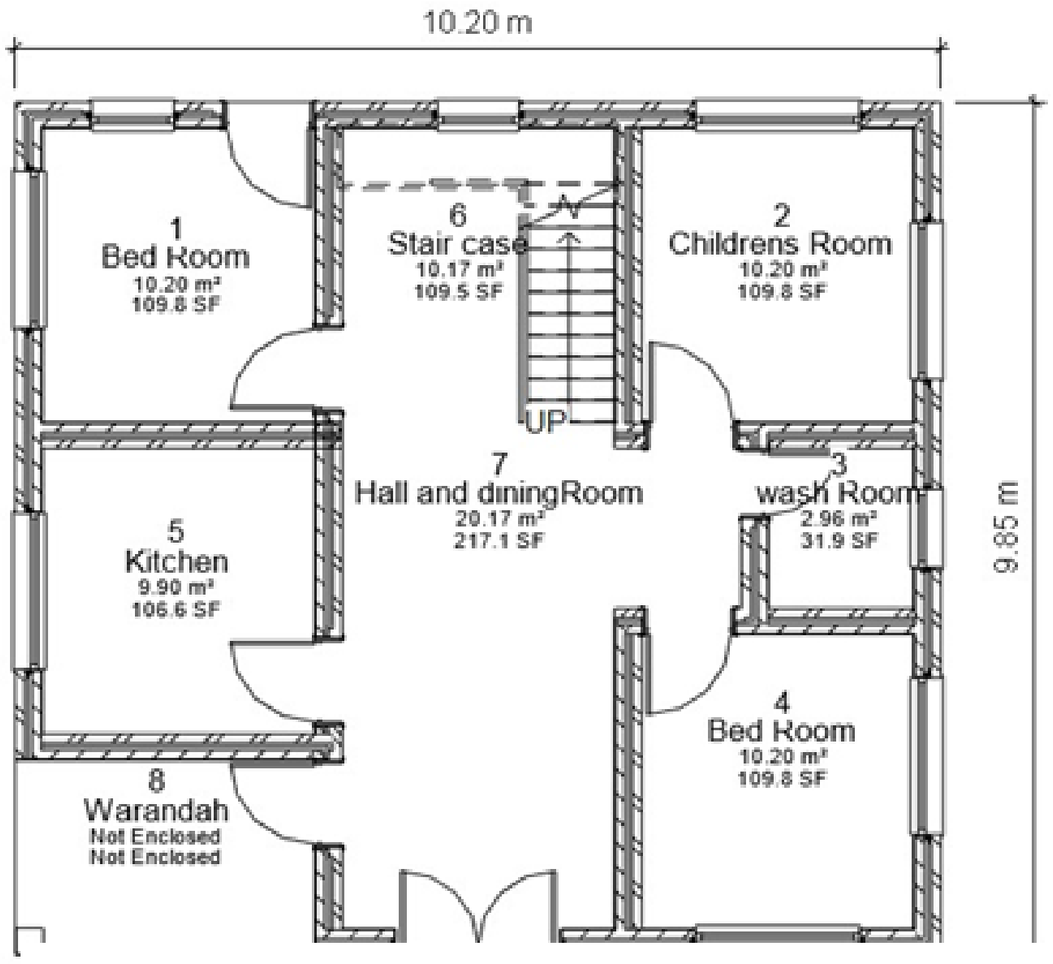

Fig 1 .Building elevation south facing

3D model of G+1 Residential Building:

Fig 2. Building 3d model

Life Cycle Assessment:

After completion of building design by using staad pro beams, columns and footing quantities are prepared from StaadPro. Walls, floors and roof quantities are taken from revit architecture and a table with all quantities are prepared.

After that we have to follow a manual method to determine the carbon emissions of a building material by entering the material quantities manually. Now create a project in OneClick LCA software and set the filter with country India and materials with LCA materials. Now add the quantity of walls, columns, beams, roofs and other materials in OneClick LCA software. Enter the gross area of the building and life period of the building. Finally click on the result option to calculate the carbon emission of the building.

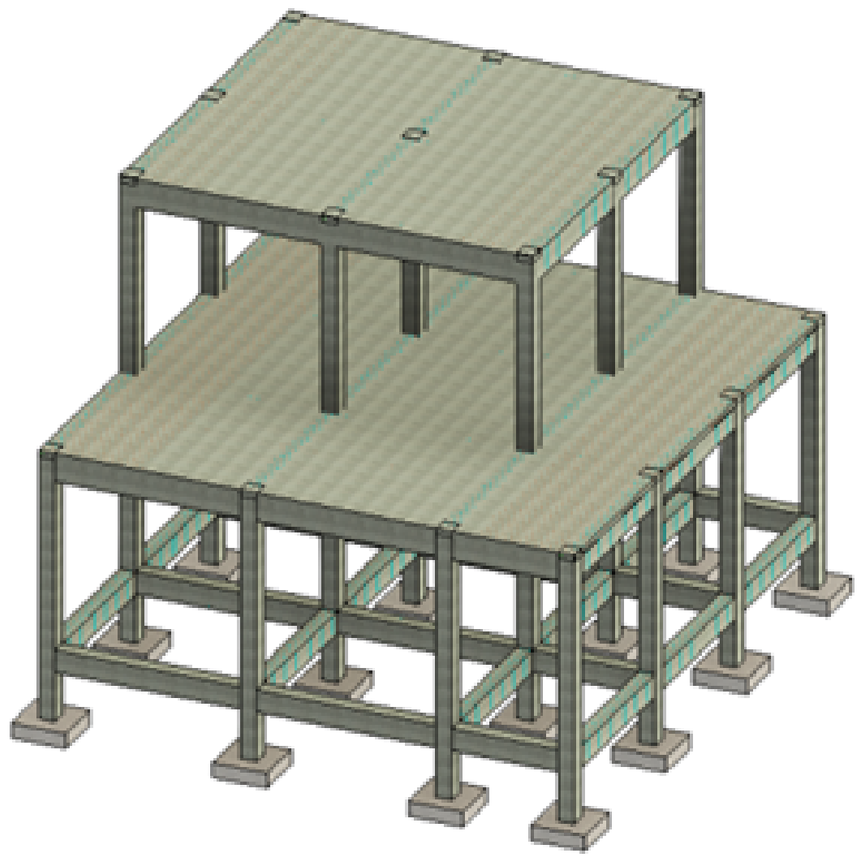

Fig 3. Revit structural drawing

Materials with average CO_2e

- Ready mix concrete for beams columns and slabs GWP of 0.11 Kg CO_2e / kg
- Clay bricks GWP of 0.24 Kg CO_2e / kg for walls
- Reinforcement steel (rebar) with GWP of 0.91 Kg CO_2e / kg

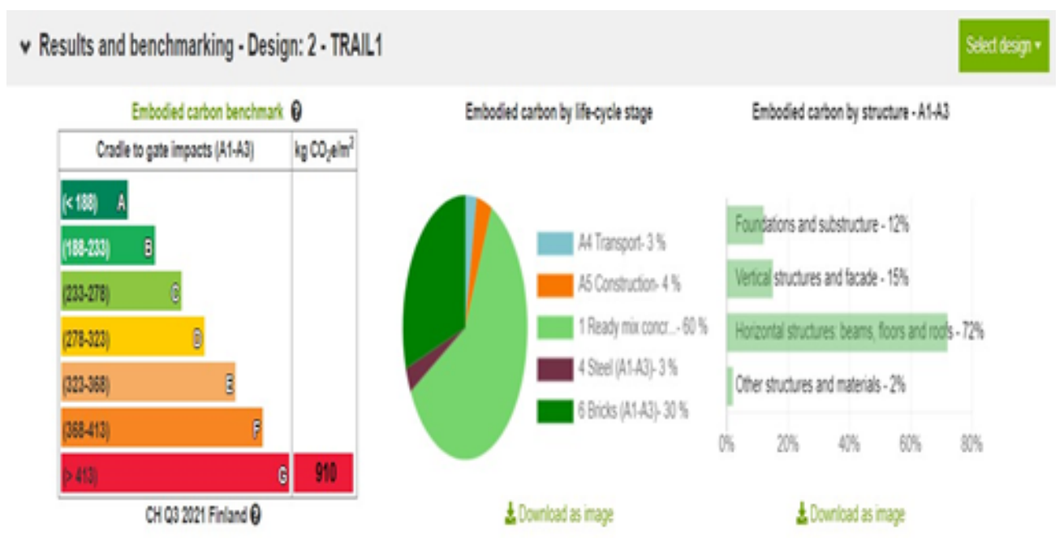

Fig 4. Embodied carbon benchmark (trail–1)

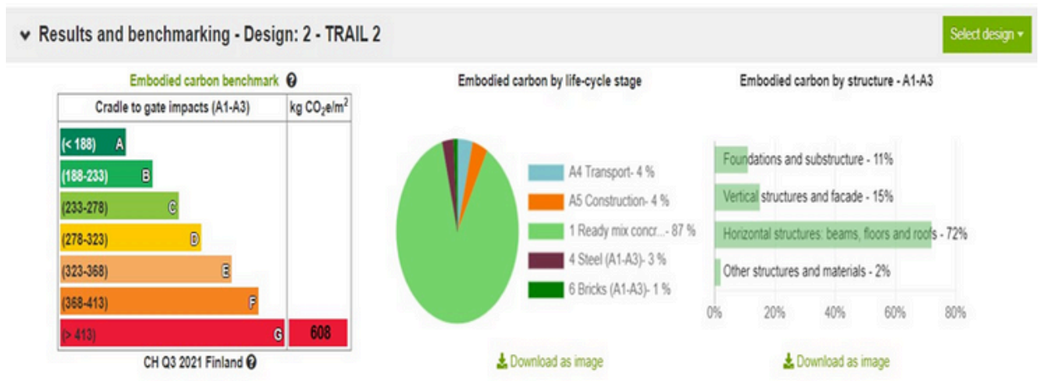

Fig 5. Embodied carbon benchmark (trail–2)

CONCLUSION

In this project we reduced the Carbon emissions of building materials by altering higher environmental impactive materials with low Carbon emission materials to design a Sustainable building by integrating BIM and OneClick LCA.

Ø BIM took an important role to prepare 3D model and quantity schedule it can help to give accurate material quantities in less time and avoided manual calculations.

Ø One Click LCA tool made the Life Cycle Assessment easier by generating automatic reports. LCA tool can help to identify areas where changes can be made to reduce the building's environmental impact, such as using sustainable materials, reducing waste during construction, and optimizing the building's energy and water usage.

ØAfter replacing of building materials with less environmental impactive materials could reduce approximately 37 % of CO_2 e in trail 3 is compared with trail 1 and the construction of building with these materials can make the building Sustainable.

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Axial compression behaviour of insulated concrete form(ICF) wall panels

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ABSTRAC

Axial, flexure, and shear loads are the most common loads that could impact any structure. For instance, wall panels and columns are majorly carrying axial loads from the beam and slabs, also, they are susceptible to flexure and shear loads from the wind or earthquake loads. Insulated concrete form (ICF) is a portable component made of interconnected expanded polystyrene (EPS) panels filled with concrete. EPS remains in place and becomes part of the wall to enhance thermal resistance and structural performance. This paper focuses on to experimentally investigate the behaviour of ICF walls under axial, flexure, and shear loading and to evaluate the bearing capacity of ICF wall panels under different loads. Higher density 20 and 40 kg/m^3 with higher thickness 50 and 100 mm of EPS were selected for the preparation of ICF wall panels. Also, plain concrete panels were cast for reference. Axial, flexure, and shear load carrying capacity, load–displacement and load–deflection profiles, crack observation and propagation patterns and ductile or brittle nature of failure by means of strain energy were analyzed and reported in this paper. It was observed that ICF panels were superior to the plain concrete panel in terms of axial, flexure, and shear load carrying capacity, failure nature, and absorbed strain energy.

METHODOLOGY

Material Properties :

The materials used in the present studies are concrete, reinforcement and EPS. Table 1 presents the design mix proportion and properties of M25 grade concrete. Fe415 grade high yield strength deformed steel bars was used to interlock EPS sheets. Table 2 presents the properties of EPS. Two higher density EPS, along with two different thicker EPS sheets were selected for the experimental investigation. The selected higher density EPS are 20 and 40 kg/m^3 and the selected size two thicker EPS are 50 and 100 mm. Young's modulus of EPS were evaluated during the priliminary investigation and reported in Table 2 (Arun Solomon & Hemalatha, 2020).

Table 1: Design mix proportion of M25 grade of concrete and its properties

Materials	Quantity (kg/m^3)	Properties	Design mix of M25 grade of concrete, N/mm^2
Cement	393	28 days compressive strength	31.25
Fine Aggregate	742	Split tensile strength	2.760
Coarse Aggregate	1115	Flexural strength	5.690
Water	197	Modulus of Elasticity	30470

Specimen Preparation :

Ten wall panels (Figure 1) with a height of 1000 mm, a width of 500 mm and different thicknesses were cast for axial compression and four–point flexure test. Among the ten panels, five panels were tested for axial compression and five panels were tested for flexure. Higher density 40 and 20 kg/m^3 with higher thickness 50 and 100 mm of EPS were selected for the preparation of ICF wall panels. Two plain concrete specimens were also cast for reference. Cast specimen details were provided in Table 1. Reference names of Table 1 indicate the density and thickness of the EPS sheets and plain 60 represents the reference plain concrete panel which was cast without EPS sheets for comparison. M25 Grade of concrete was used to cast the specimens. The concrete thickness was maintained as 60 mm in the core part of ICF, which is same as the thickness of the plain concrete, the overall thickness of the panels was varied based on the thickness of the EPS sheets (Table 1). 60 × 60 mm cross–section with 300 mm length, wing type arrangement is provided on the bottom of the wall panel to restrain the panels in position in the experimental set–ups.



Fig 1. Typical cast specimens of ICF wall panels with plain concrete panel

Table 2: Cast specimen details

Reference Name	Grade of Concrete	Height (H) mm	Breadth (B) mm	Thickness of EPS on both sides of concrete mm	Thickness of Core Concrete (t) mm	Overall thickness of the Specimen	Density of EPS (kg/m^3)	No. of wall panels cast
ICF2050	M25	1000	500	50	60	160	20	2
ICF20100	M25	1000	500	100	60	260	20	2
ICF4050	M25	1000	500	50	60	160	40	2
ICF40100	M25	1000	500	100	60	260	40	2
Plain60	M25	1000	500	Nil	60	60	Nil	2

Experimental set-ups of Axial Compression Test

1000 kN capacity 'MTS high-force servo hydraulic test systems, delivering a full spectrum of high-force testing capabilities' machine (Figure 2a) has been used for the axial compression experiment. Displacement controlled axial compression tests were performed in this study to explore the characteristics of ICF wall panels under axial compressive force. MTS high-force servo hydraulic test systems records the load applied on the specimen for every increment of 0.01 mm displacement and it is capable to generate reports at the end of the experiment. Wall panels were vertically positioned in the MTS high-force servo hydraulic test systems and the bottom of the wall panels was tightly fixed using provided wing type arrangements and the bolts in the bottom of the wall panels. 20 mm thick, steel plates have been used on the top surface of the wall panel to distribute the axial compression load uniformly (Figure 2b).

