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Dr. D. Shanmugasundaram & Dr. T. Sivaraman

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Prof. Dr. D. Shanmugasundaram is currently serving as the Principal of Dhanalakshmi Srinivasan Engineering College (Autonomous), Perambalur, Tamil Nadu. He completed his higher studies and Research at Bharathidasan University, Trichy, and SASTRA University, Thanjavur. He has an impressive Teaching, Training, Placement, Research and Administrative background with over 28 Years of Experience in the field of Engineering and Technology, and the extensive tenure undoubtedly grants him valuable knowledge and expertise in educating and shaping the minds of aspiring engineers and technologists. His Research expertise primarily lies in the domains of Powder Metallurgy, Energy and Composites. He has successfully completed a few research projects sponsored by funding agencies like DST, TNSCST and SASTRA University.

The comprehensive analysis and findings from his research work have contributed to a deeper understanding of problem and potential solutions. He has a remarkable research record, having published nearly 10 articles in International Journals and many in Conferences. He has been invited to institutions at Malaysia, Hong Kong and Tokyo as a key note speaker for their Conferences. These publications reflected his dedication to advancing the academic and professional communities through scholarly contributions. He is in the editorial board and reviewer of some reputed journals and also a member of many International and National Societies.

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Prof. Dr. T. Sivaraman currently serves as the Dean - R&D at Dhanalakshmi Srinivasan Engineering College, part of the Dhanalakshmi Srinivasan Group of Institutions, Perambalur - 621212, Tamil Nadu, India. He earned his Ph.D. in Chemistry from National Tsing Hua University, Taiwan, in 1999, and brings over 28 years of extensive research experience across multiple domains, including Toxinology, Cancer Biology, Computational Biology, and Drug Design. As of November 2024, he has published more than 100 research articles in leading international journals, achieving a cumulative impact factor exceeding 218. His scholarly work has garnered over 1,500 citations, reflected in an h-index of 21 and an i10-index of 41. In addition to his research publications, he has authored eight books and delivered more than 100 presentations at various national and international scientific events.

Dr. Sivaraman has mentored over 80 research projects for students across undergraduate, postgraduate, and doctoral levels in Science and Engineering. He has successfully led several research initiatives funded by prestigious national agencies, including the Department of Biotechnology (DBT), the Indian Council of Medical Research (ICMR), and the Council of Scientific and Industrial Research (CSIR), New Delhi, India. In recognition of his expertise, he serves on the editorial boards and as a reviewer for several reputed journals. He is also an active member of numerous professional societies and organizations, both at the national and international levels, contributing significantly to the advancement of his fields of research.

FOREWORD

Shri. A. Srinivasan

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In the 21st century, science and technology have become pivotal forces driving societal progress and global transformation. The rapid pace of innovation touches every sphere of our existence - reshaping industries, revolutionizing education, improving healthcare, and inspiring sustainable development. However, the promise of these advancements must be tempered with mindful responsibility, as technological progress carries both great potential and significant challenges.

The Second Edition of *Emerging Innovative Research in Science and Technology* is a testament to the dynamic research culture at Dhanalakshmi Srinivasan Engineering College (DSEC), Perambalur, Tamil Nadu. With 64 chapters encompassing diverse domains - ranging from Biological Sciences, Circuit Engineering, Non-Circuit Engineering, Software Engineering and Management Studies - this volume provides a comprehensive view of emerging trends across multiple disciplines. This collection of research is not just a celebration of academic achievements but a roadmap toward future innovation. By fostering interdisciplinary collaborations across engineering, science, and business management, the authors and contributors present holistic solutions to real-world challenges.

The contributions of the faculty and scholars from DSEC reflect a deep engagement with the core challenges and opportunities of our time. They exemplify the belief that research, when conducted with purpose and precision, can profoundly shape the future. This book serves as a platform not only for sharing remarkable discoveries but also for encouraging a dialogue on how science and technology can be harnessed responsibly and inclusively.

I commend the Editors for their meticulous work in curating this volume and ensuring that it reflects both depth and diversity. Their collaborative efforts with Trueline Publishers and the support from Dhanalakshmi Srinivasan University (DSU) leadership have brought this edition to life, reinforcing the spirit of academic inquiry and shared knowledge. This book will undoubtedly inspire students, researchers, and professionals to pursue new avenues of innovation while staying grounded in ethics and sustainability.

As you explore the chapters within this volume, I encourage you to approach them with curiosity, enthusiasm, and a sense of responsibility. I believe this book will continue to play an essential role in the academic and research community, spurring further innovations and meaningful impact. May it inspire you to not only learn but also to think boldly and creatively about the challenges and opportunities that lie ahead.

PREFACE
SECOND EDITION

In a rapidly evolving world, science and technology continue to shape and redefine the way we live, work, and thrive. With each passing day, new discoveries and innovations drive profound changes across industries and societies. As we stand on the cusp of unprecedented advancements, it becomes increasingly essential to explore these developments with thoughtful responsibility, ensuring they are harnessed for the betterment of all. This **Second Edition of** *Emerging Innovative Research in Science and Technology* builds upon the success of the first edition, expanding on the remarkable research and development undertaken **by the faculty and scholars of Dhanalakshmi Srinivasan Engineering College (Autonomous), Perambalur, Tamil Nadu.** The book continues to serve as a platform to highlight cutting-edge research in the fields of Science, Engineering, Technology, and Business Management.

This edition retains the well-structured classification of the content into five domains - **Biological Sciences, Circuit Engineering, Non-Circuit Engineering, Software Engineering and Management Studies.** The 64 chapters in this volume reflect the latest trends in a variety of fields, offering insights into innovative practices across Biological, Biomedical, Mechanical, Electrical, Civil, Communication, and Computer engineering. Several chapters also address crucial management strategies that contribute to organizational excellence and sustainability, providing a multidisciplinary view of innovation.

The Editors would like to take this opportunity to extend heartfelt gratitude to **Honourable Ayya A. Srinivasan, Chancellor, Dhanalakshmi Srinivasan University (DSU), Tamil Nadu, India,** for his continued guidance and blessings, which have been instrumental in our journey. We also express our sincere appreciation to the **Vice-chairman, Secretary, and all dignitaries of the Dhanalakshmi Srinivasan Group of Institutions** for their unwavering support.

This edition would not have been possible without the valuable contributions of the **authors**, who have shared their knowledge and expertise, elevating the book's scientific

rigor. We also wish to thank the **Editorial Board members** for their meticulous efforts in ensuring the quality and relevance of the content. A special note of appreciation goes to **Trueline Publishers** for their entrepreneurial partnership, helping us bring this second edition to life with the same spirit of excellence.

We remain committed to making this book a meaningful contribution to the research community and society at large. Constructive feedback from our readers is invaluable, and we encourage suggestions that could further enhance the content and impact of future editions. With this second edition, **we hope to inspire researchers, students, and professionals to explore the latest innovations in science, engineering, and management with curiosity and responsibility.** Together, let us shape a future that is sustainable, inclusive, and full of promise.

Prof. Dr. D. Shanmugasundaram   **Prof. Dr. T. Sivaraman**

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CONTENTS

Biological Sciences

CHAPTER 1

ANTAGONISTS SPECIFICALLY TARGETING ANTI-APOPTOTIC MEMBERS OF BCL-2 FAMILY PROTEINS AS EVALUATED BY COMPUTATIONAL METHODS

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ABSTRACT

Maintaining cell homeostasis is critical for the proper functioning of higher eukaryotic organisms, where imbalances in cell death and survival mechanisms can lead to neurodegenerative diseases or cancers. Cancers, characterized by uncontrolled cell proliferation and impaired apoptosis, are influenced by genetic and environmental factors. The Bcl-2 family of proteins plays a pivotal role in regulating apoptosis through intrinsic and extrinsic pathways. This study explores the design of small molecular antagonists targeting anti-apoptotic Bcl-2 family proteins such as Bcl-XL, Mcl-1 and Bcl-B using In silico methods. The study highlighted the importance of considering structural differences in the BH3-binding grooves of Bcl-XL and Mcl-1 to achieve specificity in antagonist design. For Bcl-B, a novel computational strategy, the peptidodynmimetic method, was successfully employed. Cumulatively, this study contributes to the development of precise antagonists for anti-apoptotic proteins, offering potential advancements in cancer chemotherapy. The integration of computational methods enriches the comprehension of protein-ligand interactions, thereby guiding the formulation of novel therapeutic strategies with enhanced efficacy.

KEYWORDS

Antagonists, Anti-Cancer, Bcl-2, Drug Design and Therapeutics.

INTRODUCTION

In higher eukaryotic organisms, cell homeostasis between cell deaths and cell survivals is tightly regulated by complex mechanisms of several biological processes such as autophagy, necrosis, necroptosis, apoptosis, and cell proliferations [1]. However, imbalances among the processes lead to neurodegenerative diseases or cancers. In general, cancers are due to uncontrolled cell proliferation and/or impairment of apoptosis. Cell proliferation processes are generally regulated by oncogenes and tumor suppressor genes. The homeostasis of the functions of these genes is affected by hereditary genetic factors and environmental factors such as exposure to mutagens, carcinogens, radiation, infections, and imbalanced diet habits [2–5].

The apoptosis processes are characterized by two different mechanisms: the intrinsic, or mitochondrial pathway and the extrinsic pathway. While the extrinsic pathway is activated by death receptors on the cell surface, the intrinsic pathway is tightly regulated by the Bcl-2 family of proteins [6]. Proteins belonging to the Bcl-2 family are grouped into three distinct categories: pro-survival proteins, pro-apoptotic proteins, and BH3-only proteins [7]. The proteins belonging to all three groups are linked in one way or another to the mitochondrial apoptotic pathways. The pro-apoptotic proteins present in the outer membrane of mitochondria oligomerize to form a channel through which the death signal cytochrome C is released, and then it activates caspases leading to cell death [8]. The anti-apoptotic proteins sequester the pro-apoptotic proteins and consequently terminate the cell death signals. Thus, designing small molecular antagonists to the anti-apoptotic proteins has become an important strategy in cancer chemotherapy.

In silico methods for designing antagonists to anti-apoptotic proteins

In the past few years, computational tools have been extensively used to design lead compounds for various diseases and disorders. Highly sophisticated free and commercial tools on molecular modelling, docking, dynamics, and structure-activity predictions are now available to scrutinize the binding affinities, modes of interaction, specificities, bioavailability, and toxicities of small and macromolecules [9]. In 2000, Wang et al. reported, for the first time, that HA14-1 obtained through high-throughput virtual screening was an inhibitor of Bcl-2, an anti-apoptotic protein [10]. At present, we have tens of lead anti-cancer

compounds identified using a variety of computational methods as reported in the literature, and a few of them are right now in different stages of clinical trials [11].

Computational Rationalization to Specific Antagonists of Anti-Apoptotic Proteins of Bcl2-Family

To date, six structurally characterized anti-apoptotic proteins (Bcl-2, Bcl-W, Bcl-XL, Bcl-B, Mcl-1, and Bfl-1) from human beings have been reported in the literature [12]. The six proteins depict highly similar three-dimensional structures to each other, notwithstanding their weak sequence identities (about 30%) among them. Moreover, it has been shown that each anti-apoptotic protein plays an essential role in different biological processes and is also unique in targeting BH3-only peptides. In these backgrounds, it is indispensable to design specific inhibitors for each anti-apoptotic protein in order to avoid adverse effects on the chemotherapy treatments of specific cancers by overproducing the anti-apoptotic proteins in different concentrations.

In the present studies, specific antagonists designed for Bcl-XL, Mcl-1, and Bcl-B have been brought to the fore. Based on the structures of antagonists reported in the literature for Bcl-XL, a small, focused combinatorial library of rhodanine derivatives as inhibitors of Bcl-XL was developed [13]. The compounds from the library were docked on the BH3-binding groves of Bcl-XL and Mcl-1 (as the two anti-apoptotic proteins are well documented to get overexpressed in most types of cancers) and then ranked based on their binding energies. Based on the comprehensive analysis of data from the docking studies and experimental data on the protein-ligand interactions obtained from isothermal titration calorimeter, circular dichroism, fluorescence spectroscopy, fluorescence polarization assay, STD-NMR, and two-dimensional N15-HSQC-NMR techniques, compound 7 (as reported in the original paper) was identified as a specific inhibitor of Mcl-1 [13, 14]. The dissociation constants of the compound were 10 µM and >750 µM for binding on the Mcl-1 and the Bcl-XL, respectively. A possible rationale for the differential interactions of the ligand on the two structurally similar proteins could be understood from in silico docking studies on the complexes. The docking models showed that one of the two methoxy groups in the phenyl ring of compound 7 was not fitting into the BH3-binding groove of Bcl-XL and was exposed to a charge-incompatible environment (Figure 1). It could be rationalized that the ligand

should need to adapt a conformation in order to bring the exposed methoxy group into the groove, and the resultant conformation of the compound may presumably not be compatible with being accommodated in the groove. However, the Mcl-1 could accommodate the ligand in its BH3-binding groove, as the groove is much wider than that of the Bcl-XL (Figure 1). Recently, quite a lot of chemical compounds that are specific to Bcl-XL or Mcl-1 have been reported in the literature [11, 14].

Figure 1: The binding interactions of Compound 6 (magenta) and Compound 7 (cyan) within the BH3-binding groove of Bcl-XL, as revealed by molecular docking studies, are depicted here. For detailed structural information on Compounds 6 and 7, please refer to the original publication by Bernardo PH et al., published in the Journal of Medicinal Chemistry (2010, Vol. 53, pp. 2314-2318).
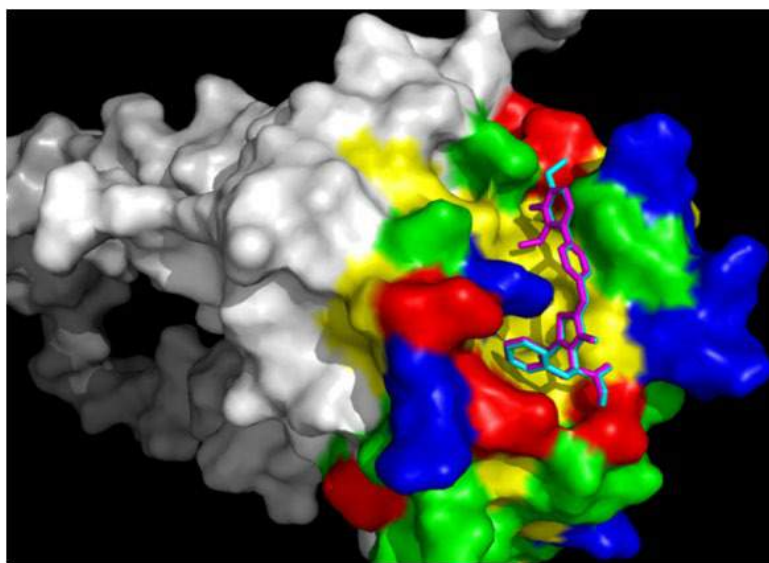
In order to design highly efficient and specific antagonists to hBcl-B (playing important roles in regulating apoptosis that are exclusively mediated by Bax), we have successfully used a novel computational strategy, the peptidodynmimetic method [15]. In this method, the hBcl-B-hBaxBH3 (BH3 peptide of hBax) complex was, at first, subjected to molecular dynamic simulation in near physiological conditions (pH 7.0, 0.1 M NaCl, 1 atm pressure) at three different temperatures: 300 K, 310 K, and 320 K. Second, essential residues of hBaxBH3 to interact with hBclB were identified at each temperature using the 'Strong Contact Filter'

strategy. The residues that were consistently present in all three temperature-specific dynamic simulations (at least in 80% dynamic structures) were defined as the 'pharmacophore pattern' of the hBaxBH3 peptide under its dynamic states. The pattern was then used to collect small molecules mimicking the peptide interactions with the protein, and the collected chemical compounds have been named 'peptidodynmimetics' [15, 16]. The compounds showed superior qualities to peptidomimetics in terms of ligand efficiencies, bioavailability, and pharmacokinetics for interacting with the hBclB, as analyzed by dockings, molecular dynamics, and pharmacokinetic prediction computations tools. The experimental validations for a few numbers of the peptidodynmimetics identified from the computational studies are right now in progress.

Concluding Remarks

The development of specific antagonists targeting Bcl-XL, Mcl-1, and Bcl-B demonstrates the potential of computational methods in designing selective inhibitors for anti-apoptotic proteins of the Bcl-2 family. By leveraging docking studies, molecular dynamics simulations, and experimental techniques, this research has identified compound 7 as a potent Mcl-1 inhibitor [13, 14] and introduced the innovative peptidodynmimetic approach for targeting hBcl-B [15, 16]. These findings underscore the importance of tailored strategies in designing cancer therapeutics to minimize adverse effects and enhance treatment efficacy.

Acknowledgements

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CHAPTER 2
DETERMINATION OF VARICOSE VEINS PROBLEMS USING CONCURRENT SENSOR NETWORK

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ABSTRACT

In Varicose vain is a chronic disease which occurs when leg vein blood circulation is not working properly. This cause problem in the blood circulation from leg to heart. Nearly 10 million people in India were affected by varicose vein. In India, number of varicose vein cases are increasing rapidly. 12.5% cases occur due to heredity. Varicose veins occur in person who stands and squats for long time. This occurs because of blood get collected in the leg veins and this condition is said to as stasis which leads blood to drop backward and damage the valve. Prolong standing or sitting, aging, lack of mobility are some of the main reason for this chronic disease. Early detection of this problem can be treated easily and help the patient relief from pain and stress. Varicose veins are inflammatory lesions on veins that occurs mostly on legs. When the veins expand, the valves become weaker, lesser flexible and starts to flow in opposite direction. The cost for treatment is also too high. Mostly the treatment for varicose vein is by invasive methods such as surgery, laser therapy, RF endogenous therapy and sclerotherapy. To solve this problem, IoT-based system is to provide an efficient and non-invasive method for detecting varicose veins and providing therapeutic treatment. The system aims to provide an accurate and early diagnosis of varicose veins, which can help prevent further complications and improve the patient's quality of life. The system uses three sensors - SpO2 sensor, accelerometer sensor, and force sensor to detect varicose veins by measuring the oxygen saturation level, movement and vibration of the leg, and pressure applied to the leg, respectively. By using IoT technology, the system can provide real-time monitoring and analysis of the data collected from the sensors, which can help doctors and healthcare professionals make informed decisions regarding the treatment of varicose veins. The therapeutic treatment provided by the system, which includes a Peltier crystal, aims to alleviate pain and discomfort associated with

varicose veins. The Peltier crystal can cool or heat the skin's surface, which can help reduce inflammation and improve blood circulation.

KEYWORDS

sclerotherapy, IoT-based system, Peltier crystal.

INTRODUCTION

Inflamed veins that are visible beneath the skin's surface are known as varicose veins. Although they can form anywhere, most often in the legs where the veins must work harder to support the weight of the torso. They may also result in skin sores, slight pain, blood clots, and itching. Varicose veins are superficial, cylindrical, or vascular veins, according to the World Health Organisation (WHO). They can be brought on by a number of things, including a sedentary lifestyle, pregnancy, heat exposure, being overweight, wearing tight clothing and shoes, etc. Its primary purpose is to stop blood from constantly returning to the heart, which causes the body's veins to deteriorate and worsen if a person leads an inactive lifestyle. the legs are the most often affected areas. The World Health Organisation reports that varicose veins affect almost 10% of the global population, with a higher incidence in women. In addition, the risk of developing varicose veins rises with age, accounting for 35% of cases in active individuals and rising to 50–60% in sedentary lifestyles. Varicose veins are categorised into grades I through IV. They typically start out as an aesthetic issue with thin turquoise blue lines that cause itching, heaviness, and fatigue. As the grade increases, varicose veins can be seen on the skin's surface with small swellings. Lastly, if the damaging factors associated with varicose veins are not addressed in a timely manner, they can result in ulcers, internal circulation problems, and inflammations affecting large areas of the leg2.Even though varicose vein disease is a slowly progressing medical illness, it can be prevented by detecting suspected cases of the veins in the legs as soon as possible. Symptoms of early varices include itching, cramping, and other discomforts. Ulcers, swelling and inflammation, bleeding from veins close to the skin, and finally leg sensitivity are the symptoms that occur if an early identification and healing process is not followed.

METHODOLOGY

Existing System

Buses and autos are common modes of transportation in Indian cities. Jerks from vehicles are transmitted to the driver's coccyx and lumbar vertebrae, leading to serious spinal issues, wear of the gristle pad between vertebrae, and insufficient cerebrospinal fluid circulation. Slow movement of blood to the lower extremities causes problems such as varicose veins and deep vein thrombosis. Studies suggest that drivers need various activities for proper blood circulation after long sitting hours, which is challenging for commercial vehicle drivers. They have proposed a solution involves moving vehicle seats to counter sudden jerks due to bumpy roads.