CONLUSION

Insulated concrete form (ICF) wall panels with varying thickness and density of EPS were prepared and the capacities of the panels were tested under axial compression and a four-point flexure test. Higher density 40 and 20 kg/m^3 with higher thickness 50 and 100 mm of EPS were selected for the preparation of ICF wall panels. Two reference plain concrete panels were also cast for the comparison of axial compression and flexure test. The following conclusions were made based on the analysis of axial and four-point flexure load carrying capacity, load-displacement and load-deflection profiles, crack propagation patterns, absorbed strain energy, and analytical investigation.

In the axial compression test, brittle failure was observed in the plain concrete panel, rather ductile failure nature was observed in the ICF wall panel. The quantitative value of ductile failure nature was measured by absorbed strain energy. The absorbed strain energy of the ICF 40100 wall panel is 6428.04 J which is 2.75 times (175.31 %) higher than the reference plain concrete panel. The higher absorbed strain energy refers to higher ductility of ICF wall panels. The plain concrete panel was broken into pieces after reaching its peak load, also all the ICF panels exhibit their ability to stand even after the complete failure of core concrete. The interlocked EPS in ICF helps the wall panel to stand even after the failure of the concrete core and increases its range displacement. The high axial load carrying capacity of 780.051kN was observed in ICF 40100 which is 56.97 % higher than the reference plain concrete panel, similarly, the peak load displacement of ICF 20100 is 15.656 which is 371.56 % higher than the reference plain concrete panel. The modified empirical analytical expression derived from IS 456:2000 and ASTM D6272 is predicting the ultimate load-carrying capacity of ICF wall panels and plain concrete panels.

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Concrete mix design automation using python

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ABSTRACT

Concrete mix design is the process of proportioning the various ingredients of concrete in such a way that the strength of mix satisfies the desired concrete strength. Concrete mix design is very much important to get economical and good concrete mix. Concrete mix design process is a tedious and time taking procedure when it is done manually. It involves many steps and calculations. To avoid such difficulties and errors in the process, automation needs to be done. Automation is the trending technology that has been used in most of the fields now a days. It is a better idea to implement the automation in concrete mix design. Automating the mix design will simplify the entire procedure. Automating the process will save us time as well as gives us accurate results. In this project, python programming language is used to automate the process. The program needs several inputs like grade of concrete, grade of cement, exposure condition, specific gravityvalues of the materials used etc. By giving the required inputs, the required quantity of the ingredients will be displayed on the console as output. The code is tested with several input values and got successfully executed with correct results. This project showcases the importance of concrete mix design automation and the process of implementing the automation by using python language.

Keywords:
Concrete mix design, Automation, Python, Concrete, Program

METHODOLOGY

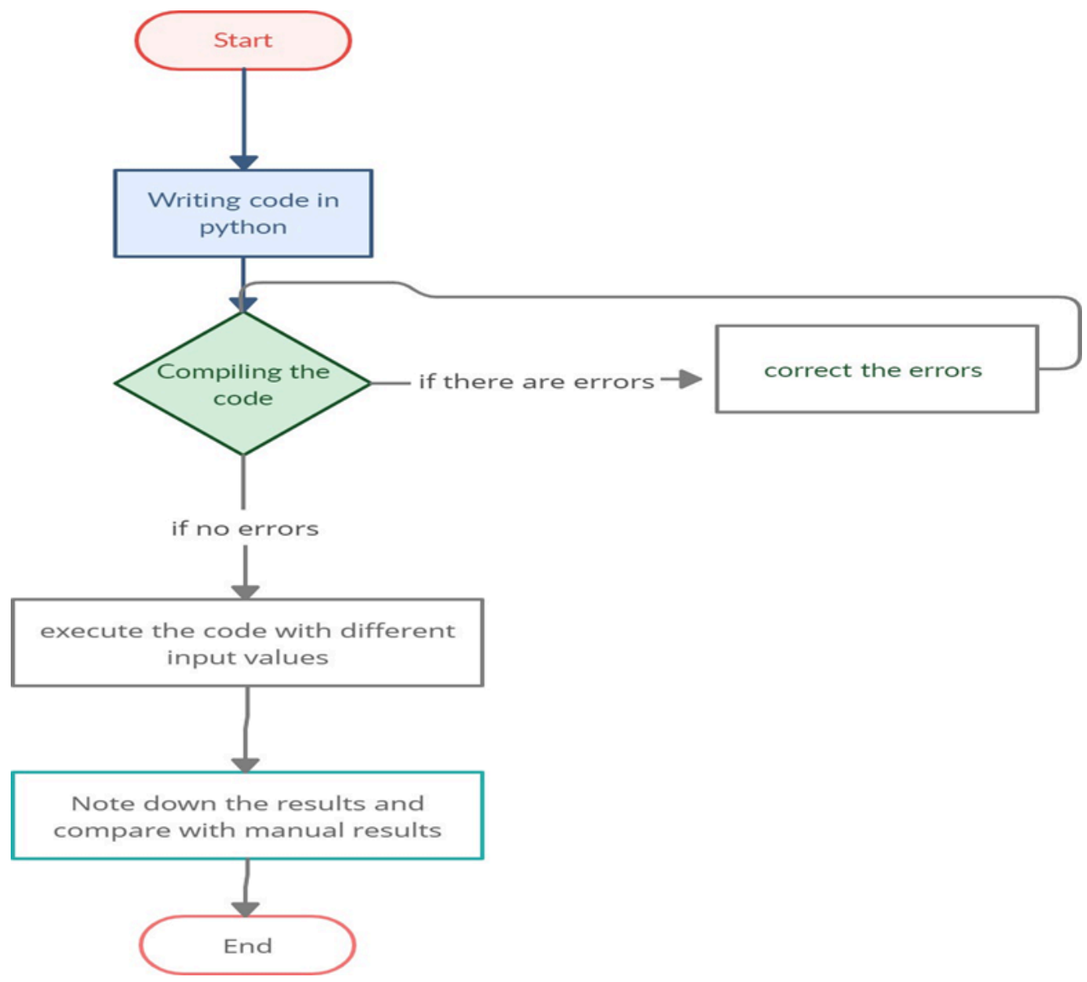

Fig 1. Methodology for automatic mix design

Table 1: Concrete Mix Proportioning Manual Calculation

GRADE	CEMENT (kg/m3)	CA (kg/m3)	FA (kg/m3)	WATER (kg/m3)
M20	300	1213	746	161
M30	304	1221	792	165
M35	385	1170	684	174

Concrete Mix Proportioning using Python

1. Type of cement: Portland Pozzolona Cement (PPC)

```
def cement_type():
    try:
        n=input("\nSelect type of cement from below list:\n(If you want to exit,enter zero)\n\n1)OPC33\n2)OPC43\n3)OPC53\n4)PP
        global lst4
        lst4=['1','2','3','4']
    except ValueError:
        print("\nPlease enter a valid choice")
        concrete_grade()
    if n=='0':
        import sys
        sys.exit()
    elif n in lst4:
        return n
    else:
        print("Please enter a valid choice.")
        cement_type()
type_cem=cement_type()
```

2. Console

```
Select type of cement from below list
(If you want to exit,enter zero)

1)OPC33
2)OPC43
3)OPC53
4)PPC/PSC

Enter your choice as a number:4
```

3. Exposure: Mild (Reinforced concrete)

```
def exposure_cond():
    try:
        n=input("\nSelect the exposure condition from below list:\n(If you want to exit, please enter zero)\n\n1)Mild\n2)Moderate\n3)Severe\n
        4)Very severe\n5)Extreme\n\nPlease enter your choice as a number:")
        global lst2
        lst2=['1','2','3','4','5']
    except ValueError:
        print("\nPlease enter a valid choice")
        exposure_cond()
    if n=='0':
        import sys
        sys.exit()
    elif n in lst2:
        return n
    else :
        print("\nPlease enter a valid value.")
        exposure_cond()
exp=exposure_cond()
```

4.Console

```
Select the exposure condition from below list:
(If you want to exit, please enter zero)

1)Mild
2)Moderate
3)Severe
4)Very severe
5)Extreme

Please enter your choice as a number:3
```

5. Slump required: 65 mm

```
def slump():
    try:
        n=int(input("\nEnter the slump required for the concrete in mm(If you want to exit, enter zero): "))
    except ValueError:
        print("\nPlease enter a valid choice")
        slump()
    if n<0 or n>200:
        print("Please enter a valid slump value")
        slump()
    elif n==0:
        import sys
        sys.exit()
    else:
        return n
slump_value=slump()
```

6. Maximum cement content: 390 kg/m^3

```
def super_plast():
    try:
        n=input("\nIs chemical admixture is used?\n(If you want to exit, enter zero)\n\n1)Yes\n2)No\n\nEnter your choice as number:")
    except ValueError:
        print("\nPlease enter a valid choice")
        super_plast()
    if n=='0':
        import sys
        sys.exit()
    elif n=='1':
        reduction=(0.23*act_wc)
        return reduction

    elif n=='2':
        return 0
    else:
        print("Enter a valid value.")
        super_plast()
```

7. Console

```
Is chemical admixture is used?
(If you want to exit, enter zero)

1)Yes
2)No

Enter your choice as number:1
```

Final Mix Proportion:

```
cement_content= 300 Kg/m3
water_content= 159.46482662071176 Kg/m3
coarse_aggregate mass= 1234.8597097605475 Kg/m3
fine_aggregate mass= 759.8518834888362 Kg/m3
```

CONCLUSION

The following conclusions were drafted based on the investigation.

·The results obtainedare compared with results obtainedby manual calculation.

·It is observed that the python calculation results have more accuracy as compared to manual calculation.

·The automatic calculation is done within very less time where manual calculation took lot of time.

·The automatic calculation certainly will not have any calculation mistakes where manual calculation may have errors.

·The automation technique is being popular in many fields and automating the concrete mix design process will definitely have a bright scope in future.

·The concrete mix proportion plays a crucial role in gaining of strength of concreteand if any errorsoccur, it will lead to the weakeningof building and subsequently the building will collapse.

·Theseerrors are minimised effectively by automating mix design process.

·Finally, the automated calculation has many advantages as compared to manual calculation.

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Converting LDPE Plastic Waste into Sustainable Building Bricks

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ABSTRACT

Plastic trash is a global environmental problem. Recycling and creating commercial products from waste plastics are the best solutions to mitigate environmental degradation. This paper attempted to develop building bricks from waste plastics with the
addition of M–sand. The research was carried out with three mix ratios 1:3,1:4, and 1:5. Here, the first part of the ratio represents shredded waste LDPE plastics, and the second part of the ratio represents the M–Sand. The shredded waste plastics were kept in a pan and heated, and the M–sand was added when the plastics in the pan became semi–solid. Then the M–sand was thoroughly mixed
with semi–solid plastics and kept in the standard size brick mold for manufacturing building bricks. From the research, it could be observed that the waste plastics could be converted into bricks. The mechanical characteristics of developed plastic bricks were examined experimentally. The characteristics of plastic bricks with a mix ratio of 1:4 were observed to be higher than the standard first–class red clay bricks.

Keywords
LDPE; Plastic bricks; Stress–strain ; Toughness.

INTRODUCTION

Over the years, brick production has significantly increased due to the increasing demand for housing and infrastructure in developing countries. The rapid increase in construction
activity has motivated researchers to innovate alternative construction materials for masonry works.Many poor people in India cannot afford their own houses due to the high cost of building materials. India has tremendous demand for inventing low–cost and efficient construction materials to fulfill underprivileged peoples' dreams of building their own houses. Over 40 million metric tons of plastics are consumed annually in India, and after use for some time, most of it becomes a waste that threatens the environment. This quantity reportedly increases by 1.5 to 2% annually [1]. Table 1 provides the different types of plastics.

Table 1: Different types of plastics with a few examples

S.No	Type of Plastics	Few examples
1	Poly-ethylene terephthalate (PET)	water bottles
2	High-density polyethylene (HDPE)	Shampoo bottles, containers, buckets
3	Low-density polyethylene (LDPE)	Carry bags, garbage bags,
4	Polypropylene (PP)	Ropes, twine, tape, carpets
5	Polyvinyl Chloride (PVC)	Credit cards, windows, pipes
6	Polystyrene (PS)	CD cases, PS-food trays.
7	Urea-formaldehyde	Electrical fitting handles.

The pie chart shown in Figure 1 illustrates the number of various plastics produced worldwide in 2015 and their recycling codes. 17 % of LDPE–based products are produced; this is the third significant portion of produced plastics, and these are used only once and, after usage, thrown away. This research focuses on converting LDPE
waste into bricks and its characterization to reuse this large–scale single–use LDPE plastic waste for sustainable development.

Plastic Brick Preparation:

Available spaces, and the shredding process was done manually for easy burning. Three different mix proportioned bricks are utilized to create the plastic bricks. The mix proportions are 1:3, 1:4, and 1:5, where the first portion represents LDPE plastics and the second represents M-sand. The second phase is to convert the solid shredded plastic into semi-solid by heating plastics above 180°C in a big pan. M-sand was gradually added to the semi-solid plastic and mixed thoroughly to attain a uniform mixture according to the design mix. The uniform mixture is poured into a brick mold of 190 mm × 90 mm × 90 mm for brick casting. A wooden mold has been preferred for making plastic bricks as the plastic does not have a bond with the wood. The brick should be in the mold for 2-3 hours to cool down; after that, the bricks can be demolded. This process was repeated for three different plastic and M-sand mix ratios. Fig.3 shows the typical plastic brick mold and developed plastic bricks.