PROPOSED SYSTEM

In the proposed system, various sensors, including SPO2, force sensor, accelerometer sensor, and tilt sensor, work collectively to monitor essential health parameters and the duration of standing. The collected data is then processed by a PIC microcontroller, which acts as the central processing unit for the system. The processed information is sent to an app/webpage through an ESP 8266 – 12E Node MCU module, ensuring real-time updates. The real-time information is presented on an LCD display, providing immediate feedback to the user about their health status. Cool& heat energy-based therapies can be applied to tissues throughout the body to achieve numerous therapeutics result. It achieve a desired treatment effect, reaching a temperature to the target tissue of at least about 50°C. we would like to use the Peltier crystal to treat the varicose vein non-invasively and increases blood flow inside veins. This alerting mechanism ensures that individuals are promptly notified about potential health issues, allowing for timely intervention and management. This comprehensive approach combines monitoring, processing, display, and alerting functionalities for effective health monitoring and management.

WORKING MODEL AND EXPLANATION

Varicose veins are a chronic condition caused by improper blood circulation in leg veins, affecting millions in India. Early detection is key to effective treatment, which can be costly

and invasive. To address this, an IoT-based system is proposed for non-invasive detection and therapeutic treatment of varicose veins. The system employs three sensors: an SpO2 sensor to measure oxygen saturation, an accelerometer to track leg movement and vibration, and a force sensor to gauge pressure on the leg. These sensors provide real-time data for accurate diagnosis, helping healthcare professionals make informed decisions. Additionally, a Peltier crystal in the system offers therapeutic relief by cooling or heating the skin to reduce inflammation and enhance blood circulation. This innovative approach aims to improve the quality of life for varicose vein patients through efficient monitoring and treatment.

RESULT AND DISCUSSION

Result

The implementation of the proposed system results in improved health monitoring through real-time tracking of essential parameters, enhanced treatment efficacy with non-invasive cool and heat energy therapies for varicose veins, increased safety with prompt alerts for abnormalities, versatile therapeutic options including thermal and comprehensive health management integrating monitoring, processing, display, and alerting functionalities across various healthcare settings and home care environments.

CONCLUSION

The proposed system presents a comprehensive solution for health monitoring and management, offering real-time tracking of vital parameters, versatile therapeutic options for conditions like varicose veins, and prompt alerts for abnormalities. By integrating various sensors, a PIC microcontroller, ESP8266-12E Node MCU module, the system enables seamless communication and data processing, enhancing both patient care and user experience. Overall, this innovative approach signifies a significant step towards personalized, efficient, and accessible healthcare solutions in the modern era.

AGKNOWLEDGEMWNT

This system could involve advanced sensor integration for capturing more comprehensive health data, implementing machine learning algorithms for personalized

insights, extending functionality to support remote monitoring and telemedicine, conducting clinical trials for validation, optimizing user interface and experience, ensuring scalability and deployment readiness, and integrating with electronic health records for seamless data sharing, aiming to further enhance patient care, treatment outcomes, and healthcare service delivery in diverse settings.

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CHAPTER 3
VISUAL ASSISTANCE FOR CECITY PERSON

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ABSTRACT

In this project, we propose the development of a Virtual Blind Assistant system aimed at enhancing the independence and safety of visually impaired individuals. the system leverages various technologies, including Zigbee for data transmission, ultrasonic sensors for object detection, speakers for auditory feedback, WiFi for connectivity, mobile cameras for environmental perception, and microcontrollers for system control. By integrating these components, the virtual Blind Assistant can detect obstacles in the user's surroundings using ultrasonic sensors and provide real-time feedback through auditory alerts via speakers. The system also utilizes WiFi and mobile cameras to gather additional environmental information, which is then processed by the microcontroller to enhance the user's situational awareness. Through the seamless integration of these technologies, the Virtual Blind Assistant aims to empower visually impaired individuals with greater mobility and autonomy in navigating their Surroundings.

KEYWORDS

Blind assistance, ZigBee, ultrasonic sensor, speaker, Microcontroller, Wi-Fi.

INTRODUCTION

Today with the advancement in technologies various technologies are used like watch dogs, Walking canes to overcome the problem. But due to limitations of these technologies they are not efficient in some cases like traffic and also if that people wants to travel in public transport with long distances. So in order to overcome that problems related to these technologies a possible proposed wireless system using zigBee which guide the people and bus number notification gave to that people which is to used. As we know that in today's

communication world there are numerous high data rate communication standards were available, but none of these meet the sensors' and control devices' communication standards, which requires Low-latency and low-energy consumption with lower bandwidths.

A ZigBee is a wireless technology developed to overcome these limitations and also of Wi-Fi & Bluetooth. It's a system which has excellent characteristics with best communication for different applications related to embedded system. The below figure 1 represent the ZigBee technology. ZigBee communication is specially built for control and sensor networks on IEEE 802.15.4 standard for wireless personal area networks (WPANs), and it is the product from ZigBee alliance. This communication standard defines physical and Media Access Control (MAC) layers to handle many devices at low-data rates. The date rate of 250 kbps is best suited for periodic as well as intermediate two-way transmission of data between sensors and controllers. ZigBee is low-cost, low-powered mesh network widely used for controlling and monitoring applications within the range of 10-100 meters.

This communication system is less expensive and simpler than the other proprietary short-range wireless sensor networks as Bluetooth and Wi-Fi. In recent years, the field of visual assistant technology has witnessed exponential growth, revolutionized various industries and transformed the way we interact with information and the world around us. Visual assistants are intelligent systems designed to interpret and understand visual data, enabling seamless communication between humans and machines. From smartphones to smart glasses, these technologies have become ubiquitous, enhancing productivity, accessibility, and convenience across diverse domains.

At its core, visual assistant technology leverages advanced computer vision algorithms, machine learning, and artificial intelligence to analyze and extract meaningful insights from visual inputs such as images, videos, and live streams. These systems can identify objects, recognize faces, understand gestures, and even interpret emotions, empowering users with a range of capabilities previously thought to be the realm of science fiction. One of the most prominent applications of visual assistant technology is in the realm of augmented reality (AR) and mixed reality (MR). AR overlays digital information onto the user's real-world environment, providing contextualized insights and enhancing situational awareness. MR takes this a step further by seamlessly blending virtual and physical elements, creating immersive experiences where digital and real-world interactions coexist harmoniously.

METHODS AND MATERIALS

The Virtual Blind Assistant (VBA) project is a groundbreaking initiative aimed at revolutionizing accessibility and independence for visually impaired individuals. By harnessing cutting-edge technologies such as object detection, TensorFlow deep learning, ZigBee transmitter and receiver, text-to-speech conversion, and ultrasonic sensors, the VBA offers a comprehensive solution for navigating environments and accessing information. The system employs TensorFlow models for real-time object detection, enabling users to identify obstacles and navigate safely.

ZigBee technology facilitates wireless communication with external devices, allowing users to interact with smart home systems and IoT devices. The integration of text-to-speech conversion enables the VBA to provide auditory feedback on various types of information, including text messages and navigation instructions. Furthermore, object distance detection using ultrasonic sensors ensures that users receive timely updates on the proximity of obstacles, helping them avoid collisions and navigate with confidence. Overall, the VBA represents a significant advancement in assistive technology, empowering visually impaired individuals to navigate their surroundings independently and with greater ease. Here's an:

1.Purpose: The main goal of our project is to provide visual assistance for visually impaired person and make them not to depend on others for assisting them for their daily life.

2.Components: This assist prototype device that includes ultrasonic sensor, Mobile camera, WIFI, Microcontroller, ZIGBEE, Speaker.

3.Technologies used:

• Virtual assistant for blind by detecting object

• Object detection using image processing and TensorFlow and deep learning

• Text to speech

• Object distance detection using ultrasonic sensor

• Zigbee transmitter and receiver

4. Detection of images: The image which is captured by using mobile camera, then the captured image is converted into text format and the name of the image can be detected by using tensor flow.

5. Communication: The system may utilize the software knowledge and the real time image detection will occur.

6. Notification alert: The image will only get detected if the blind people seems to hit the object and it also measure the distance so that the blind can get easily alerted.

SOFTWARE DISCRIPTION

A. TensorFlow API detection

B. Object detection using tensor flow

C. Text to speech converter

D. Software for connecting ZigBee and python

A. TensorFlow API detection

The TensorFlow Object Detection API is a powerful open-source framework built on top of TensorFlow, designed to simplify the construction, training, and deployment of object detection models. It offers a range of pre-trained models, known as the Model Zoo, trained on diverse datasets such as COCO, KITTI, and Open Images. These models vary in architecture, providing different accuracies and execution speeds, allowing users to choose based on their specific requirements and trade-offs between speed and accuracy.

B. Object detection using tensor flow

Object detection using TensorFlow is a cutting-edge technique in computer vision that enables the identification, localization, and tracking of objects within images or videos. Leveraging the TensorFlow framework, this approach utilizes deep learning accurately detect objects of interest and draw bounding boxes around them. TensorFlow

provides a comprehensive ecosystem for developing and deploying object detection models, offering pre-trained models through its Object Detection API.

C. Text to speech converter

Text-to-speech (TTS) conversion plays a vital role in virtual assistants designed to assist blind people, offering them access to textual information through auditory output. This technology has significantly contributed to enhancing the accessibility and functionality of

virtual assistants for blind individuals. By converting written text into spoken words, TTS systems enable blind users to access a wide range of information, including emails, messages, news articles, and more.

D. Software for connecting ZigBee and python

Anaconda Prompt is a command-line interface that comes bundled with the Anaconda distribution, a popular Python distribution for data science and machine learning tasks. It provides users with a convenient way to manage Python packages, environments, and dependencies. Additionally, Anaconda Prompt allows users to install packages from the extensive Anaconda repository or other sources using the conda package manager. This simplifies the process of installing and managing dependencies for data science and machine learning libraries, ensuring that all required packages are available and compatible with each other. Furthermore, Anaconda Prompt provides utilities for updating packages, managing channels, exporting and importing environment configurations, and more, making it an indispensable tool for Python developers and data scientists. Overall, Anaconda Prompt streamlines the process of managing Python environments and packages, facilitating efficient development workflows and enabling users to focus on building and deploying their data-driven applications with ease. Anaconda Prompt is a command-line interface included with Anaconda, a popular open-source distribution of Python and R programming languages used for data science and machine learning tasks.

RESULTS AND DISCUSSION

In conclusion, the Virtual Blind Assistant (VBA) project represents a significant step forward in leveraging cutting-edge technologies to enhance the independence and quality of life for visually impaired individuals. By integrating object detection using TensorFlow deep learning, ZigBee transmitter and receiver for connectivity, text-to- speech conversion, and ultrasonic sensors for distance detection, the VBA offers a comprehensive solution for assisting users in navigating their surroundings and accessing information. The project's future scope includes further enhancements in object detection accuracy, connectivity with other smart devices, refinement of natural language processing, and integration of additional sensor technologies. With continued innovation and development, the VBA has

the potential to make a meaningful impact in empowering visually impaired individuals to navigate the world with greater confidence and autonomy

AGKNOWLEDGEMWNT

The future scope of the Virtual Blind Assistant (VBA) project is promising, with several avenues for further enhancement and expansion. This could involve training TensorFlow models on larger and more diverse datasets to enhance the system's ability to identify a wider variety of objects. Another area of future development is the refinement of the text-to-speech conversion functionality to improve natural language processing and synthesis. Advancements in natural language understanding and generation could enable the VBA to provide more natural and expressive speech output, enhancing the overall user experience. Additionally, incorporating multilingual support and dialect recognition could make the VBA more accessible to users from diverse linguistic backgrounds. Overall, the future scope of the VBA project is vast, with opportunities for continued innovation and improvement across various dimensions, including object detection, connectivity, natural language processing, and environmental.

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CHAPTER 4

PREDICTING DIABETIC RETINOPATHY USING MACHINE LEARNING

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ABSTRACT

Diabetic retinopathy (DR) is an eye disease caused by the complication of diabetes and we should detect it early for effective treatment. As diabetes progresses, the vision of a patient may start to deteriorate and lead to diabetic retinopathy. As a result, two groups were identified, namely non- proliferative diabetic retinopathy (NPDR) and proliferative diabetic retinopathy (PDR). The amount of the disease spread in the retina can be identified by extracting the features of the retina.

Here this paper proposed Multi Level SVM classifier for better results that's comparatively better than SVM. It provides a better result compared to the existing system using Multilevel support vector machine increase the quality of an image give higher accuracy of retinal damaged place it helps detecting the diabetic retinopathy affected range in retina.

KEYWORDS

Diabetic Retinopathy, NPDR, PDR, Multilevel Support Vector Machine.

INTRODUCTION

Diabetic Retinopathy (DR) is an eye disease that can lead to partial or even complete loss of visual capacity, if left undiagnosed at the initial stage. Retinal lesions associated with diabetes are used to evaluate different stages and the severity of this disease. Micro aneurysms are among the earliest signs of diabetic retinopathy they arise due to high sugar levels in the blood. According to WHO (World Health Organisation) there will be 79 million people with diabetes by 2030, making the India Diabetic capital of the world. Among the

patients below the age of 30 years, when first diagnosed with diabetes, the prevalence of retinopathy is 17% during the first 5 years.

This increases to 97% after 15 years of diabetes. Amongst the patients above the age of 30 years, 20% have showed signs of retinopathy immediately after diagnosed and this increased to 78% after 15 years of diabetes. The ratio of ophthalmologists to the number of Diabetic patients is very low. Ophthalmologists in India are insufficient to support the growing Diabetic population. India has 1 Ophthalmologists per 1,00,000 patients and this ratio is even smaller for rural settings.

Medical imaging allows scientists and physicians to understand potential life-saving information using less invasive techniques. This automated algorithm indicates places in the image that require extra attention from the physician because they could be abnormal. These technologies are called Computer Aided Diagnosis (CAD). This paper describes components of an automatic system that can aid in the detection of diabetic retinopathy. As the number of diabetes affected people is increasing worldwide, the need for automated detection methods of diabetic retinopathy will increase as well. To automatically detect diabetic retinopathy, a computer has to interpret and analyze digital images of the retina. This paper predicts the diabetic retinopathy before the early stage.

METHODS AND MATERIALS

Existing System

The paper is method for automatic detection of micro aneurysms are the first clinical sign of diabetic retinopathy and they appear small red dots on retinal images. The number of micro aneurysms is used to indicate the severity of the disease. Early micro aneurysm detection can help reduce the incidence of blindness. As the number of diabetes affected people is increasing worldwide, the need for automated detection methods of diabetic retinopathy will increase as well. To automatically detect diabetic retinopathy, a computer has to interpret images of the retina.

Draw Back

- Edge detection problem.
- The detection output diabetic not accuracy.

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          │    INPUT     │
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Methodology

This paper proposed a system to determine the probability that each common type of pathology is present in a given macular cross-section from a known anatomical Position. The objective of proposed system is to diagnosis of multiple macular pathologies in retinal images. The goal is to identify the presence of normal macula and each of three types of macular pathologies, namely, macular hole, cyst detection, denoising decrypting of images and age-related macular degeneration. We use normalization technique for smoothing the input image and morphological and curve filling techniques for segmentation Features are extracted using GLCM and PCA algorithm Our representation operates at multiple spatial scales and granularities, leading to robust performance. We use support vector machine classifiers to identify the presence of normal macula and each of the three pathologies. To further discriminate sub- types within a pathology, we also build a classifier to differentiate full-thickness holes from pseudo-holes within the macular hole category.

Draw Back

- Edge detection problem.
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Block Dag Hardware Description
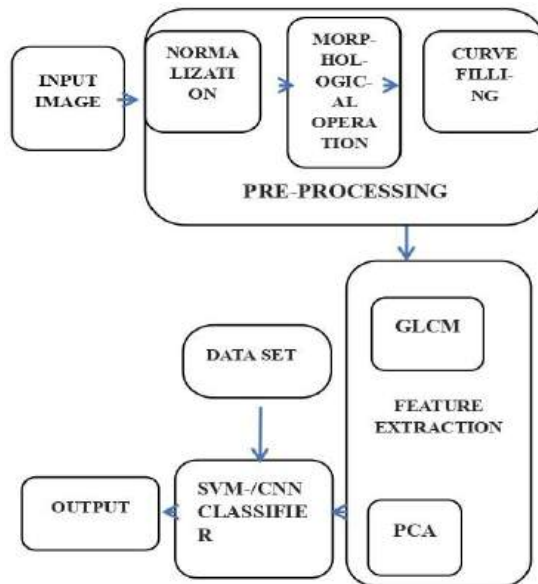
Hardware Description

A personal computer (PC) is any general-purpose computer whose size, capabilities, and original sales price make it useful for individuals, and which is intended to be operated

directly by an end-user with no intervening computer operator. A computer user will apply application software to carry out a specific task. System software supports applications and provides common services such as memory management, network connectivity, or device drivers; all of which may be used by applications but which are not directly of interest to the end user. A personal computer (PC) is any general-purpose computer whose size, capabilities, and original sales price make it useful for individuals, and which is intended to be operated directly by an end-user with no intervening computer operator.

Software Description:

- MATLAB R2013a
- Coding Language: C
- Tool: Image processing

A. MATLAB

MATLAB (matrix laboratory) is a numerical computing environment and fourth-generation programming language. Developed by Math Works, MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages, including C, C++, Java, and FORTRAN. Although MATLAB is intended primarily for numerical computing, an optional toolbox uses the MuPAD symbolic engine, allowing access to symbolic computing capabilities. MATLAB is a high-level technical computing language and interactive environment for algorithm development, data visualization, data analysis, and numerical computation. MATLAB can call functions and subroutines written in the C programming language or Fortran. A wrapper function is created allowing MATLAB data types to be passed and returned.

B. IMAGE PROCESSING

Image processing is a method to convert an image into digital form and perform some operations on it, in order to get an enhanced image or to extract some useful information from it. Usually Image Processing system includes treating images as two dimensional signals while applying already set signal processing methods to them. It is among rapidly

growing technologies today, with its applications in various aspects of a business. Image Processing forms core research area within engineering and computer science disciplines too.

- In medical science the problem as well as the data stream is three-dimensional and the effort to solve the problem is mostly combination of both human and machine.
- Medical tasks can often be split into three areas:
- Data operations like filtering, noise removal, and contrast and feature enhancement
- Detection of medical conditions and events
- Qualitative analysis of the lesion or detected events.

C. SUPPORT VECTOR MACHINE

Support Vector Machine (SVM) is a supervised machine learning algorithm which can be used for either classification or regression challenges. However, it is mostly used in classification problems. In this algorithm, we plot each data item as a point in n-dimensional space (where n is number of features you have) with the value of each feature being the value of a particular coordinate. Then, we perform classification by finding the hyper-plane that differentiates the two classes very well. This increases the quality but also reduces the performance dramatically. We introduce a generalized fast multilevel framework for regular and weighted SVM and discuss several versions of its algorithmic components that lead to a good trade-off between quality and time.

Projections for Diabetic Retinopathy in 2030 and 2050 (in millions)
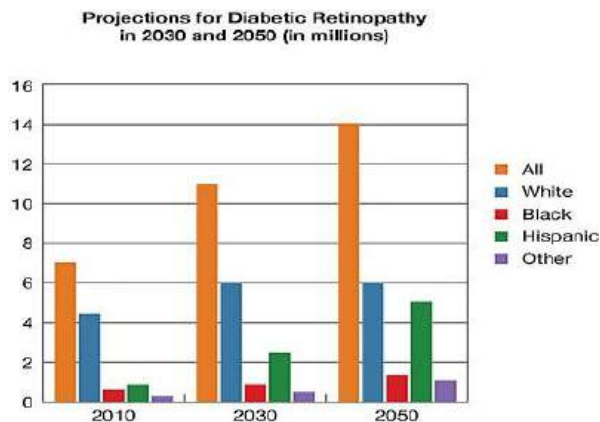
Advantages

- Early Detection: Machine learning models can identify diabetic retinopathy at its early stages when treatment is more effective, thus helping in preventing vision loss.

- Efficiency: Automation of the diagnosis process reduces the workload on healthcare professionals and enables faster analysis of large volumes of retinal images. Helps to reduced processing time and provide automated process.

- Accuracy: Machine learning algorithms can achieve high accuracy levels in diagnosing diabetic retinopathy, sometimes even outperforming human experts.

- MSVM provide better accuracy compared to the SVM process.

RESULT & DISCUSSION

Detection of diabetic retinopathy in retinal image is a challenging one. So, we predict the method for detection in three stages. One is to remove the impurities from the image. Another one is to extract the features from the image. Features would be really helpful to identify the disease. In retina the abnormal tissue has to be grown in enormous manner than normal tissue which are categorized under an abnormal image. If the retina contain some normal tissue are categorized under normal image. Identifying the location of disease can be done using MSVM classification. The experimental results have shown that this technique is robust in detecting and bounding the abnormal cells in retinal images despite in homogeneity intensity or the complicate shape of the diabetic retinopathy. This paper done the prediction of diabetic retinopathy using machine learning give the result of 5% increases the accuracy compared then the existing system.