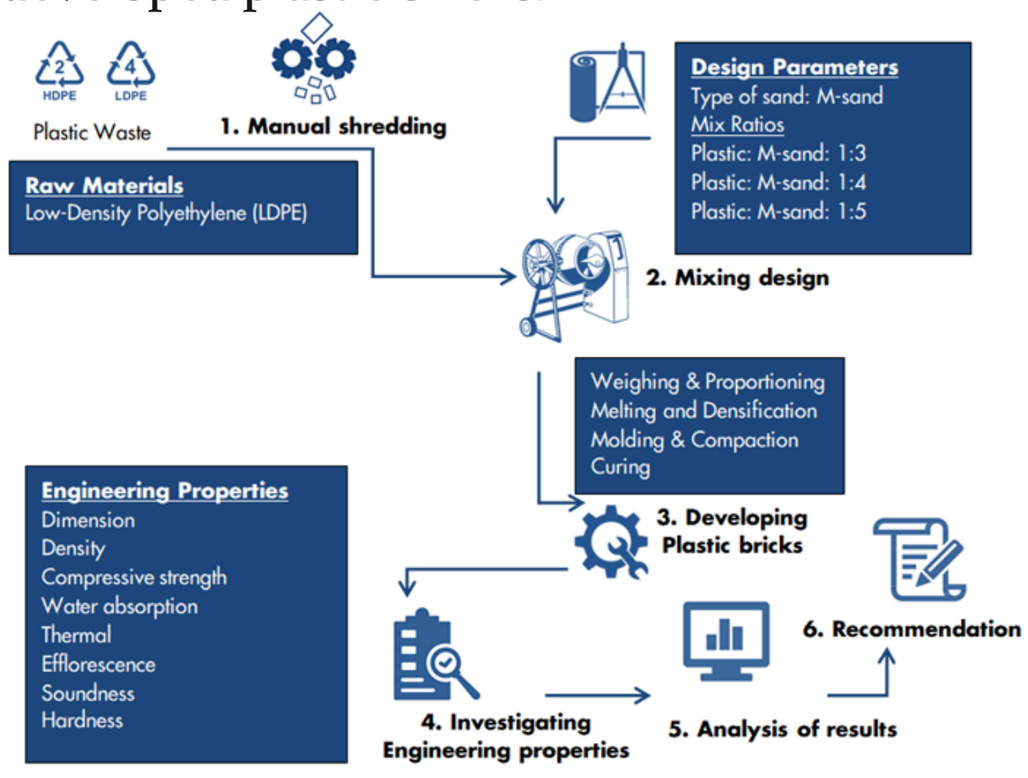

Fig 1. Proposed Methodology

Fig 2.Typical mold and developed plastic bricks

CONCLUSION

The investigation was carried out to convert the waste LDPE plastics into construction material as bricks which are called plastics bricks. The shredded waste LDPE plastics were heated above 180°C, and M-sand was added to the half-melted plastics with the ratio of 1:3, 1:4, and 1:5. The mixture was placed in the standard size brick mold to develop plastic bricks. The characteristics of developed bricks were examined experimentally. The following conclusions were drafted based on the experimental investigation.

The compressive strength of plastic bricks with the ratio of 1:4 attained a higher compressive strength of 12.23 N/mm than the first-class red clay bricks.

The toughness of developed plastic bricks was evaluated based on the stress-strain profiles. The toughness of plastic bricks with the ratio of 1:4 is 1706.26 J, which is 2.3 times higher than the toughness of red clay bricks.

It was observed that the water absorption percentage of plastic bricks is minimal <0.7%.

The plastic bricks deteriorate when the temperature is raised above 180°C. Hence, plastic bricks are not recommended where the buildings are susceptible to fire accident

The plastic bricks performed better than first-class red clay bricks during the efflorescence, soundness, and hardness test.

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Enhancing Aesthetic and Structural Properties using Translucent Concrete

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ABSTRACT

The concrete currently used in the construction industry generally consists of at least cement, water and aggregates (fine or coarse). As is well known, traditional concrete has a greyish colour, and its high density prevents the passage of light through it, which means that it is also impossible to distinguish bodies, colours and shapes through it. As can be imagined, concrete with the characteristic of being translucent will permit a better interaction between the construction and its environment, thereby creating ambiences that are better and more naturally lit, at the same time as significantly reducing the expenses of laying and maintenance of the concrete. Along with the translucent characteristics, the paper confines its area towards the reinforcement method of this type of concrete such that they can be practically implemented as a load bearing structure. This new kind of building material can integrate the concept of green energy saving with
the usage self–sensing properties of functional materials.

Keywords

Translucent, Reinforcement, load–bearing

Formulation For Obtaining A Translucent Concrete Mixture:

The invention relates to a formulation for obtaining a translucent concrete mixture comprising a mixture of polycarbonate and epoxy matrices as well as glass fibers, optical fibers, colloidal silica, silica and diethylentriamine (DETA) and Portland cement.

This invention has greater mechanical strength properties than those of a standard concrete, with lower density and mechanical characteristics that enable same to be used in both a structural and architectonic manner. The inventive formulation used to obtain the translucent concrete mixture comprise a type of concrete that is different from those currently available, which combines the advantages of existing concretes with translucency.

Ingredient Characteristics :

The characteristic details of this novel concrete are studied under the following description and following the same reference signs for indicating it. A polymeric matrix is expected to be provided to enhance the binding capacity and also the mechanical strength.

Preferable two polymeric mixture as per our studies are required. One, epoxy and the other is polycarbonate matrix. These together with their respective catalyst shall form a good binding strength.

The aggregates used in the manufacture and formulation were fiberglass, silica, colloidal silica sol and optical fibers. Optionally, rocky elements can be used as aggregates, for example, gravels, sands, etc. The setting agent used is diethylenetriamine (DETA),which has to be dehydrated on molecular sieves prior to use.

The optical fibers used in the formulation of this concrete are basically fine glass or plastic threads that guide the light. The communication system arises from the union between the light sources that is sufficiently pure for not being altered. The types of fibers used are monomode and virgin fibers, in other words, those in the pure state and without any coatings, the aim of which is so that the light can pass through the concrete.Used as additives are:pigments; bridging agents for favouring the attachment to the matrix, giving resistance and protection against aging; lubricant agents for giving surface protection and filmogenic gluing agents for giving integrity.

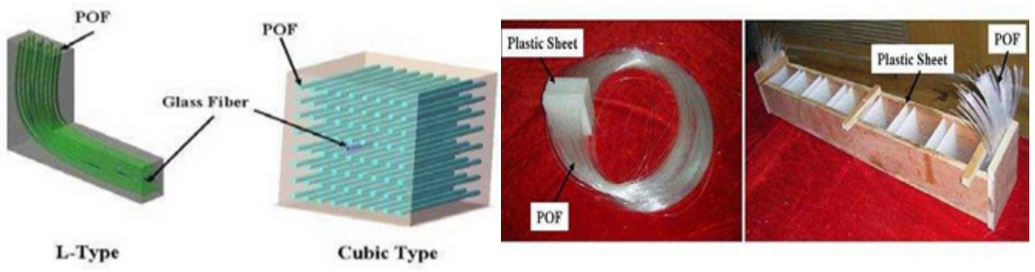

Fig 1. Structure of Transulacent Fibers

Self-Sensing Property of Translucent Concrete Based On Stress : Elasto-Optic Effect

Glass fiber is a kind of photoelastic material, which is isotropic under normal circumstances. Once be applied load, glass fiber becomes anisotropic, and light birefringence phenomena in it is generated. Commonly, if the optical constants and thickness of glass fiber, the isochromatics and isoclinics are known, the stress state of the glass fiber can be obtained based on the shear difference method. Based on this phenomenon, glass fiber is layout into the cube to monitor the stress state of structures, and the glass fiber can be considered as a sensing element and an optical transmission material. In order to study the self-sensing property of translucent concrete cube, we simultaneously layout a glass fiber with 15mm diameter and numbers of POFs into the concrete with the size of 100mmx100mmx100mm. In the test, the isochromatics and the hisoclinics of the samples are gotten by using the plane polarized light and circularly polarized light equipments respectively. Figure below shows the experimental setup including a glass fiber or a translucent concrete, a loading device and a photoelasticity experimental equipment. The circularly polarized optical field is obtained by adding two 1/4λ wave plates in the plane polarized optical field. The strain applied on the samples is recorded by the strain gauge pressure transducer.

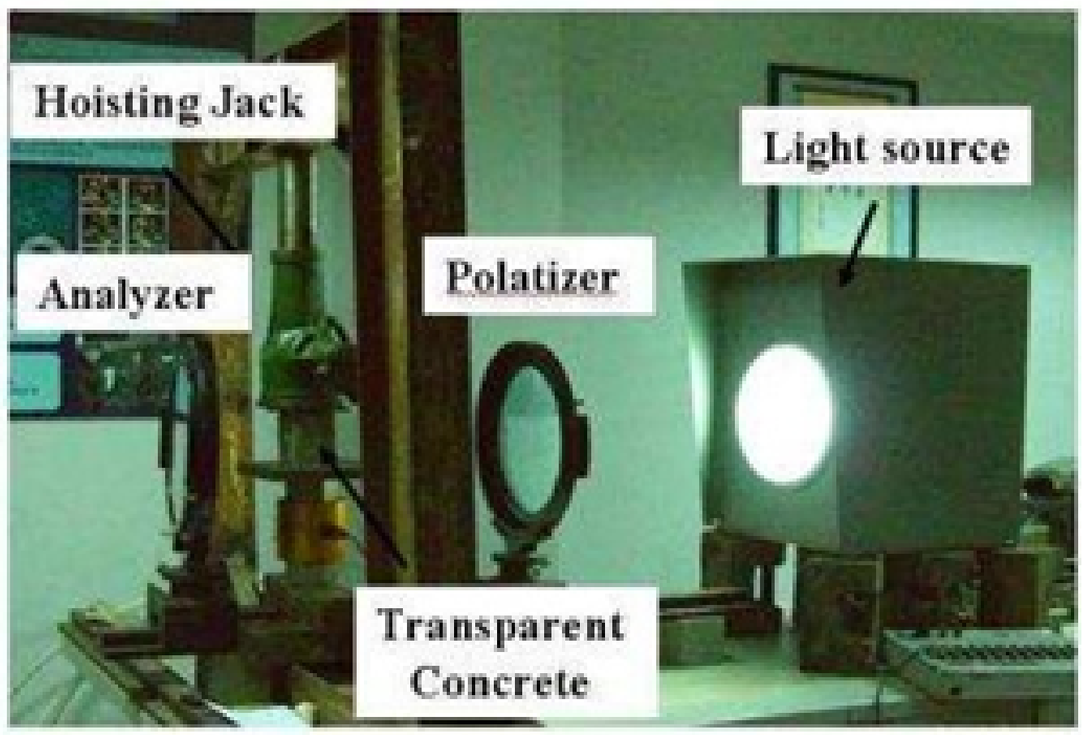

Fig 2. Testing of Translucent concerete

Test of Glass Fiber's Stress Elasto-Optic Effect.

Glass fiber with 15mm diameter is chosen to test its elasto-optic property under radial stress. Before test, the cross-section of glass fiber is polished to ensure the surface smooth. Under the plane polarized optical field, the glass fiber is applied radial load of 0.4kN and 0.8kN respectively. Keeping the polarizer and the analyser mirror orthogonal, the series of isoclinic of glass fiber at 0-90 degree with the step of 10 degree are obtained by synchronously rotation of the corresponding orthogonal polarization axis. To separate the isochromatic from the colour coupled photo elastic patterns, the series of isochromatic of fiber glass are obtained under the circularly polarized optical field, where the glass fiber is applied 0.2-1.6kN with step of 0.2kN.

Test of Self Sensing Property Of Translucent Concrete Based On Stress Elasto-Optic Effect :

Figure below shows the translucent concrete with size of 100mm×100mm×100mm by combining with glass fiber and POFs. The diameters of glass fiber and POF are 15mm and 2mm espectively. The glass fiber is considered as stress-sensing element in the concrete. Like the test described in the 3.2.1, the isochromatic and the isoclinic of the glass fiber are monitored under plane/ circularly polarized optical field, which can reflect the stress state of the concrete.

In order to test the self-sensing properties of the translucent concrete, the elasto-optic effect of the translucent concrete under different damage modes are studied. Figure 7b shows the damage modes of concrete, where a crack with size of 0.5mm is produced. Figure 8 gives three loading modes:
Un-damage mode (I)
"Longitudinal" damage mode (II)
"Lateral" damage mode (III).
The "longitudinal" damage
mode is that the crack is parallel to the loading direction, and the "lateral" damage mode is that the crack is vertical to the loading direction.

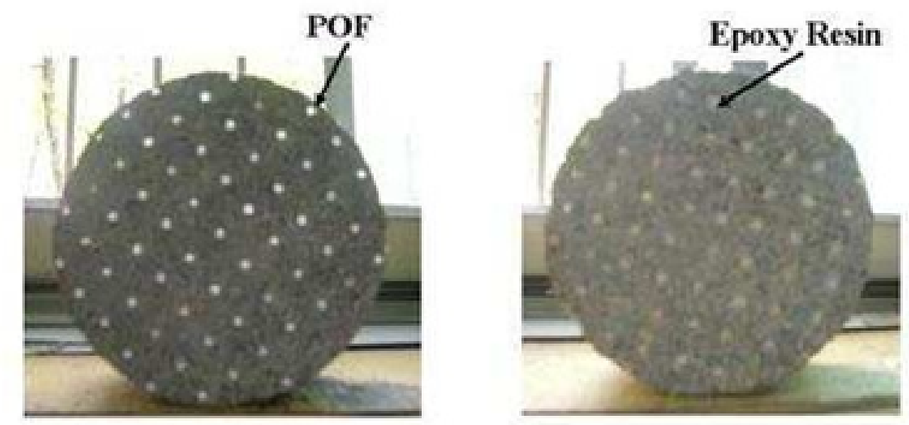

Fig 3. Castspecimens of translucent concrete

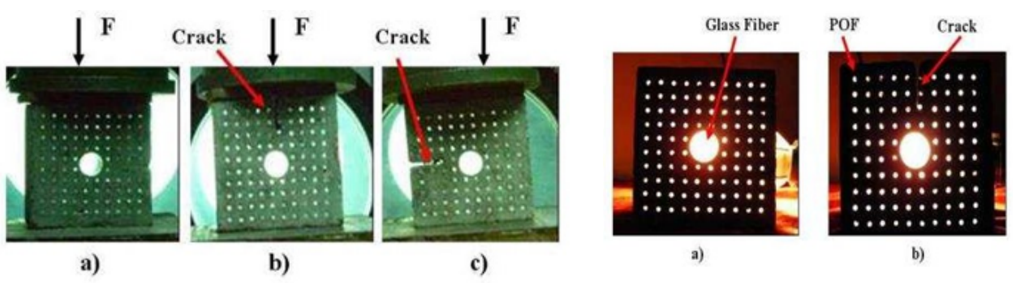

Fig 4.Night view of transulacent concrete

Light Guiding Propert :
Figure 11 and figure 12 show the light guiding property of translucent concrete with the POF volume ratio of 1%, 2%, 3%, 4%, 5% and 6% by using the halogen lamp and incandescent lamp, respectively. It can be seen that the transmittance of each type of translucent concrete almost keeps stable at whole wavelength, and the linear relationship between the POF volume ratio and its transmittance is good.