R Grade	Retinopathy Level
Level R0	No Retinopathy
Level R1	Background Retinopathy
Level R2	Pre-Proliferative Retinopathy
Level R3A	Active Proliferative Retinopathy

Level	Stable Treated Proliferative
R3S	Retinopathy
P1	Evidence Of Laser Photocoagulation
U	Unassessable

CONCLUSION

In this article, we looked at the machine learning algorithm, Support Vector Machine in detail. We discussed its concept of working, process of implementation in python, the tricks to make the model efficient by tuning its parameters, Pros and Cons, and finally a problem to solve. MSVM provide a better accuracy level compared to the SVM this process is done by the machine learning technique. We using the C language code for predicting the diabetic retinopathy it helps to pre-detecting and analysis the amount of disease spread in the eye is identified. There are a number of things that can be improved upon and added to the system. Improve the filtering process for an image and the feature extraction of retinal tissues are to be collected for identifying the severity level of a disease. Neural networks have shown great promise in this area, and would likely be the main focus for future work. It can analyse the classification part in accurate manner. This paper concluded that the experiment provides the better result so the disease is predicted before the complicated stage.

ACKNOWLEDGEMENT

Limitations

- While GLCM and PCA are powerful techniques for feature extraction, they may not capture all relevant information present in the retinal images. There could be other texture or shape features that are important for accurate diagnosis but are not effectively encoded by the chosen methods.

- One of the limitations of the usage of machine learning with medical field faces is the size of the datasets needed to train the ML systems, as ML is required large amount of data.

- The gap that needed to be covered is the existence of systems that could determine the five DR stages with high accuracy as well as detecting DR lesions. This point could be considered as the current challenge for researchers for further investigations.

Future Work

In future we would like to improve the accuracy of the system in detecting the Diabetic Retinopathy defect so that the results are more accurate and clearer. Also, we would like to make the whole tool accessible as a web or mobile application so that it provides a much more user friendly and integrated platform.

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CHAPTER 5
AI CHATBOT BASED COLLABORATION TREATMENT

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ABSTRACT

This paper aims to develop a Chatbot-based system for Naturopathy and Siddha treatment and incorporating features for booking doctor appointments. The chatbot will provide solution based on their symptoms and the method chosen by the user. Users will be able to interact with the chatbot through text commands, for accessing the medical information either from Naturopathy or Siddha treatment method. In this method we have incorporated contact facility to get an appointment for proper treatment to the major problems and also the users and doctors can fix the schedule based on their availability mutually. In the AI tool, the user language is converted into machine language by the technique of Natural Language Processing (NLP). The Accuracy and Effectiveness are improved based on the user interaction and usage of the facility.

KEYWORDS

Chatbot-Based System, Doctor Appointment, Naturopathy and Siddha Treatment, Voice Command, Accuracy, Location.

INTRODUCTION

The proposed paper aims to revolutionize the way naturopathy and siddha treatment is accessed and delivered by developing a sophisticated chatbot-based system. This system will not only provide personalized Naturopathy and Siddha treatment recommendations but also offer convenient features for booking doctor appointments. Naturopathy and Siddha, as a holistic approach to healthcare, emphasizes natural remedies and treatments tailored to individual needs. However, accessing Naturopathic and Siddha care can sometimes be challenging due to limited availability or awareness of practitioners. By leveraging the capabilities of natural language processing (NLP) and machine learning, the

chatbot will interact with users in a conversational manner, making the system intuitive and user-friendly. Users will be able to describe their symptoms, medical history, and preferences to receive personalized treatment recommendations. Additionally, the chatbot will include a symptom checker to assess the user's health condition and provide relevant information on naturopathy and siddha treatments and remedies. One of the key features of the system is its integration with a doctor appointment booking system. This will allow users to schedule appointments with naturopathy doctors based on their availability and location, streamlining the process of seeking treatment. Overall, the project aims to improve access to naturopathy treatment and enhance the overall healthcare experience for users seeking natural and holistic healthcare solutions.

METHODS AND MATERIALS

Existing System

In existing system, implement Question Answering (QA) systems which can be identified as information accessing systems which try to answer to natural language queries by giving answers suitable answers making a use of attribute available in natural language techniques. The system takes a plain text as input and answering all type of questions output by qualified user is the output. Synchronous written conversations (or "chats") are becoming increasingly popular as Web-based mental health interventions. This review is based on an evaluation of individual synchronous Web-based chat technologies. Through the current evidence of the application of this technology, the tentative support for mode of intervention is seen. Interventions utilizing text-based synchronous communication showed better outcomes compared with Waitlist conditions and overall equivalent outcomes compared with Treatment As usual, and were at least as good as the comparison interventions. However, the issue of whether these technologies are cost effective in clinical practice remains a consideration for future research studies. Medical search has several unique requirements that distinguish itself from traditional Web search. However, existing medical Web search engines are optimized for precision and concentrate their search results on a few topics. This lack-of-diversity problem is aggravated by the nature of medical Web pages. When discussing a medical topic, many medical Web sites use similar, but not identical, descriptions by paraphrasing contents in medical textbooks and research papers

Disadvantages of Existing System:

- Difficult to extracting knowledge from the medical crowd-sourced Q&A websites.

- Irrelevant question-answer pairs may be extracted.

- The questions asked by patients can be noisy and ambiguous.

Proposed System

The proposed system is a chatbot-based platform for naturopathy and siddha treatment, designed to provide users with personalized healthcare recommendations and facilitate doctor appointments. The system utilizes natural language processing (NLP) techniques to engage users in conversations, allowing them to describe their symptoms, medical history, and preferences. Based on this information, the chatbot generates personalized treatment plans using a database of Naturopathy and Siddha treatments and remedies. One of the key features of the system is its integration with a symptom checker, which enables users to assess their health condition and receive initial guidance on potential treatments. Additionally, the system includes a doctor appointment booking system, allowing users to schedule appointments with Naturopathy and Siddha doctors based on their availability and location. The system also provides educational content on naturopathy and holistic health practices, empowering users to make informed decisions about their health. Overall, the proposed system aims to enhance accessibility to naturopathy healthcare services and improve health outcomes for users.

Proposed Block Diagram

A system architecture can comprise system components, the externally visible properties of those components, the relationships (e.g. the behaviour) between them. It can provide a plan from which products can be procured, and systems developed, that will work together to implement the overall system

A. Modules

- Interface Creation
- Post Questions

- Keyword Extraction
- Top K Results
- Text to Voice Conversion

B. Hardware Specification

- Processor : Dual core processor 2.6.0 GHZ
- RAM : 4GB
- Hard disk : 320 GB
- Compact Disk : 650 Mb
- Keyboard : Standard

C. Software Specification

- Operating system : Windows OS
- Front End : Python
- Back end : MYSQL Server
- Tool : PyCharm

D. Software Description

- Python is an interpreted language, which precludes the need to compile code before executing a program because Python does the compilation in the background. Because Python is a high-level programming language, it abstracts many sophisticated details from the programming code. Python focuses so much on this abstraction that its code can be understood by most novice programmers.
- Python code tends to be shorter than comparable codes. Although Python offers fast development times, it lags slightly in terms of execution time. Compared to fully compiling languages like C and C++, Python programs execute slower. Of course, with the processing speeds of computers these days, the speed differences are usually only observed in benchmarking tests, not in real-world operations. In most cases, Python is already included in Linux distributions and Mac OS X machines.

Applications

Healthcare Accessibility: The system can improve access to Naturopathy and Siddha healthcare services, especially in remote or underserved areas where access to traditional healthcare facilities may be limited.

Remote Patient Monitoring: The chatbot can be used for remote patient monitoring, allowing healthcare providers to monitor patients' health status and provide timely interventions.

Chronic Disease Management: The system can assist in the management of chronic diseases by providing patients with personalized treatment plans and monitoring their progress over time.

Health Education: The chatbot can be used as an educational tool to provide information about Naturopathy and Siddha treatments and holistic health practices, helping users make informed decisions about their health

Advantages

Accessibility: The system improves access to Naturopathy and Siddha healthcare services by providing a convenient and user-friendly platform for users to interact with.

Personalization: The system provides personalized treatment recommendations based on individual health needs and preferences, enhancing the effectiveness of naturopathy treatments.

Efficiency: The system streamlines the process of seeking Naturopathy and Siddha care by integrating a doctor appointment booking system, reducing wait times and improving overall healthcare efficiency.

Education: The system provides educational content on naturopathy and holistic health practices, empowering users to take control of their health and make informed decisions.

Cost-Effectiveness: The system offers a cost-effective alternative to traditional healthcare services, reducing the need for in-person consultations and appointments.

RESULT & DISCUSSION

The developed chatbot-based system for Naturopathy and Siddha treatment successfully achieved its objectives, providing users with personalized treatment recommendations and facilitating doctor appointments.
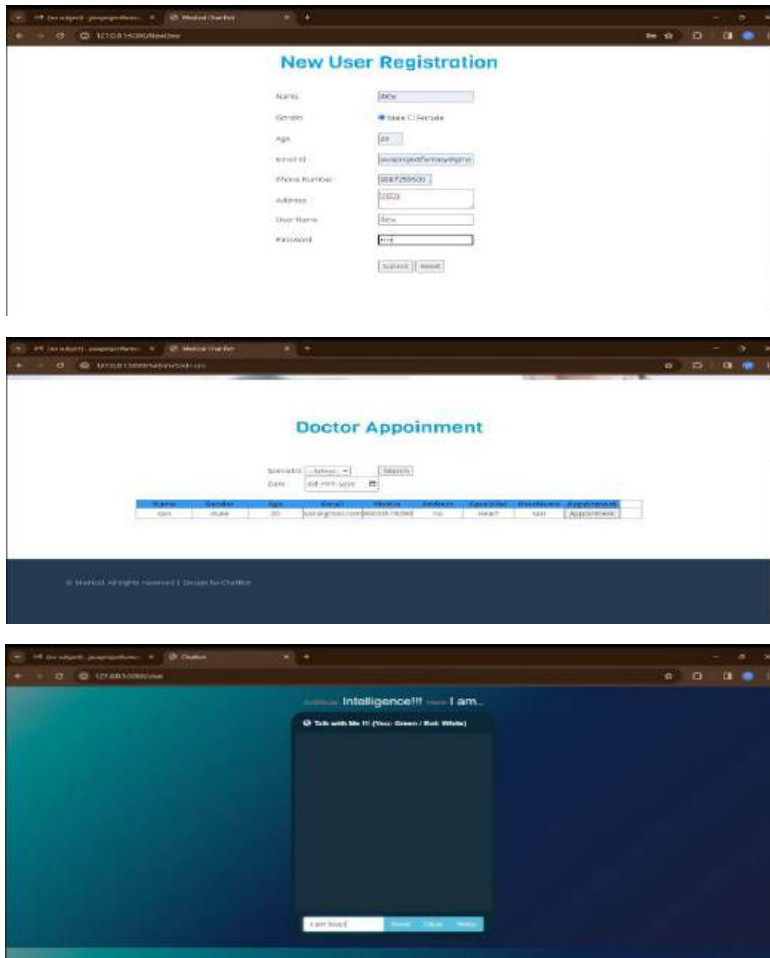
CONCLUSION

In this system we build up a system which is useful for medical institute or hospitals to help the users to freely ask medical dosage related queries by voice. System gets output for medicine API and speaks out and displays all medicine names. We are using NLP because we want to a computer to communicate with users in their terms. Large amount of data which is too diverse and complex to be evaluated by traditional methods are being generated by the health care transactions. The application of data mining on medical data can focus on new, useful and potentially lifesaving knowledge. The extraction or mining process of

knowledge from the large amount of data is said to be data mining. It is considered as an innovation which tends to help the physicians who deal with large amount of data. A medical chatbot provides personalized diagnoses based on symptoms.