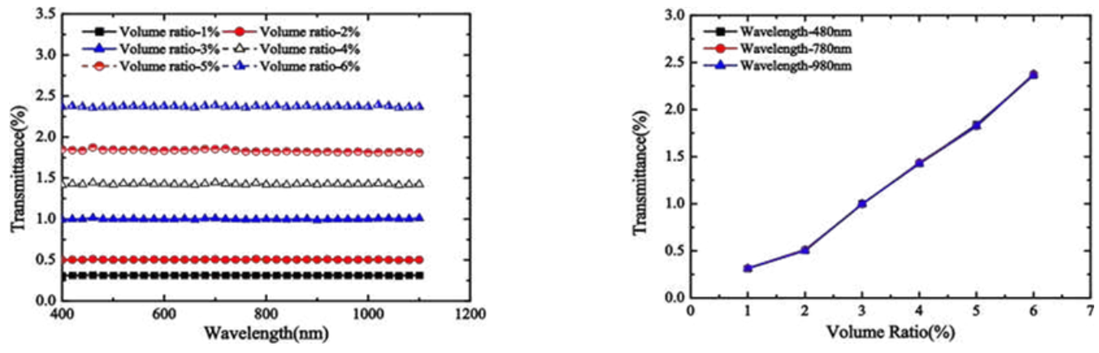

Fig 5. Wavelength and volume ration of translucent concrete.

Photoelastic Effect Of Glass Fiber On Glass Fiber:
Figure 13 shows the results of photoelastic effect of glass fiber applied radial load of 0.4kN under plane polarized optical field. Both the isochromatics and the isoclinics are figured out in the figure. The isoclinics, described as black lines in the figure, are changed along with the angle of the rotation of the corresponding orthogonal polarization axis, while the isochromatics remain unchanged at the same load. The isoclinics denote the direction of principle stress of the glass fiber, and the isochromatics are the difference.Figure 14 shows the isochromatics at different load by adding two 1/4λ wave plates in the plane polarized optical field. It can be seen that the isochromatics are changed with loading change, which hints that the isochromatics of glass fiber are sensitive to the external load. In photoelasticity experiment, it is difficult to measure the series of isochromatic precisely due to various factors such as the accuracy or resolution of the measuring equipment. From the test's results,.

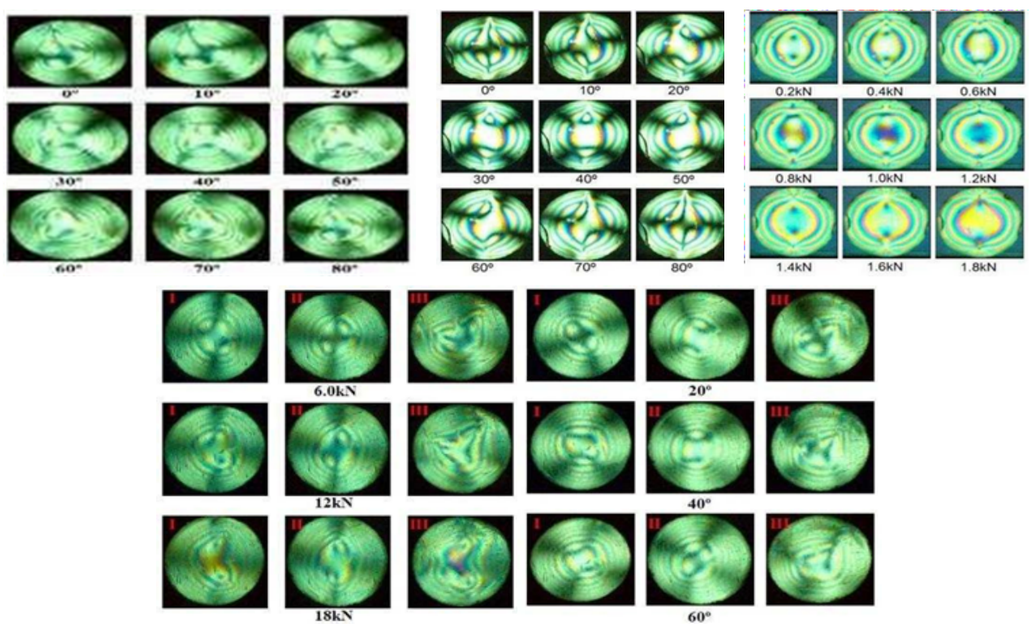

Fig 6. Isochromatic view of translucent concrete

CONCLUSION

A novel architectural material called translucent concrete can be developed by adding optical fiber or large diameter glass fiber in the concrete mixture. The translucent concrete has good light guiding property and the ratio of optical fiber volume to concrete is proportion to transmission. The translucent concrete not loses the strength parameter when compared to regular concrete and also it has very vital property for the aesthetical point of view. It can be used for the best architectural appearance of the building. Also used where the light cannot reach with appropriate intensity. This new kind of building material can integrate the concept of green energy saving with the usage self-sensing properties of functional materials.

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High–Performance cementitious composites reinforced with polyvinyl alcohol fibres

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ABSTRACT

Engineered cementitious composites (ECC) also called as Bendable concrete is an easily moulded mortar based compositereinforced with speciallyselected short random fibres. Traditional concrete suffers catastrophic failure when strained in an earthquake or by routine overuse. ECC remains intact and safe to use at tensile strains up to 5%. Traditional concrete fractures and may not carry a load at 0.01 % tensile strain. In this paper, to overcome the demand for concrete in future and to develop the fibre materials, the PolyVinyl Alcohol Fibre isused so as to reduce the cement content and to enhance flexibility. It has high aspect ratio, high ultimatetensile strength, relatively high modulus of elasticity, good chemical compatibility with Portland cement, good affinity with water and no health risks. To increase the workability of concrete super plasticizer is used. The compressive strength and flexural strength of cubes and slabs (two different thicknesses) is determined and also the bendability characteristics of the concrete are checked during flexural strength test.

Keywords

ECC (Engineered Cementitious Composites) or Bendableconcrete, Poly VinylAlcohol, fibre, Super plasticizer.

INTRODUCTION

Bendable concrete also known as Engineered Cementitious Composites abbreviated as ECC is class of ultra–ductile fibre reinforced cementitious composites.

be damaged by various factors, including weather, traffic, and aging. Potholes and cracks are some of the most common

This material is capable to exhibit considerably enhanced flexibility. An ECC has a strain capacity of more than 3% and thus acts more like a ductile metal rather than like a brittle glass. A bendable concrete is reinforced with micromechanically designed polymer fibres(PVA). Conventional concretes are almost unbendable and have a strain capacity of only 0.1% making them highly brittle and rigid. This lack of bendability is a major cause of failure under strain and has been a pushing factor in the development of an elegant material namely, bendable concrete also known as Engineered Cementitious Composites abbreviated as ECC. This material is capable to exhibit considerably enhanced flexibility. A bendable concrete is reinforced with micromechanically designedpolymer fibres(PVA).

METHODOLOGY

While selecting fibresfor ECC, it was found that polyvinylalcohol (PVA) fibre was of lowcost and high performance. The hydrophilic nature of PVA fibre imposedgreat challenge in the composite design, as the fibres are susceptible to rupture instead of being pulled out because of the tendency for the fibre to bond strongly to cementitious matrix. The objective of this paper is to provide a performance summaryof an exemplary PVA–ECC. PVA fibres have some structural strength and can also be used for shrinkage control. While they cannot replace reinforcing steel, they improve the mechanical properties of cured concrete,boosting its strength. Polyvinyl alcohol fibre (PVA) is an ideal environment–friendly cement reinforced material, which possesses alkali and weather resistance due to its unique molecular structure, taking on good affinity to cement, effectively prevent and suppress the crack formation and development.

Table 1: PROPERTIES OF PVA FIBRES

Technical Parameters	
Materials	100% PVA
Fibre Type	Bunchy Monofilaments
Density	1.29
Formula	(CH2CHOH)n
Titer	1.80-2.40 Dtex
Specification	12MM
Hot water resistance	2.00%
Oil agent content	0.20%

2

MATERIAL TESTSAND PROPERTIES:

Specific gravity of Cement:

Specific gravity is normally definedas the ratio between the mass of a given volume of material and mass of an equal volume of water. One of the methods to determining the specific gravity of cement is by the use of a liquid such as water–free kerosenewhich does not react with cement. A specific gravity bottle may be employed or a standard Le–Chatelier flask may be used. The results obtained by testing the cement used in the present work is presented in the below table:
Ordinary Portland cement confirming to IS 8112–1989 was used. The properties of cementare given below: 53 grade OPC, Ultra tech.

Fig 1. sieving of sand

POLY VINYL ALCOHOL FIBER(PVA):

•While selectingfibres for ECC, it was found that polyvinyl alcohol (PVA) fibre was of low cost and high performance.
•PVA fibreshave some structural strength and can also be used forshrinkage control.
•While they cannot replace reinforcing steel, they improve the mechanical properties of cured concrete, boostingits strength.
•It has the idealized formula[CH2CH(OH)]n
Polyvinyl alcohol fibre (PVA) is an ideal environment–friendly cement reinforced material, which possesses alkali and weather resistance due to its unique molecular structure, taking on good affinity to cement, effectively prevent and suppress the crack formation and development.

Fig 2. PVA Fibres

MIXPROPORTIONS:

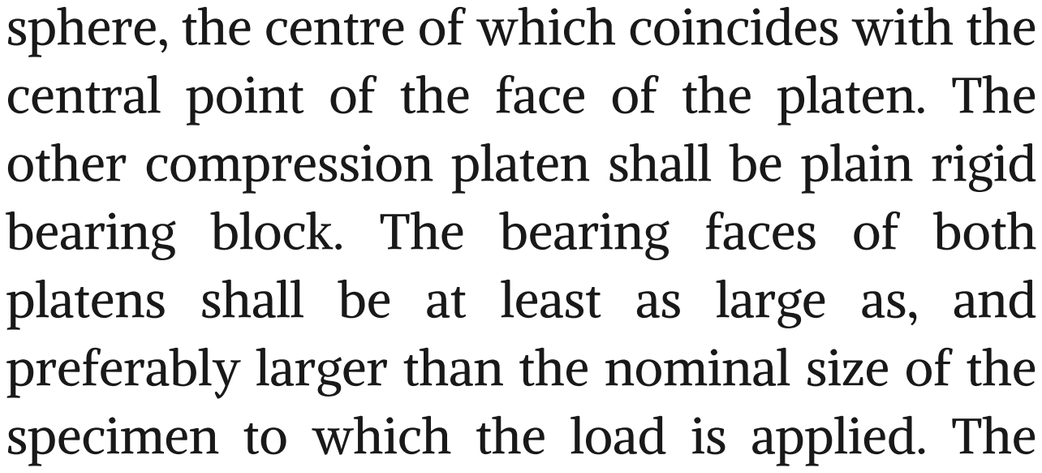
• Concrete mix ratio=1:2
• Water to cement ratio=0.45
•Intial percentage of pva=3%of total volumeof cubes and mould
•Final percentage of pva =5% of total volume of cubes and mould
•Superplasticizer for cubes=30 ml per mould
•Super plasticizer for beams =50ml per mould

Fig 3. Preparation of concrete mix

Fig 4.Casting of ECC

COMPRESSIVE STRENGTHTEST:

The testing machinemay be of any reliabletype, of sufficient capacity for the tests and capable of applying the load at the rate specified below. The permissible error shall be not greater than ± 2 percent of the maximum load. The testing machine shall be equipped with two steel bearing platens with hardened faces. One of the platens (preferably the one that normally will bear on the upper surface of the specimen) shall be fitted with a ball seating in the form of a portion of a sphere, the centre of which coincides with the central point of the face of the platen. The other compression platen shall be plain rigid bearing block. The bearing faces of both platens shall be at least as large as, and preferably larger than the nominal size of the specimen to which the load is applied. The bearing surface of the platens. When new,shall not depart from a plane by more than 0·01 mm at any point, and they &ban be maintained with a permissible variation limit of 0·02 mm.



(a) (b)

Fig 5. Compression test

Table 2: 5% pva used for flexural strength in concrete

% PVA	STRENGTH	7 DAYS	14 DAYS	28 DAYS
3%	FLEXURAL	7.95	8.97	10.17
5%	FLEXURAL	10.14	10.86	11.79
3%	COMPRESSIVE	8.28	14.51	16.56
5%	COMPRESSIVE	9	16	18

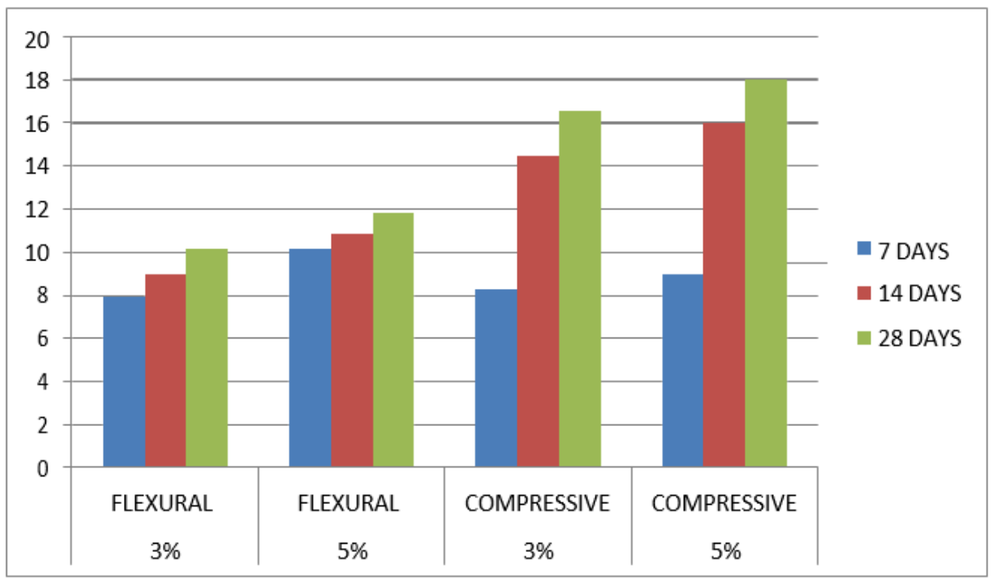


Fig 7.Age vs Flexure&compression strength

CONCLUSION

In this project we compared the compression strength and flexural strength of the bendable concretewith conventional concretefor different mix proportions. Basicallybendable concrete comparatively higher than the conventional cubes and beams. The reason behind the higher flexure strengths of bendable concrete is due to the presence of fibre as reinforcement.

The Flexural strength of conventional cubes and beams is comparatively low since it is not reinforced. In this paper the compression and flexural strength of bendable concrete are compared with the values ofconventional cubes and beams.

Therefore we determined to prove that the bendable concrete is more strength than the conventional concreteand it is more flexibleso that it resists cracksand acts as more efficiency in seismic regions we concluded from the results

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Fabrication of drone using 3D printing for agricultural purpose

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ABSTRACT

Due to their reliable technology and simple operation, drones have found widespread use in many fields. This study aims to plan, investigate, and build a quadcopter for use in farming. This drone is implanted for pesticide spray in the farms. An innovative quadcopter design that is easily removable and transportable is used in this study. The entire structure is developed in Iron CAD, and the viability of the new design is verified using stress analysis in ANSYS. Using the ANSYS analysis tool, the finite element analysis for the quadcopter body was conducted under extreme ambient conditions, and the stress distribution of the body was presented. Under the same load conditions, deflection and stress of the body are found at 6.17 mm and 8.11 MPa, respectively. PLA is used as the appropriate material for manufacture. A flight controller module with Arduino and MPU6050In is used to streamline and reduce the cost of the drone. Also, a GPS module was used to stand and deliver control at one stop.

INTTRODUCTION

Drones have undergone quite a remarkable evolution throughout time. Drones were primarily developed for military use but are currently utilized in various ways. Due to their reliable technology and simple operation, drones have found widespread use in many fields. This study aims to plan, investigate, and build a quadcopter for use in farming. This drone is implanted for pesticide spray in the farms.An innovative quadcopter design that is easily removable and transportable is used in this study. The entire structure is developed in Iron CAD, and the viability of the new design is verified using stress analysis in ANSYS; PLA is used as the appropriate material for manufacture. A flight controller module with Arduino and MPU6050In is used to streamline and reduce the cost of the drone. Also, a GPS module was used to stand and deliver control at one stop.

Industries are becoming more and more well-liked among amateurs. When the Austrians assaulted Venice with explosive-loaded balloons in the middle of the 19th century, uncrewed aerial vehicles (UAVs) were first invented. However, during World Wars I and II, the development of remote-controlled aircraft significantly improved drone technology. Drones came to widespread notice during the Cold War because of surveillance drones deployed for reconnaissance. As technology advanced and costs fell, businesses began to adopt drones: agricultural surveys, filmmaking, and aerial photography.

Faraz Ahmad et al. [1] study involves designing the propellers in Creo 2.0 software and analyzing them using Ansys 16.2 for their vibration frequencies. The authors then describe the 3D CAD model and material properties used in the study. Pulkit Sharm et al. [2] designed a paper drone that can operate in land, water, and air environments. The weight-carrying capacity of the drone is evaluated through simulations where the weight of the components is gradually increased until failure occurs. UM, Rao Mogili et al. [3] studied integration, which offers accurate site-specific applications for large crop fields. Heavy lift UAVs are required for spraying large areas, and the spraying system's efficiency can be improved by using PWM controllers. Tadeusz Kosmal, Kieran Beaumon, et al.

METHODOLOGY

This work focuses on three crucial aspects of quadcopter advancement. Each of these components was crucial to the overall success of the system in this attempt. The frame, additional components, and flight controller are the three components. Figure 1 is a block diagram depicting the relationships between the components presented there.

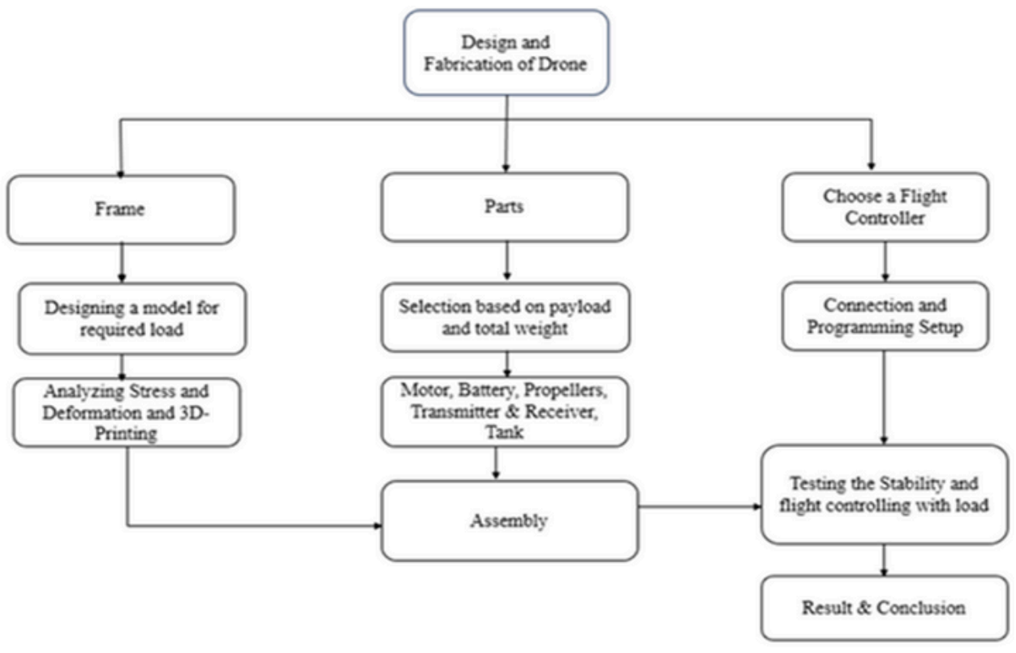

Fig 1. Methodology of the work

Iron CAD software was used to design the drone after considering its intended use in the field. The frame's bottom and top are individual pieces that will be joined together with screws. Drone motors are held firmly in place by motor holders that were also custom-made. The central hub, spars, and wings are designed individually and assembled, shown in figures 2, 3, and 4, respectively.

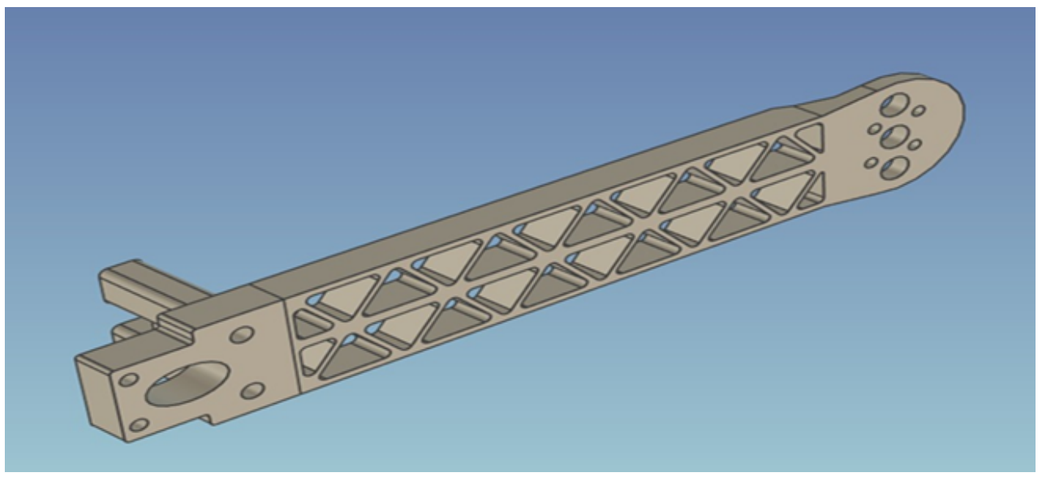

Fig 2. Design of drone wing in Iron cad.

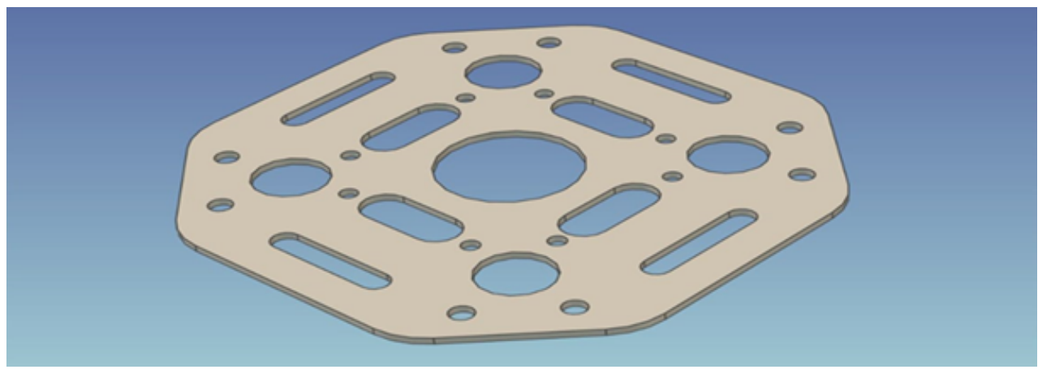

Fig 3. Design of drone frame in Iron cad

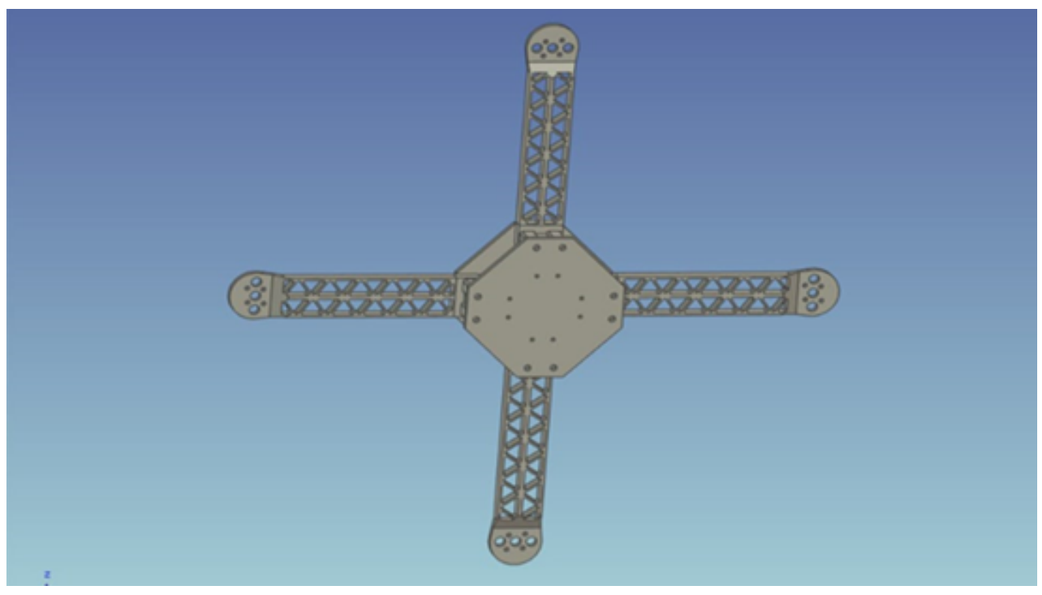

Fig 4. Assembly of drone in Iron cad

Fabrication of drone in 3D printer:

The ultimate Cura software is used to slice the 3D object designed in Iron Cad software by choosing the infill percentage and layer height, followed by material selection, which generates the G-codes to process in a 3D printer (X-Max 3D). We selected the PLA material based on results obtained from Ansys software. Figure 5 shows the printing of the wing of the drone. The Infill of the product is 100%, the layer height is 0.15mm, and the zig-zag pattern.

Fig 5. 3D printing of the drone wing

It takes around 8hrs for printing the one wing. Figure 6 shows the final product of fabricated quadcopter wing. Like this there are 4 wings for a Quadcopter. The bed temperature for 3D printer for using PLA material is 60°c and the filament temperature is 212°c.

Fig 6. Quadcopter wing after printing.

The drone frame is also made by using 3D printing for that infill is 100% and the layer height is 0.15mm and the thickness is 2 mm it takes around 5hrs to print which is shown in figure 7.

Fig 7. 3D printing of Frame

Assembly and flight testing of the quadcopter drone's 3D-printed arms attached to the drone's body. An electronic speed controller (ESC) is connected to a Brushless DC motor.

The ESC is positioned in the center of the arms, while the motors are placed on the edges. The power is distributed to each component using a power distribution board. The drone's flying controller is constructed using an Arduino Uno (R3) as the microcontroller and an MPU6050 as the gyroscope sensor. It is connected to the receiver and ESC. Figure 8 and 9 depict an assembled drone in top and isometric views. Flight testing is done on the drone. A weight of 2.5 kg has been lifted using the designed drone.

Fig 8. Top view of the drone

Fig 9. Isometric view of the drone

CONCLUSION

It has been concluded that the designed frame is optimal according to the load requirement as well as part selections discussed above in the work, and Arduino Uno (R3) with the addition of the MPU6050 module has been selected as a flight controller and the code used in the flight controller is open-source code. It is calibrated according to our required stability as needed.

•The quadcopter drone can fly quickly to its destination due to the use of light materials in the device's construction.

•This work thoroughly details the design and construction of a quadcopter.

•Components like wings and frames of drones are produced via an additive manufacturing process (3D printing).

•Iron cad is used to design the drone frame and motor support wings.

•Ansys software is used for analysis; as a result, the equivalent stress value obtained is 8.1159 MPa, which is safe. At the same time, the maximum stress value of PLA material is 37 MPa, which is a safe design.

•Arduino Uno (R3) as the microcontroller and an MPU6050 as the gyroscope sensor are used as flight controllers.

•Using the selected battery per our designed consideration, the flight time is 4 minutes.

•I have successfully assembled the drone by attaching sprinklers to spray the liquids. Suitable for use in small crop areas.

•Complete mechanization has been achieved for the above reason. Because of its novel layout, the product has improved safety, cost, efficiency, and utility for rural areas.