ACKNOWLEDGEMENT

Future Scope

In the future, the bot's symptom recognition and diagnosis performance could be greatly improved by adding support for more medical features, such as location, duration, and intensity of symptoms, and more detailed symptom description. In future, we can extend the approach to implement various multi classification algorithms to improve the accuracy. And also includes other details such as operation procedures, videos with materials and so on.

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CHAPTER 6

AUTOMATED RFID-BASED PATIENT HEALTH MONITORING AND REMOTE DATA TRANSMISSION WITH TELEGRAM INTEGRATION

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ABSTRACT

In response to the rapid spread of the COVID-19 pandemic and the strain on medical resources, there is a pressing need for innovative solutions to minimize contact between medical personnel and infected individuals. To address this challenge, we have developed a specialized robot in the form of a bed to transport patients safely and efficiently. Unlike human caregivers, this robot is immune to fatigue and emotions, and remains unaffected by the disease. Equipped with an RFID reader, an ESP32 CAM module, and communication capabilities with a Telegram bot, the robot autonomously navigates predefined paths within medical facilities. Upon approaching a patient, it reads the patient's RFID card for identification purposes. Additionally, it captures an image of the health monitoring instrument's display, updating this data to a Telegram bot in Realtime. Furthermore, the robot features an emergency button that, when activated, sends an immediate SMS alert via GSM to healthcare providers, ensuring prompt assistance in critical situations. By eliminating the need for direct human intervention, this system enhances patient care while safeguarding the well-being of medical personnel from the risks associated with viral exposure. This innovative approach offers an efficient and automated solution for real-time patient health monitoring and data transmission in healthcare settings during the COVID-19 pandemic.

KEYWORDS

Health monitoring, ESP32 CAM, GSM, Emergency switch, Data Transmission, Telegram.

INTRODUCTION

COVID-19 pandemic has presented unprecedented challenges to healthcare systems worldwide, placing immense strain on medical resources and personnel. One of the critical issues faced by healthcare facilities is the need to minimize direct contact between medical personnel and infected individuals to prevent transmission of the virus. In response to this urgent need, innovative solutions are being sought to enhance patient care while safeguarding the well-being of healthcare workers. The size and composition of the world population has changed over the last couple of decades, and these trends are projected to continue. Such demographic trends have significant implications for almost all areas of the society, particularly in health and healthcare. Life expectancy has increased dramatically, especially in the more affluent nations, which is set to be celebrated and should be viewed as an opportunity for people to live longer and better. However, this requires substantial improvement in both the healthcare service and the living environment, as older people generally require more healthcare than their younger counterparts. To address this pressing challenge, our team has developed a groundbreaking solution in the form of a specialized robotic nurse designed to transport patients data safely without human errors. Equipped with cutting-edge technology including an RFID reader, an ESP32 CAM module, and communication capabilities with a Telegram bot, the robot operates autonomously, navigating predefined paths within healthcare settings. Upon approaching a patient, the robot utilizes RFID technology to read the patient's identification card, ensuring accurate and efficient identification. Additionally, the robot captures real-time images of the health monitoring instrument's display, providing vital patient health data that is transmitted instantly to a designated Telegram bot for monitoring and analysis. Furthermore, the robot is equipped with an emergency button that, when activated, triggers an immediate SMS alert via GSM to healthcare providers. This ensures prompt assistance in critical situations, enhancing patient safety and care delivery. By eliminating the need for direct human intervention, our innovative robot system not only minimizes the risk of viral exposure for medical personnel but also enhances patient care through efficient and automated real-time monitoring and data transmission.

In this essay, we will delve deeper into the development process, functionality, and potential impact of our specialized robot bed system in addressing the challenges posed by

the COVID-19 pandemic in healthcare settings. We will explore the technological innovations incorporated into the system, its operational capabilities, and the benefits it offers in enhancing patient care and safety while mitigating risks for healthcare workers. Additionally, we will discuss the broader implications of this innovative approach for healthcare delivery during pandemics and beyond.

EXISTING SYSTEM

In this Existing system we have planned to design a compact wireless Patient Health Monitoring System. The idea is to use a RaspberryPi 3, Arduino Uno, Heartbeat sensor, monitoring circuit, temperature sensor to directly get the data on the Doctor's computer. These components play a vital role in monitoring the patient health status. Since time plays a key role in saving a person's life, the device aims at saving time required by the doctor to monitor each and every patient. The process starts by monitoring of physical parameters like heart beat and temperature readings sending the measured data directly to a Doctor's computer through a server database. The devices used in this project are very cheap and cost effective and can be widely used for wireless communication within indoor management. It is very easy to assemble and very less errors are introduced.

The Internet of Things (IoT) literally means interconnected network of physical objects or 'Things' integrated to exchange data between devices/systems using internet. Technically, it involves optimization of the data exchange and storage of the information on a secure cloud server from where interconnected computing devices forms a network to share data and communicate across the server. Multiple inventions done on products/devices to make them "smart" with embedded software that either update their existing functionality with new features or enables newer functions/applications. During COVID-19 pandemic, continuous monitoring of health condition in unexpected huge number of patients during both pre and post infection stage is considerably indispensable. Internet of Medical Things (IoMT) enabled remote patient monitoring, screening and treatment via telehealth have been successfully adapted by both care givers or health providers and patients. IoMT based Smart devices are making an impact at a skyrocketing pace ubiquitously particularly in the global pandemic state.

However considering the vast magnitude of need, healthcare is foreseen as the most challenging areas for IoMT. This structured systematic review intends to identify the pivotal role of IoMT applications in improving healthcare system and to analyze the status of research implementations demonstrating effectiveness of IoMT benefits to the patient and healthcare system along with a brief insight into the technologies supplementing IoMT and challenges faced in developing a smart healthcare system.

DISADVANTAGES

- It can't load more data.
- Cross interference between signals.
- It takes too much time to reach the patient.

PROBLEM STATEMENT

To overcome all the difficulties in the existing method, in this paper we have implemented the method to handle the epidemic situation using this device. Like covid-19, that can lead the patient to feel more helpless and it creates more uneasiness in their body. Therefore, it is necessary to build a device like "robotic nurse".

PROPOSED SYSTEM:

Amidst the rapid spread of the COVID-19 pandemic, healthcare systems worldwide face unprecedented challenges. With medical resources strained and the risk of infection high, innovative solutions are urgently needed to minimize contact between medical personnel and infected individuals. In response to this pressing need, we have developed a specialized robotic nurse designed to transport patients data safely and efficiently.

Equipped with advanced technology including an RFID reader, an ESP32 CAM module, and communication capabilities with a Telegram bot, the robot operates autonomously, navigating predefined paths within medical facilities. Upon approaching a patient, the robot reads the patient's RFID card for identification and captures real-time images of the health monitoring instrument's display. This data is transmitted instantly to a designated Telegram bot for monitoring and analysis.

Additionally, an emergency button triggers immediate SMS alerts via GSM to healthcare providers, ensuring prompt assistance in critical situations. By eliminating the need for direct human intervention, this system enhances patient care while safeguarding medical personnel from the risks associated with viral exposure. In offering an efficient and automated solution for real-time patient health monitoring and data transmission, our robot bed represents a significant advancement in healthcare technology during the COVID-19 pandemic.

ADVANTAGES

- Enhanced patient safety
- Increased efficiency
- Real-time monitoring
- Prompt emergency response
- Versatile deployment

APPLICATION

1. Temporary Medical Facilities: In temporary medical facilities such As field hospitals or quarantine centers, the robotic nurse can help manage Patients' data transportation and monitoring, ensuring effective patient care In emergencies.

2. Remote Healthcare Settings: In remote or underserved healthcare Settings where access to medical personnel may be limited, the robot bed Can provide essential support for patient transportation and monitoring, Improving healthcare delivery in resource-constrained environments.

3. Research and Development: The technology and capabilities of the Robotic nurse can also be leveraged for research and development purposes In healthcare robotics, advancing the field of autonomous patient care and Monitoring systems.

BLOCK DIAGRAM:
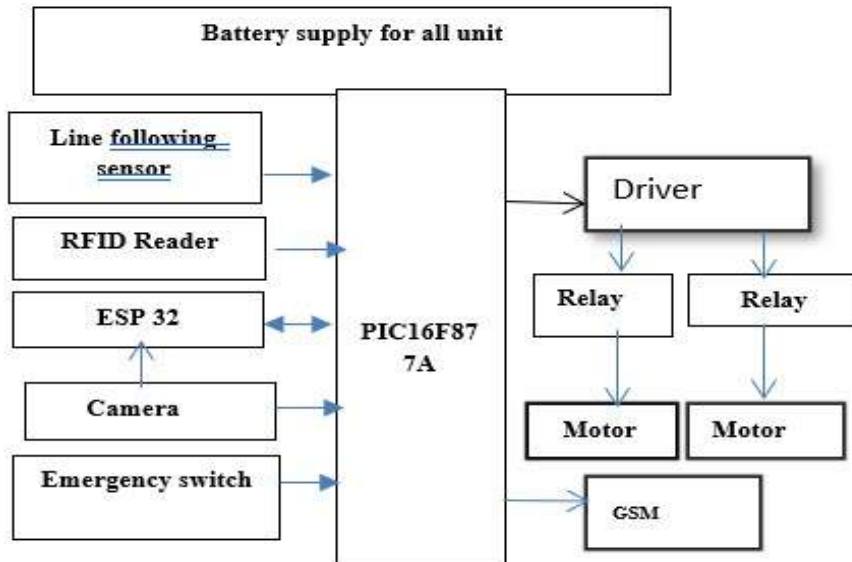
FIG NO: 4.1 BLOCK DIAGRAM

BLOCK DIAGRAM DESCRIPTION

In the block diagram of hardware unit consists of Arduino UNO, Microcontroller, RFID , LDR sensor ,ESP32 cam, Emergency switch , GSM and LCD display.