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Fabrication of indirect solar dryer with modified collectors

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ABSTRACT

Agriculture is the mainstay of the Indian economy, 58% of population are depend upon agriculture. Now the industries going towards the sustainable development for the current scenario a new technique is needed to support the agriculture and promote sustainability. Solar dryer is an equipment that collects the sun energy and utilises it for drying agriculture produce. The project deal with the design and fabrication of Indirect Solar dryer equipped with modified air heater designs. The study deals with the six types of collectors with different designs, these are tested under the indirect drying unit. Dehydration rate, air outlet temperature and collector efficiency are the factors that depicts the which one of them is most effective design. Thermocouple, Hygrometers, Weighting machine are the auxiliary equipment used to check the factors. This study helps to select the best design suitable for definite application under certain atmospheric conditions.

INTRODUCTION

The major occupation of people in India is farming, about 58% of Indian population depends on agriculture. Spoilage of fruits and vegetables mainly due to microbial attack, auto oxidation and insect pest attack. As a result, about 25% –30% the production is lost after harvest due to improper handling, storage, and microbial contamination. One of the effective and most suitable solutions to the above problem is drying the products indirectly under the sun.

Solar dryers plays key role in modern agriculture and food preservation practices, it promotes sustainability and reduce the reliance on fossil fuels. Spoilage of fruits and vegetables mainly due to microbial attack, auto oxidation and insect pest attack. As a result, about 25% –30% the production is lost after harvest due to improper handling, storage, and microbial contamination. One of the effective and most suitable solutions to the above problem is drying the products indirectly under the sun. An equipment that grabs the energy from the sun to extend the life of products for reducing waste and ensuring food security is “Indirect Solar Dryer”. Solar dryers plays key role in modern agriculture and food preservation practices, it promotes sustainability and reduce the reliance on fossil fuels.

Solar dryers can dry items faster because they create a controlled environment that optimizes temperature and airflow. Provides better quality dried products as the process is more controlled, protecting items from overexposure to UV rays, dust, insects, and animals. Items are enclosed in a chamber, protecting them from rain, wind, and contaminants. Efficiently utilizes solar energy through designed components (collectors, chambers), often supplemented with fans for better airflow in some designs. Allows for better control over drying parameters like temperature and humidity, often featuring adjustable vents or fans. Suitable for a wide range of applications including fruits, vegetables, grains, fish, and meats. Some advanced models are used for industrial purposes like drying textiles and chemicals.

The present study focuses on characteristics and outcomes of the indirect solar dryer with various geometry of absorber plate such as V–grooved, Chevron, Cylindrical baffles with three orientations in practical equipment.

METHODOLOGY

•V–Pattern is made by bending process

•Chevron is made by punching with bar punch.

•Baffles plate is made by fastening the cylindrical baffles over the flat plate.

•Black coloured spray paint sprayed over the plates by maintaining proper distance from the plate. Figure 1 and 2 display the 3D model and fabricated Solar Dryer.

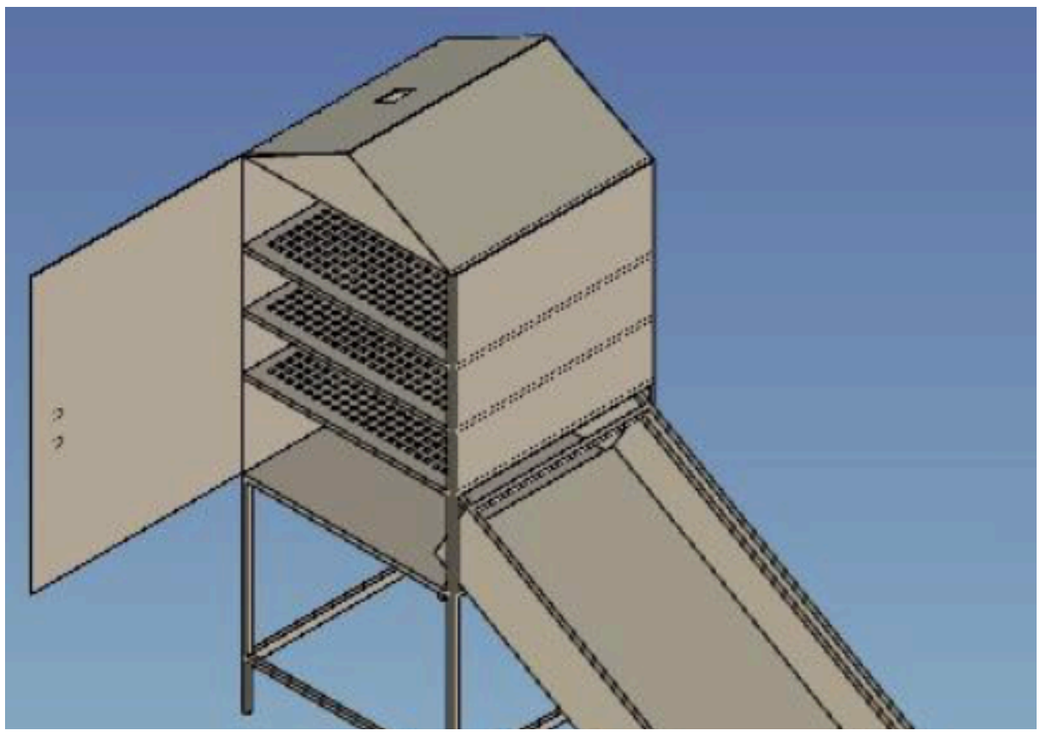

Fig 1. 3D Model for Indirect Solar Dryer

Fig 2. Fabricated Indirect Solar Dryer

Experiment procedure:

•Keep the experimental setup under the sun radiation.

•Insert the Flat plate in Collector holder.

•Place the grapes over the two trays after weighting separately by digital weighting machine. Close the door of the Dryer and switch on the blower with controlled mass flow rate.

•Note down the thermocouple readings at air inlet to collector (tai), air outlet to collector(ta0), collector surface(tc), unit outlet air(tuo).

•Note down the hygrometer readings inside the unit (Hu) and outlet air humidity (Huo).

7.Weight the grapes using digital weighting machine.

•Repeat 5–6 steps periodically with 1hour gap from 10am to 6pm.

•Conduct the same experiment on V–type, Chevron, Parallel Baffles, Horizontal Baffles and Inclined Baffles collectors.

CONCLUSION

•The turbulators over the surface of the collector increases the turbulence in air flow which breaks the laminar sublayer. Due to that the heat transfer rate from the collector to the air is increased which increases the collector efficiency.

•The collector with inclined baffles shows the most effective results among the collectors studied in the experiment. The efficiency of the inclined baffles collector is 20% greater than that of the flat plate collector.

•Dehydration rate of the grapes is more when the inclined baffles collector is installed in the collector holder. Upto 10% more moisture is removed from the grapes using inclined baffles collector than that of Flat plate collector.

•Air outlet temperature is maximum for the inclined baffles collector this is due to maximum contact area and maximum turbulence in the air

•It is concluded that inclined baffles collector is most suitable to dry the grapes in our atmospheric conditions.

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Fabrication of Low-cost Solar Electric Scooter

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ABSTRACT

Today there is a widespread scope for the vehicles working on the renewable energy especially in India. India is one of the world's largest exporters of oil. The emission from petrol and diesel leads to tremendous amount of CO_2, NO_2 emissions, and thereby depleting the ozone layer leading to environmental pollution. This results into respiratory diseases, eye related problems, and other comorbidity in human beings and animals. The objective of project is to fabricate solar based eco-friendly scooter to facilitate pollution-free transportation; hassle free riding experience for shorter distances. The integration of rechargeable batteries powered by solar panels in these vehicles significantly reduces emissions and diminishes reliance on human effort. The primary objective is to create a hardware model of solar electric vehicles (SEVs) to mitigate carbon emissions from traditional fossil fuel vehicles and signify a move towards environmentally conscious transportation. The modelling and simulation of the solar based scooter will be carried out by employing Solid-works as well as ANSYS software's. This endeavor involves the research to enhance solar electric bicycle technology, emphasizing carbon reduction and the promotion of sustainable transportation for a greener future.

INTTRODUCTION

Solar powered bicycles are one of the best methods of reducing our dependence on fossil fuels and minimizing environmental damage caused by carbon dioxide emissions. In this project we are going to use solar panel and DC motor.

The voltage generated by the solar panel is stored in battery (48V/20AH) through charging circuit. From the battery, power will be supplied to the DC motor (48V/200W) through accelerator followed by gate switch. The purpose of gate switch is when break is applied then automatically it opens the connection between motor and accelerometer [1].

The increasing environmental concerns and the depletion of fossil fuels have accelerated the search for sustainable and green transportation solutions. Electric scooters have emerged as a popular alternative due to their energy efficiency and lower emissions compared to traditional internal combustion engine vehicles. Integrating solar technology with electric scooters can further enhance their sustainability, offering a renewable means to recharge the battery, thus extending the range and reducing dependency on grid electricity. Designing a lightweight, efficient, and durable solar panel integration system that maximizes energy absorption. Developing an energy-efficient propulsion system that includes a battery, motor, and controller optimized for performance and range. Implementing smart charging circuits that manage the power flow from the solar panels to the battery and ensure safe, efficient charging. Evaluating the performance of the solar electric scooter under various environmental conditions and usage patterns through both experimental testing and computer simulations [2].

METHODOLOGY

Creating a solar electric bike is a multifaceted project that integrates mechanical engineering, electrical engineering, and renewable energy technologies. The process starts with conceptualization and planning, where objectives such as the bike's range, speed, weight, and usability are defined.

During the design phase, a suitable bike frame is selected or designed to support the additional weight of solar panels and a battery pack, with consideration for strength and durability. The selection of solar panels focuses on efficiency, weight, size, and potentially flexibility, to ensure they can produce the required power within the constraints of the bike's design. The battery and motor are chosen based on the necessary capacity and power output to meet the bike's range and speed objectives, with attention to their weight and size.

In the integration and assembly phase, the solar panels are securely mounted on the bike, ensuring they are optimally angled for sunlight exposure. The electric motor is installed, and a carefully designed electrical system connects the solar panels, battery, motor, and any necessary controllers or converters, incorporating safety features like fuses or circuit breakers.

Designing and fabricating a solar electric scooter through an experimental and simulation approach involves a methodical process to ensure the end product is efficient, reliable, and meets the desired specifications. Below is a detailed methodology presented in a structured. Figure 1 shows the Fabricated Low-cost Solar Electric Scooter.

Fig 1. Fabricated Low-cost Solar Electric Scooter

CONCLUSION

In light of the growing concern over the dwindling availability of crude oil reserves and the pressing need to mitigate the environmental impact of conventional fossil fuel-powered vehicles, the shift towards alternative, more sustainable modes of transportation has become imperative.

•Electric Vehicles (EVs), encompassing electric cars, e-bikes, and electric scooters, emerge as a forefront innovation in this transition, offering a clean, pollution-free alternative to petrol and diesel vehicles.

•The adoption of electric vehicles is pivotal in achieving a significant reduction in air pollutants and greenhouse gas emissions, thus contributing to cleaner air quality and a healthier environment.

•Electric bikes and scooters, in particular, not only exemplify zero-emission transportation but also present a practical solution for reducing urban traffic congestion and enhancing the efficiency of personal mobility.

·In response to this challenge, our main project focuses on the development of electric vehicles that are powered by renewable energy sources, specifically aiming to harness solar energy for this purpose.

•The project, titled "Design and Fabrication of Solar Electric Scooter by Experimental and Simulation Approach," is conceived as a comprehensive initiative to innovate in the field of sustainable transportation.

•By designing and constructing a solar electric scooter that utilizes photovoltaic panels to convert solar energy directly into electrical power for charging the scooter's battery, we aim to demonstrate a self-sustaining, eco-friendly vehicle that significantly reduces reliance on fossil fuels and non-renewable electricity.

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Fabrication of inexpensive solar wood cutting

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R. Raghu – 21341A03B7

ABSTRACT

In recent years, the push towards sustainable and renewable energy sources has gained significant momentum. Among various sectors, the adoption of solar energy in powering industrial and agricultural tools presents an innovative solution to reduce dependency on fossil fuels and decrease carbon emissions. This project focuses on the development and implementation of a solar-powered wood cutter designed for use in rural and off-grid areas. The solar wood cutter integrates photovoltaic panels to harness solar energy, converting it into electrical power to drive the cutting mechanism. The design includes a high-efficiency motor and a robust cutting blade, optimized for various types of wood. Energy storage is managed through advanced battery systems to ensure continuous operation even during low sunlight conditions. Key aspects of this project involve the technical specifications of the solar panels, the electrical system's design, the efficiency and durability of the motor, and the overall environmental and economic benefits. The solar wood cutter aims to provide a cost-effective and eco-friendly alternative to conventional wood cutting methods, promoting sustainable practices and supporting energy independence in remote locations. Initial field tests indicate promising results, demonstrating the tool's reliability, performance, and potential for scalability. Future developments will focus on enhancing energy storage, improving cutting efficiency, and integrating smart technology for monitoring and maintenance.

INTRODUCTION

The transition to sustainable and renewable energy sources is a critical step in addressing global environmental challenges. As industries strive to reduce their carbon footprint and embrace eco-friendly practices, innovative solutions like the solar wood cutting machine emerge as a significant advancement in the woodworking and manufacturing sectors [1,2].

A solar wood cutting machine harnesses the power of solar energy to operate cutting and shaping tools, offering a sustainable alternative to traditional electric or fuel-powered machinery. By integrating photovoltaic (PV) panels, these machines convert sunlight into electrical energy, which is then used to power the cutting mechanisms. This approach not only reduces reliance on non-renewable energy sources but also promotes a cleaner and greener environment [3–5].

The development and deployment of a solar wood cutting machine aim to achieve several key objectives, focusing on sustainability, efficiency, and innovation. These objectives ensure that the machine not only meets the demands of modern woodworking but also aligns with broader environmental and economic goals.

METHODOLOGY

Solar operated wood-cutter machine is operated using solar energy. The battery is charged using a solar panel. Solar panel is used for conversion of solar energy into electrical energy which is further stored in the battery D.C. Motor is run using this battery. Flywheel is attached to the shaft of the D.C. motor. The torque generated by the D.C. Motor is transmitted through the flywheel to a link attached to the flywheel. This link is connected to movable link, whose other end is connected to the main link in which hacksaw blade is fixed.

The self – weight of the main link and upper link which is moving on the movable link attached to the base provides the required amount of downward force for cutting. The continuous motion of fine tooth of hacksaw blade on work-piece leads to the cutting of this work-piece. Machine is driven by 0.67 HP and 70 rpm electric motor. Test was carried out on machine using different metal. For the loaded test, a shaft of diameter 25 mm and length 12 inch and the material of the shaft was mild steel was clamped on the vice of the machine. It took the machine 240 seconds to cut the with a new hacksaw blade. The cut was observed to be neat and straight. Recommendation has been made on the operation and parameters of the machine. Suggestion have been offered on overall machine performance optimization and further work on the machine. Figure 1 and 2 display the CAD model and fabricated of solar wood cutting.

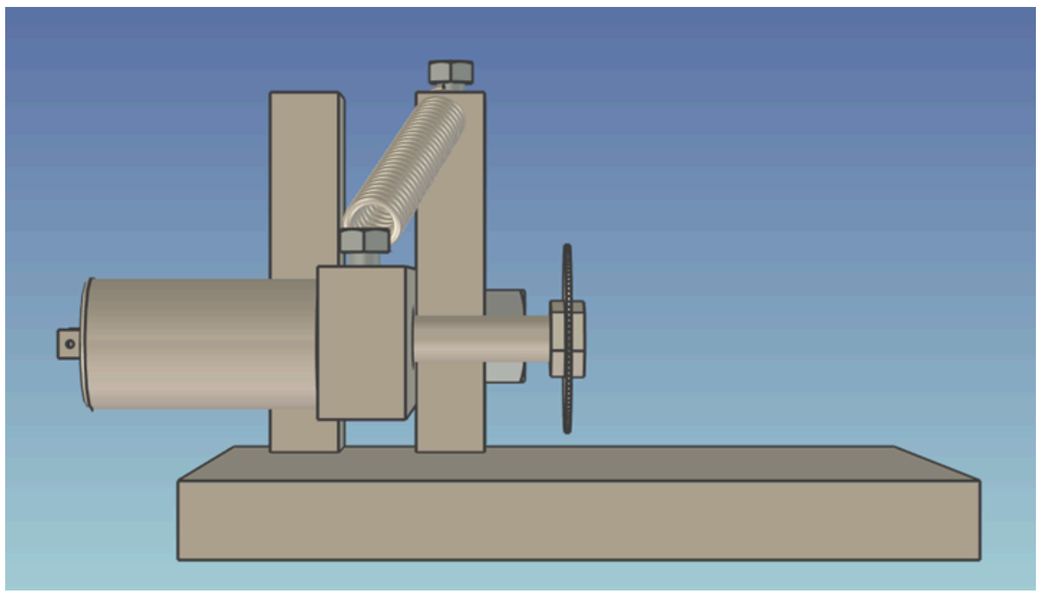

Fig 1. CAD model of the experimen

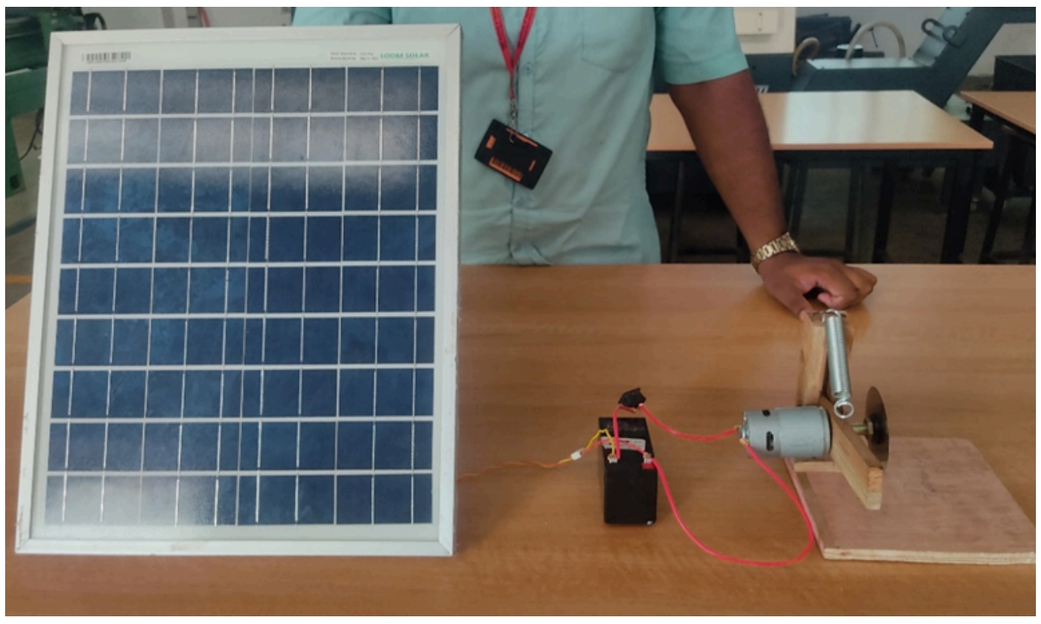

Fig 2. Fabricated of solar wood cutting.

CONCLUSION

Solar-powered wood cutters are a good option for light to medium-duty tasks in areas with good sunlight availability. They are a more sustainable choice than gasoline-powered machines and can save on running costs in the long term. However, their dependence on sunlight and potentially lower power output may limit their usefulness for some applications. After completion of this project, we gained lot of practical knowledge regarding purchasing and assembling and we also had real time industrial experience. We feel that the project work is a good solution for industries to save the energy and solar energy is also pollution less energy. The proposed topology eliminates the used of electricity and reduces the manpower.

Using this system pollution can be reduced as it uses solar energy only. It is known that conventional hacksaw machine can be replaced with solar power hacksaw machine. Solar power hacksaw machine gives high productivity in short time period in comparison with the conventional hacksaw machines. The major advantage of this machine is that intervention of labor is reduced to maximum level. In this rapid emerging industrial era, the use of power Hacksaw machine is wide. Time and labor plays a major role in production process this can be overcome by using this type of machines.

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Fabrication of Prototype model of self-governing braking system using ultrasonic sensor

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ABSTRACT

The project aims to build an autonomous braking system using ultrasonic sensor. The design is specifically intended to enhance vehicle safety by detecting obstacles and automatically applying the brakes to prevent collisions. This is particularly crucial in emergency braking situations such as sudden stops, avoiding obstacles, avoiding sudden pedestrian collision, where traditional braking systems may lead to skidding and loss of control and where the driver cannot react in time for applying the brakes. This system uses sensors to monitor the distance and relative speed between the vehicle and other vehicles in front of it. If a collision is likely, the system automatically applies the brakes to prevent or minimize the impact. Autonomous Emergency Braking (AEB) was first introduced in 2009 to prevent car crashes or reduce the impact of unavoidable ones. However, cameras and radars, which are the main sensing equipment for AEB systems, are less effective in bad weather and low light conditions. If a collision is imminent, the driver does not intervene, and the Autonomous Emergency Braking (AEB) system begins braking automatically. The AEB can detect a probable collision and activate the braking system to slow the vehicle down in order to avoid or mitigate the impact of the accident. It is an advanced system, specifically designed to either prevent possible collision, or reduce speed of the moving vehicle, prior to a collision with another vehicle, pedestrian or an obstacle of some sort.

INTRODUCTION

A braking system is defined as a mechanism designed to slow down or stop the movement of a vehicle or machinery. It typically involves applying friction or resistance to the wheels or moving parts to convert kinetic energy into heat energy, thereby reducing speed or bringing the vehicle to a halt. It consists of various parts, including brake pads, rotors, calipers, drums, and hydraulic systems. When the driver depresses the brake pedal, hydraulic fluid is transmitted through brake lines, applying pressure to the brake pads against the rotors or drums. This generates the necessary friction to decelerate or stop the vehicle efficiently and safely, ensuring driver and passenger safety on the road. It serves the purpose of decelerating or halting the motion of vehicles. While complex in its components, the braking system may seem deceptively simple in its operation, triggered by pressing a single pedal that activates brakes on all four wheels. The general principle of a brake system is to prevent the wheel from turning or turning by using the friction between the non-rotating elements connected to the body (or frame) and the rotating elements connected to the wheel (or transmission shaft).

Recent surveys states that, the increase in vehicles speed is one of the major constraints for the causes of road accidents. The road accidents lead to loss of human life. Car accidents are considered one of the most destructive phenomena. Though there are many different reasons behind car accidents, most accidents occur due to driver's unawareness and uncontrolled speed, which are the critical problems to solve. Then during the night time, a maximum number of accidents happen as the driver may not be aware of the upcoming obstacle or the driver may be in the drowsy state. These critical problems can be solved by our proposed solution, which saves the people's life.

Assuming the driver is not paying attention to the obstacles in front of the vehicle; the automatic braking system can send a warning to the driver and act directly to avoid potential collisions. This study aimed to automate the task of assessing the situation and deciding the correct amount of brake pressure to apply for collision avoidance. That means the car brake itself must have a controller to assist the driver on the road. This will greatly reduce the loss of property and money due to accidental damage [2].

METHODOLOGY

Automatic braking system by the initial technologies has a strong influence on the advanced technology in automobiles. Althougha significant number of numericaland experimental works related to the automatic braking system and different mechanisms have been reported in literature journals. Accordingly, in this study, experiments on the automatic braking system are done closelyin this chapter. The simulations are carried out by varyingcalculations and detailed fabrications are done in this chapter. Ultrasonic sensor plays a major role in the collision avoidance of the automatic braking system. This chapter also gives the clear statement about the prototypeand its actual capability with and withoutultrasonic sensor. Figure 1 shows the fabricated model of the automatic braking system.

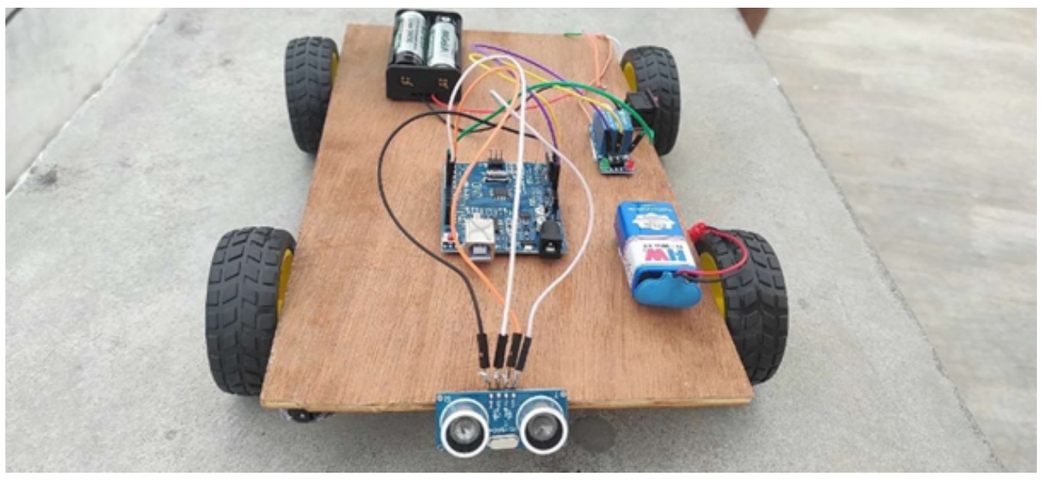

Fig 1. Fabricated model of the automatic braking system.

The above image shows the working model which was attached with the ultrasonic sensor and to drive we used the Arduino UNO circuit for the purpose of collision avoidance. The result was as predicted and the automatic braking system showing good report with the ultrasonic sensor. Figure 2 & 3 explain about the connecting circuit of automatic braking system details.

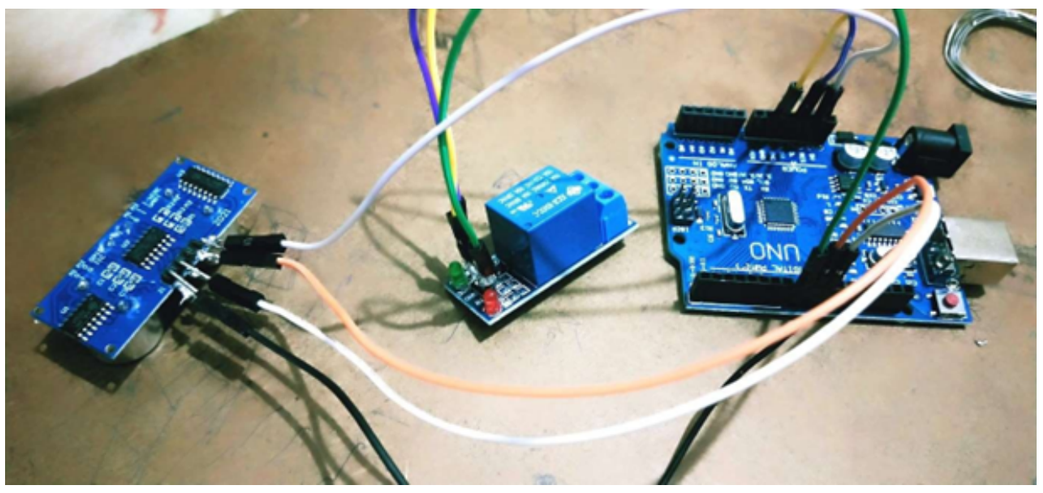

Fig 2.Connecting circuit of automatic braking system

The above image shows the giving connections to the circuitsof the Arduino UNO, the relay moduleand the ultrasonic sensor as per the circuit diagram.The result was as predictedand the ultrasonic braking system is showing the good results with the ultrasonicsensor.

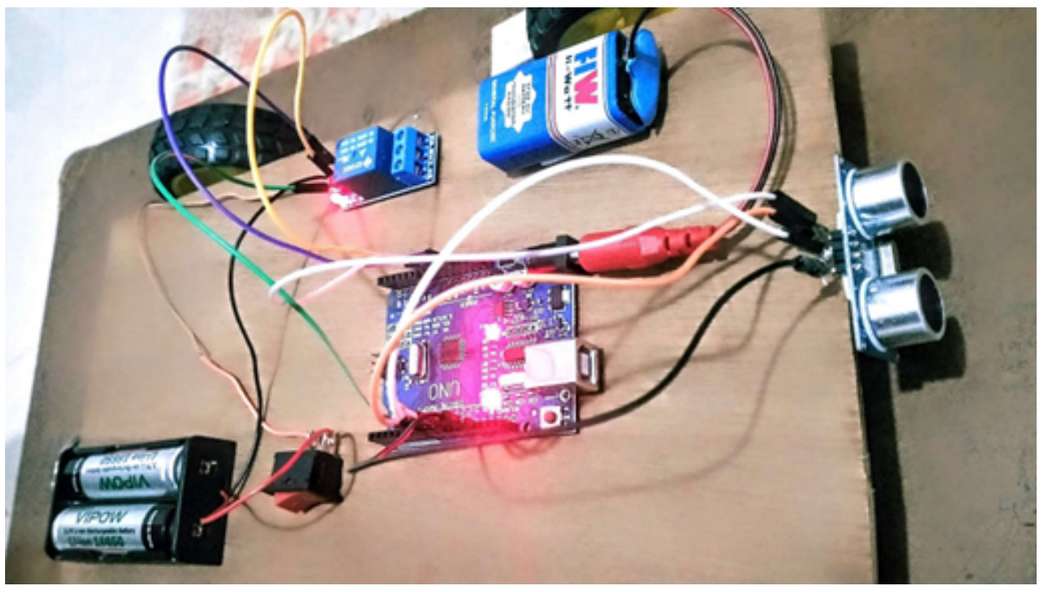

Fig 3. Preparation of the working model

The above image shows the working model whichwas attached with all components that are the ultrasonic sensor, Arduino UNO, relay module, 3.7V batteries, battery holder, HW battery, DC motors, wheels and the switch. The result was as predicted and the automatic braking system is showing good report with the ultrasonicsensor.