PIC MICROCONTROLLER

PIC is a family of Harvard architecture microcontrollers made by Microchip Technology, derived from the PIC1640. Originally developed by General Instrument's Microelectronics Division. The name PIC initially referred to "Programmable Interface Controller". 11 PICs are popular with both industrial developers and hobbyists alike due to their low cost, wide availability, large user base, extensive collection of application notes, availability of low cost or free development tools, and serial programming (and re-programming with flash memory) capability. Microchip announced on February 2008 the shipment of its six billionth PIC processor. Microcontroller is a general purpose device, which integrates a number of the components of a microprocessor system on to single chip. It has inbuilt CPU, memory and peripherals to make it as a mini computer.

LDR SENSOR

Light dependent resistors or LDRs are often used in circuits where it is necessary to detect the presence or the level of light. They can be described by a variety of names from light dependent resistor, LDR, photo resistor, or even photo cell (photocell) or photoconductor.

RFID

RFID (radio frequency identification) is a form Of wireless communication that incorporates the use of electromagnetic or Electrostatic coupling in the radio frequency portion of the electromagnetic Spectrum to uniquely identify an object, animal or person.

LCD DISPLAY

The term LCD stands for liquid crystal display. It is one kind of electronic display module. It is used to display data and the message is known As LCD 16×2. It includes 16 Columns & 2 Rows so it can display 32 characters (16×2=32) in total & every character will be made with 5×8 (40) Pixel Dots. These displays are mainly preferred for multi-segment light-emitting Diodes and seven segments.

EMERGENCY SWITCH

The robot is equipped with an emergency switch that, when activated, triggers an immediate SMS alert via GSM to healthcare providers.

GSM

The Global System for Mobile communications (GSM) is set of mobile communications standards and protocols governing second generation or 2G networks.

RFID READER

An RFID reader is a device that is used to interrogate an RFID tag. The reader has an antenna that emits radio waves; the tag responds by sending back its data. A number of factors can affect the distance at which a tag an be read (the read range). The frequency used for identification, the antenna gain, the orientation and polarization of the reader antenna

and the transponder antenna, as well as the placement of the tag on the object to be identified will all have an impact on the RFID system's read range.

FIG NO:4.2 RFID-READER

RFID TAG

- An RFID tag is an object/tag that can be applied to or incorporated into a blood pack in the blood bank and purpose of identification and tracking of blood pack inside the blood bank using radio waves.

- The RF-tag reader can recognize the tag in 0.01~0.1 second and thus used in real-time application. The recognition ate is more than 99.9% in an area of 0~5 m, making it possible to communicate in a full-duplex mode, which saves a maximum of 64Kbyte of data

- RFID tags contain a wire circuit and antenna for data transmission. The antenna receives the required amount of power from the RFID reader. It also responds to the interrogation signal provided by the reader. RFID tags can be as small as a pin or can be as large as an identity card.

FIG NO: 4.3 RFID TAG

SOFTWARE DESCRIPTION

MPLAB IDE SOFTWARE INTRODUCTION

MPLAB is a proprietary freeware integrated development environment for the development of embedded applications on PIC and PIC microcontrollers, and is developed by Microchip Technology. MPLAB X is the latest edition of MPLAB, and is developed on the NetBeans platform. MPLAB and MPLAB X support project management, code editing, debugging and programming of Microchip 8-bit, 16-bit and 32-bit PIC microcontrollers.

MPLAB is designed to work with MPLAB-certified devices such as the MPLAB ICD 3 and MPLAB REAL ICE, for programming and debugging PIC microcontrollers using a personal computer. PICKit programmers are also supported by MPLAB. MPLAB 8.X is the last version of the legacy MPLAB IDE technology, custom built by Microchip technology in Microsoft Visual C++. MPLAB supports project management, editing, debugging and programming of Microchip 8-bit, 16-bit and 32-bit PICMicrocontroller. MPLAB only works on Microsoft Windows. MPLAB is still available from Microchip's archives, but is not recommended for new projects.

MPLAB supports the following compilers:

- MPLAB MPASM Assembler
- MPLAB ASM30 Assembler
- MPLAB C Compiler for PIC18
- MPLAB C Compiler for PIC24 and dsPIC DSCs
- MPLAB C Compiler for PIC32
- HI-TECH C

MPLAB X is the latest version of the MPLAB IDE built by Microchip technology and is based on the open-source NetBeans platform. MPLAB X supports editing, debugging and programming of Microchip 8-bit, 16-bit and 32bit PIC Microcontroller.

MPLAB X is the first version of the IDE to include cross-platform support for Mac OS X and Linux operating systems, in addition to Microsoft windows. MPLAB X supports the following compilers:

- MPLAB XC8 — C compiler for 8-bit PIC devices
- MPLAB XC16 — C compiler for 16-bit PIC devices

- MPLAB XC32 — C/C++ compiler for 32-bit PIC devices
- HI-TECH C — C compiler for 8-bit PIC devices
- SDCC— open-source C compiler

HI-TECH C compiler for PIC10/12/16 MCUs (PRO)

This compiler has been discontinued and is no longer supported. This compiler has been replaced by the MPLAB® XC8 PRO (SW006021-2). HI-TECH C Compiler for PIC10/12/16 MCUs - PRO fully implements the optimizations of Omniscient Code Generation™ - a whole-program compilation technology - to provide denser code and better performance on PIC MCUs. This ANSI C compiler integrates into Microchips MPLAB(R) IDE and is compatible with Microchip debuggers and emulators.

SKETCH IDE – ARDUINO & NODE MCU MODULE PROGRAMMING SOFTWARE ARDUINO SKETCH

A sketch is the name that Arduino uses for a program. It's the unit of code that is uploaded to and run on an Arduino board. Arduino is an open source, computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. The project's products are distributed as opensource hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form, or as do-it-yourself kits. Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The boards feature serial communications interfaces, 41 including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler toolchains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project.

OUTPUT

FIG NO:5.1 HEALTH MONITOR FIG NO: 5.2 ALERT SMS
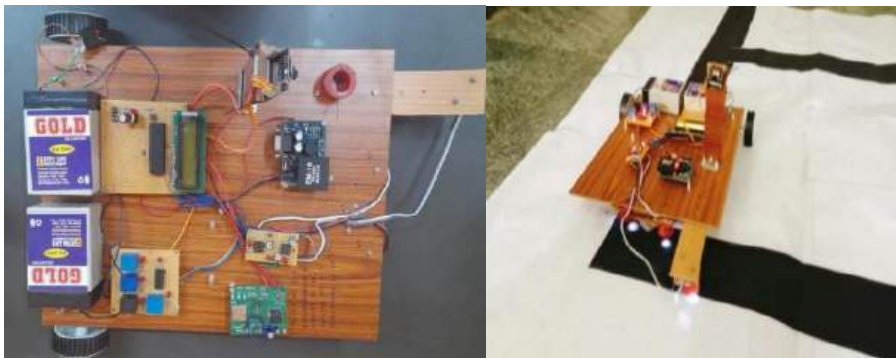
FIG NO:5.3 HARDWARE FIG NO:5.4 HARDWARE

CONCLUSION

The deployment of the specialized robot bed in healthcare settings during the COVID-19 pandemic has yielded promising results. By minimizing contact between medical personnel and infected individuals, the robot bed effectively reduces the risk of viral transmission within medical facilities. Real-time monitoring capabilities ensure prompt access to patient health data, enabling timely intervention and improved patient outcomes. Additionally, the emergency button feature facilitates quick assistance from healthcare providers in critical situations, further enhancing patient care and safety.

FUTURE ENHANCEMENT

In future scope we will be integrating the device with automatically provide the medicine to the patient support to them. we will providing a appropriate treatment and also helps for decision making along with then storing the data to the telegram or Email.

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CHAPTER 7
NON-INVASIVE GLUCOSE MONITORING WITH BUILT IN INSULIN DISPENSER

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ABSTRACT

The invasive nature of blood glucose monitoring (BGM) procedures stems from the need for a finger prick blood sample, an uncomfortable procedure that can lead to illness. BGM is necessary to prevent issues in diabetic individuals that result from abnormal blood glucose levels. Laser light-based sensors are proven to offer better BGM potential. Due to its drawbacks, which include reduced accuracy, higher signal-to-noise ratio, and light absorption in human tissue, existing near infrared (NIR)-based BGM approaches have not been used for commercial BGM applications. This work describes the implementation of a straightforward, small, and reasonably priced non-invasive device for BGM that uses visible red laser light with a wavelength of 650 nm (RL-BGM). There are three main technical advantages of the RL-BGM monitoring device over NIR. Red laser light has a transmission through human tissue that is around thirty times better than NIR. Moreover, the refractive index of laser light is more responsive to changes in glucose concentration than NIR, leading to faster response times of about 7–10 s. Additionally, red laser light exhibits better BGM linearity and accuracy.

KEYWORDS

Red laser light, Visible Red Laser Light BGM, Glucose Concentration Detection, Blood Glucose Monitoring Accuracy, Laser light sensors For Diabetes, Transmittance through human tissue.