CONCLUSION

The outcome of this project is as follow:

•A thorough analysis is carried out by taking readings with the ultrasonic sensor by giving different speeds to the motors and increasing the range of the sensor with respective to the speeds.

•An autonomous braking system must have the capability to avoid collision to the obstacles in front of the vehicle with respective to the variable change of the speeding vehicle.

•Ultrasonic sensor showed a significant increase in avoid collisions.

•A significant analysis of avoiding collisions is carried out to take readings of the distance between the system and obstacle in the units of meters.

•Adding a ultrasonic sensor to the autonomous braking system had a improvement in its performance of the avoiding collisions.

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Development of sleep detection device for two-wheeler

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S. Rishi – 221341A03D1
T.T.S Manjunath – 21341A03D4

ABSTRACT

In current days, the drowsiness of riders causes many road accidents. The National Highway Traffic Safety Administration (NHTSA) estimates that drowsiness accounts for more than 100,000 collisions each year, resulting in over 1,500 deaths and 40,000 injuries. But drowsiness is a natural phenomenon in the human body that happens due to different factors, such as sleep conditions, age factors, and health issues. Hence, it is required to design a robust alert system to avoid the cause of the problem. Accordingly, to overcome this problem, an innovative idea is proposed in this report. In this proposed device, a sleep detection system will be attached to the helmets of the riders. This system uses a pulse sensor connected to an Arduino and placed on the backside of the helmet. The detection of Beats Per Minute (BPM) is crucial to determining whether the rider is drowsy or not. This is essential for providing early warnings to the rider. The device detects sleep and sounds an alarm. At the same time, also can be reduced using any some other devices.

INTRODUCTION

The latest report by world health organization (2023) provides us there is a lot of people who lost their lives in road accident due to drowsiness [1]. Thus, several analyses were performed on this condition. Several researches have been conducted to find different ways to reduce accidents caused by drowsiness of drivers. One proposed solution is to develop a system that can alert drivers when they feel drowsy.

Those are only controlled by human behavior measures. This approach is mainly focused on drowsiness detection in two-wheeler. Already, developed countries had implemented in four wheelers, which is mainly based on different parameters like physical status, face recognition, eye blink rate etc. Advanced Driver Assistance System (ADAS) aims to reduce traffic accidents by implementing new technologies that improve vehicle security and reduce dangerous situations [3]. Current research is centered on driver drowsiness, also known as fatigue, which can be caused by stress, dreaming, illness, medication, or boredom. Drowsiness is estimated to cause 10%–20% of traffic accidents, with trucking accounting for 57% of fatalities. To reduce accidents, it is critical to develop systems that monitor drivers' attention levels while driving [3].

This situation is much more common than we notice, and hence, it is very important to counter this problem. So, to address this issue, we have come up with a Driver Anti Sleep Device. This system alerts the user if he/she falls asleep at the wheel thereby avoiding accidents and saving lives. This system is useful, especially for people who travel long distances and people who are driving late at night. The purpose of a sleepiness detection device is to warn of unexpected sleepiness and is in no way intended to 'keep the driver awake'. In particular, within commercial driving settings, it is emphasized that driver scheduling seeks to ensure that the driver has sufficient opportunity within each day to obtain adequate sleep, and within driving periods has time available to take regular breaks. This approach is key to fatigue management for both commercial and non-commercial drivers. Nevertheless, despite attention to these factors, there remains a perceived need for a device that detects driver sleepiness.

METHODOLOGY

Traditional drowsiness detection by the initial technologies has a strong influence on the advanced technology of modified one. Although a significant number of numerical and experimental works related to traditional model and different mechanisms repeated in literature journals. Accordingly, in this study, experiments on the modified model are closely mentioned in this chapter. The simulations are carried out by varying calculations and detailed fabrications of the model presented in this chapter. IR (infrared rays Sensor) plays a vital role in the model which makes a sensing the human eye closure ratio. This chapter also gives statement about the prototype and its actual capability with placed in helmet.

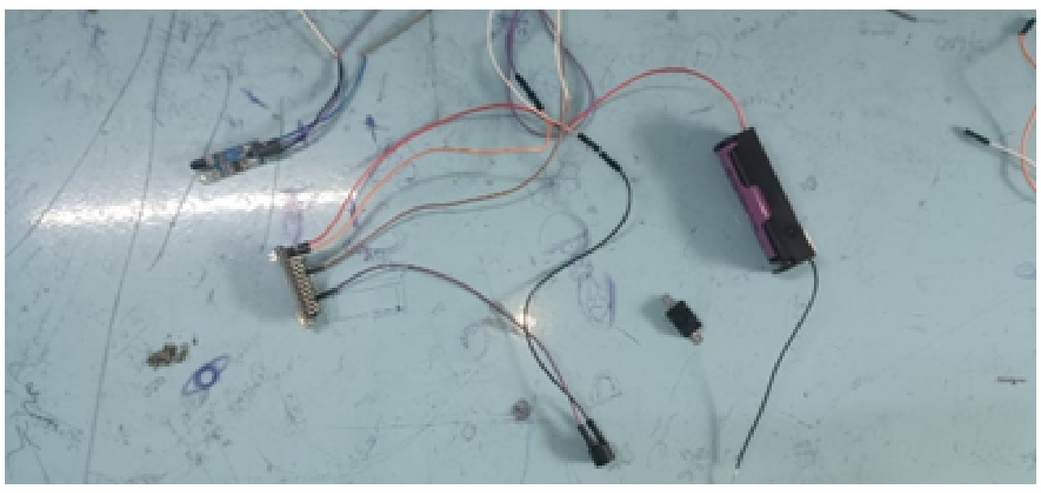

Fig 1. Wire connections for the device

Figure 1 shows the prototype initial connections which is placed inside the helmet IR sensor with a time period of 2.5 seconds. This result was as predicted and the model is showing the good report with the certain time.

Fig 2. Fixed in the existing helmet with time period of 5 seconds

Figure 2 shows the prototype model which was placed in helmet with time period of 5 seconds. If the time period. The result was as predicted and the model is good working and reporting with the 5 seconds of time period.

CONCLUSION

The outcome of the project is as follows:

- In this proposed model, a real time system that monitors and detects the loss of attention of drivers of vehicles is proposed.
- The eye of the driver has been detected by capturing eye blinks and warning is given to the driver to avoid real time crashes.
- The proposed approach uses Eye Aspect Ratio and Eye Closure Ratio with adaptive thresholding to detect driver's drowsiness in real–time.
- This is useful in situations when the drivers are used to strenuous workload and drive continuously for long distances.
- According to the experimental findings, the higher the EAR threshold, the worse the accuracy and AUC. Previously published studies showed that an EAR threshold of 0.2 was the optimal value.
- In our study, 0.18 was the optimal EAR threshold. The experimental findings suggest that the EAR threshold for identifying whether the eyes are open or closed should be recalculated.
- Performs well under various lighting conditions. Correlation coefficient template matching provides a super–fast way to track the eyes and mouth.
- The proposed system achieves an overall accuracy of 94.58% in four test cases, which is highest in comparison to the recent methods. A high detection rate and reduced false alarms makes sure that this system can efficiently reduce the number of fatalities every year.

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RANKINGS

Times Higher Education Impact Rankings 2023

OVERALL RANK 1001+ OUT OF 2152 UNIVERSITIES/INSTITUTIONS RANKED WORLDWIDE 201–300 RANK IN CLEAN WATER AND SANITATION AUG 2024.

NAAC 'A' Grade

All Departments of GMRIT Re-Accredited under Tier-1

39th IN INDIA 4th IN AP

DATA QUEST

48th IN INDIA 3rd IN AP

EDUCATION WORLD

AAAA+

CAREERS 360

201–300

2024 College nirf NATIONAL INSTITUTIONAL RANKING FRAMEWORK

5S CERTIFICATION AWARDED TO GMR VARALAKSHMI FOUNDATION BY NATIONAL PRODUCTIVITY COUNCIL.

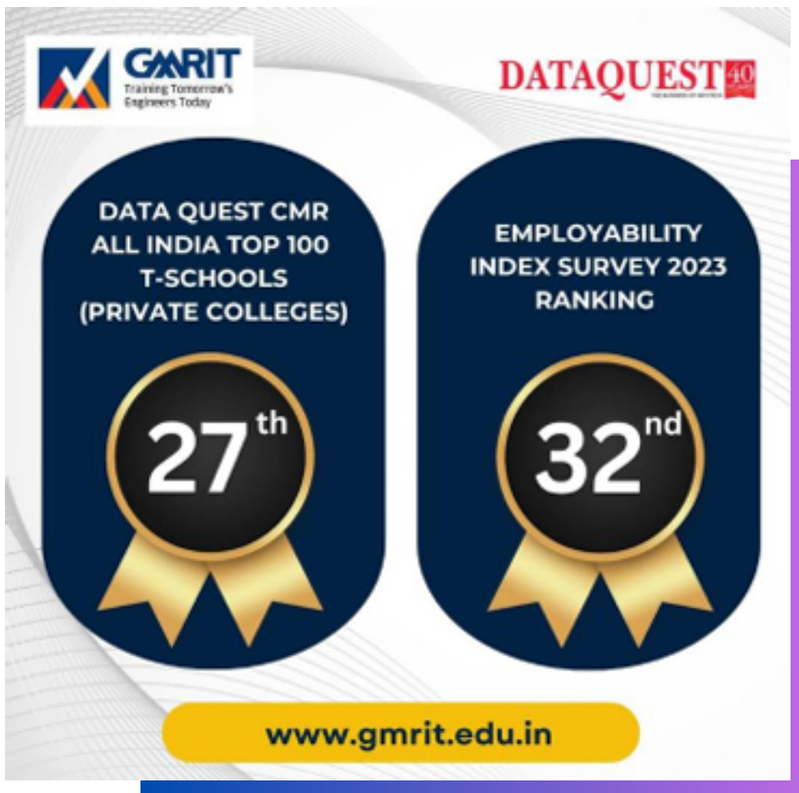
ACHIEVEMENTS

- GMRIT is ranked 12th in the country with an A++ grade in the 11th Chronicle All India Engineering Colleges Survey–2023

- GMRIT is ranked 76th among all private engineering colleges in India by India Today – Marketing & Development Research Associates (MDRA) Best Colleges (Private Engineering) ranking, July 2023.

- GMRIT secured the 16th rank in the country and the 3rd rank among the top Engineering Colleges in Andhra Pradesh in the 'Competition Success Review Magazine' (CSR-GHRDC Engineering Colleges Survey – 2023, July 2023) ranking of top Engineering Colleges of Eminence in India.

ACHIEVEMENTS



- GMR Institute of Technology (GMRIT) is ranked in the Data Quest CMR All India Top 100 T Schools (Private Colleges) and Employability Index Survey 2023. In the All-India Top 100 T-Schools (Private Colleges), GMRIT is ranked 27. In the Employability Index Survey 2023 ranking, GMRIT is ranked 32.

- MRIT's Team Avengers secured a prize of 1 lakh rupees at the Smart India Hackathon (SIH 2023). The management extends its congratulations to Team Avengers (CSE) for winning the cash prize of Rs. 1,00,000. The event took place at Chandigarh Engineering College, Chandigarh, Punjab.

- Members of the Avengers Team: Mr. Vinod (Mentor), Mr. Rizwan (Team Lead), Mr. K Shanmukheswara Rao, Mr. K Charan, Ms. K Deepika, Ms. M Poojitha, and Mr. D Badrinath.
- SIH – Problem statement: Sentiment Analysis of incoming calls on Helpdesk

ACHIEVEMENTS

- The GMRIT Go-Kart team won three awards at the Edge Line Championship held at Red Riders GoKarting in Bengaluru from January 16 to 18, 2024. The team secured the Best Captain Award, Clean Pit Award, and was the runner-up in the business presentation category. The team comprised 15 students from the III Year Mechanical Engineering program.

- GMRIT-Rajam extends heartfelt congratulations to Mr. S. Ganesh for securing All India Rank 50 in GATE Exam (Mechanical) & Mr. V. Aravind for achieving All India Rank 51 in the GATE Exam (Computer Science)

PLACEMENTS


GMRIT
Training Tomorrow's Engineers Today
EAPCET Code: GMRI
2023-24
COLLEGE
PLACEMENTS
85%
PLACEMENTS
40.5 LPA
HIGHEST PACKAGE
SO FAR
4.8 LPA
AVERAGE PACKAGE
80+
COMPANIES
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SPORTS

- Mr. M. Sai Deepak (22345A0317) participated and secured 1st place in the 70 kg weight category at the OPEN MR. ANDHRA BODYBUILDING CHAMPIONSHIP2023–2024, organized by GMRIT on behalf of the Vizianagaram District Bodybuilding Association on 10.12.2023.

GMR Institute of Technology
An Autonomous Institute Affiliated to JNTU-GV

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ABOUT GMRIT

GMRIT is an Autonomous Engineering college established in the year 1997 by GMR Varalakshmi Foundation – the corporate social responsibility arm of GMR Group. Located in Rajam,Vizianagaram district of Andhra Pradesh, GMRIT provides its learning communitystate–of the artfacilities, infrastructure, state – of – the – art facilities,infrastructure, and a competent faculty.

GMRIT was ranked (201–300)th in NIRF–2024 and ranked among the top 5 colleges in the state of Andhra Pradesh and top 50 colleges in the country by popular education magazines .The institute is accredited by both NAAC (with A grade) for the three consecutive cycle till 2025.

All the UG programs are accredited by the NBA. We offer 7 UG and 6 PG programmes. GMRIT delivers quality technical education for the all–round development for aspiring engineers.

With a strong belief that Academics and Research has to go hand in hand, GMRIT promotes research by organizing conferences and capacity buildingprograms in all the emerging areas.