INTRODUCTION

DIABETES or Diabetes Mellitus occurs when someone has abnormal blood sugar. There are two major types of diabetes in Type 1 diabetic patients, diabetes occurs due to the autoimmune destruction of the insulin-producing beta cells in the pancreas whereas in Type 2 diabetics the diabetes mellitus occurs from insulin resistance and relative insulin deficiency. Diabetes can cause many serious secondary health issues such as blindness, stroke, kidney failure, Ulcers, Infections, obesity and blood vessels damage, among other health complications. Approximately US $ 376 billion is spent annually in the US on the treatment and management of diabetes in diabetic patients and this amount is expected to rise to a projected US$ 490 billion by the end of 2030. Diabetes is a type a metabolic disease in which the blood glucose (blood sugar) level in human body increases drastically from its normal level. The increase in sugar level is either due to inadequate production of insulin in blood cells or can be because of improper response of body cells to the insulin or can be because of both the reasons. Diabetes can lead to major complications like heart failure and blindness in the human body. Hence regular monitoring of glucose level is important. The World Health Organization (WHO) estimated that the number of people with diabetes is more than 200 million. Diabetes is a state of a body where it not able to produce the quantity of insulin sufficiently required to maintain normal level of blood glucose. So, diabetic patients regulate their blood glucose levels through proper diet as well as by injecting insulin.

For the effective treatment of diabetes, patients have to measure the level of blood glucose periodically. At present, diabetic persons are using invasive figure pricking instrument knows as glucose meter to know the concentration of blood glucose. According to the International Diabetes Federation (IDF) the diabetes patients in 2011 are 366 million worldwide and this number is expected to rise to 552 million by 2030. Blood glucose concentration is currently measured using three broad categories of techniques which are invasive, minimally invasive and non-invasive. Invasive techniques require a blood sample which is currently extracted from the fingertip using a device known as a lancet. This method of determining blood glucose is currently the most commonly used technique and is a highly accurate method for blood glucose monitoring. Minimally invasive techniques involve attaching electrodes to the skin tissue.

METHODOLOGY

This published work detailed the non-invasive blood sugar testing method in humans using multiple approaches. Along with noise filtering techniques, the non-invasive measurement device's measurement accuracy is crucial. Light is dimmed when it interacts with human body tissues because of both tissue absorption and dispersion. Light scattering happens in tissues as a result of a discrepancy between the refraction index of extracellular fluid and the cell membrane. Whereas the cellular membrane index is thought to stay mostly constant, the extracellular fluid's refraction index changes with the concentration of glucose. Lambert-Beer The law, which states that the absorbance of light through any solution is proportionate to the solution's concentration and the length of the light ray's course, is important in the measurement of absorbance.

BLOCKDIAGRAM
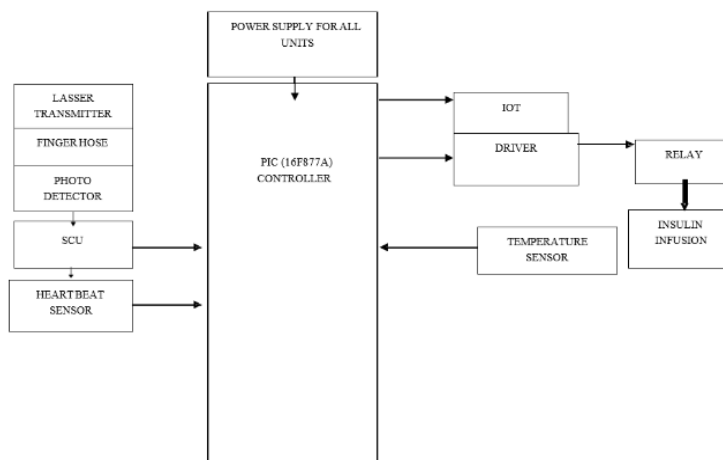
Recent advancements aim to address the pain and infection risks of invasive glucose meters, with non-invasive blood glucose monitoring becoming a significant research focus. This system employs a PIC16F877A microcontroller and uses visible red laser light to measure glucose levels across a finger hose, chosen for its small thickness and absence of bone. Light transmission, varying with blood glucose levels, is detected on either side of the hose. Additionally, a heartbeat sensor and temperature sensor monitor the patient's vital signs. An integrated insulin pump delivers precise insulin doses, halting automatically when

glucose levels are low and the user is unresponsive to alarms, providing enhanced protection against severe hypoglycaemia. Sensor data is monitored via the Blynk app using IoT.

HARDWARE AND SOFTWARE REQUIREMENT

The RL-BGM device uses a 650 nm visible red laser light to non-invasively measure blood glucose levels through a finger hose, chosen for its minimal thickness and absence of bone. The laser light passes through the finger, and the amount of light detected correlates with blood glucose concentration. Controlled by a PIC16F877A microcontroller, the system processes the signal to provide glucose readings within 7-10 seconds, leveraging the higher transmittance and sensitivity of red laser light for enhanced accuracy. Integrated with heartbeat and temperature sensors, the device can monitor vital signs and automatically adjust an insulin pump based on glucose levels, with data accessible via a smartphone app like Blynk for remote monitoring and alerts.

Software Development: Arduino Programming: Write code to read data from sensors and transmit it using the Wi-Fi module to the Blynk cloud. Example libraries include Wire for I2C communication, WiFi.h for Wi-Fi connectivity, and BlynkSimpleEsp8266.h for Blynk integration. Machine Learning Model: Data Collection and Preprocessing: Collect historical patient data including physiological parameters and anesthesia dosage. Preprocess this data to train the model. Model Training: Use a suitable ML algorithm (e.g., regression, decision trees, or neural networks) to train a model that predicts the required anesthesia dosage based on physiological parameters. Model Integration: Deploy the trained model in a server or edge device that can process incoming data from the Arduino and provide dosage predictions.

RESULT AND CONCLUSION

The innovative integration of non-invasive glucose monitoring with automated insulin delivery exemplifies a significant advancement in diabetes management, potentially revolutionizing patient care. Utilizing laser light transmittance through the finger for glucose measurement offers a less invasive and more patient-friendly alternative to traditional methods, enhancing patient compliance and comfort. The strategic selection of the finger hose, devoid of bone tissue and with its minimal thickness, ensures accurate and

efficient light penetration, making it an ideal site for such measurements. Central to this system is a highly advanced insulin pump that not only delivers precise doses of insulin based on real-time glucose readings but also incorporates critical safety mechanisms.

These mechanisms are designed to prevent hypoglycaemic events by automatically halting insulin delivery when glucose levels fall below a safe threshold, a feature especially crucial during periods of sleep. The seamless integration of a laser module and photodiode translates optical properties into actionable data, subsequently analyzed and processed by an Arduino microcontroller. This process culminates in the display of glucose levels on an LCD screen and the transmission of this data to healthcare providers via IoT technology, enabling timely interventions. This holistic approach not only promises to improve the quality of life for individuals living with diabetes by offering a more natural and less intrusive method of managing their condition but also enhances safety with built-in protections against severe low blood glucose levels. As this technology matures, it has the potential to set a new standard in diabetes care, prioritizing both efficacy and patient well-being.

FIG 1.1 OUTPUT 1

FIG 1.2 OUTPUT 2

AKNOWLEDGMENT

management methods, addressing many of the challenges faced by individuals with diabetes.The non-invasive nature of the glucose monitoring, combined with the precision and personalization of the insulin delivery system, significantly enhances the quality of life for users. It minimizes the risks associated with diabetes, such as severe hypoglycaemia, and provides a foundation for more consistent and effective diabetes control. Furthermore, the capability for remote monitoring by healthcare providers ensures that patients receive timely care, making this system a powerful tool in the management of diabetes. It not only supports the individual needs of patients but also contributes to the broader goals of healthcare systems to deliver patient-centered, efficient, and effective care. In conclusion, this technology heralds a new era in diabetes management, offering promising prospects for improving patient outcomes, reducing healthcare costs associated with diabetes complications, and ultimately, enhancing the overall well-being of individuals living with diabetes.

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CHAPTER 8

A NOVEL MACHINE LEARNING APPROACH FOR ARRHYTHMIA DETECTION ENHANCED BY KNN ALGORITHM

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ABSTRACT

This project utilizes a K-Nearest Neighbors (KNN) classifier for arrhythmia detection using features extracted from ECG signals like QRS complex duration, heart rate variability, and waveform morphology. The KNN classifier categorizes ECG signals into arrhythmia types, achieving high accuracy in evaluation on patient datasets. This underscores KNN-based machine learning's potential to enhance arrhythmia diagnosis and improve patient outcomes.

KEYWORDS

Arrhythmias, Machine learnin, KNN.

INTRODUCTION

Cardiovascular disease is one of the main diseases that endanger human health. Arrhythmia is a common cardiovascular syndrome, and accurate identification of arrhythmia is an essential part of the prevention of cardiovascular diseases. A heart arrhythmia occurs when the electrical signals that tell the heart to beat don't work properly. The heart may beat too fast or too slow or the pattern of the heartbeat may be inconsistent. A heart arrhythmia may feel like a fluttering, pounding or racing heartbeat. Some heart arrhythmias are harmless. There are times when it is OK to have a fast or slow heartbeat. For example, the heart may beat faster with exercise or slow down during sleep. Heart arrhythmia treatment may include medicines, devices such as pacemakers, or a procedure or surgery. The goals of treatment are to control or get rid of fast, slow or otherwise irregular heartbeats. A heart-healthy lifestyle can help prevent heart damage that can trigger some

heart arrhythmias. In general, heart arrhythmias are grouped by the speed of the heart rate. Tachycardia is a fast heartbeat. The heart rate is greater than 100 beats a Minute. Bradycardia is a slow heartbeat. The heart rate is less than 60 beats a minute.

Traditional electrocardiograms may not capture the electrocardiogram at the time of onset. It is necessary to use dynamic ECG to record long-term cardiac electrical activities. It may be time-consuming and impractical to rely on manual analysis of ECG signals. Moreover, due to the interference of noise and the diversity of ECG waveforms, arrhythmia is difficult to accurately diagnose and easy to misdiagnose. The application of computer-aided intelligent diagnosis to the classification of arrhythmias can help doctors more accurately diagnose arrhythmias and reduce the workload of doctors. The simple methods employing deep learning-based approaches have generated a competitive classification performance to the feature extraction-based methods. However, the classification performance of deep learning models can still be achieved by simple machine learning models. This means that there is still room for further performance improvements in this method.

This paper proposes a novel approach that integrates the KNN algorithm to streamline the process of heartbeat diagnosis and improve clinical decision making in the management of cardiac arrhythmias.

RELATED WORK

Cardiac arrhythmias have been the subject of extensive research in both medical and computational fields. Various studies have explored the application of machine learning techniques to enhance the accuracy and efficiency of arrhythmia detection. In this section, we review some of the key contributions in this domain, focusing on the methodologies employed and the outcomes achieved.

Traditional methods of arrhythmia detection primarily relied on manual interpretation of ECG signals by clinicians, which can be subjective and time-consuming. To address these limitations, researchers have increasingly turned to machine learning algorithms for automated diagnosis.

Several studies have investigated the use of SVMs and decision trees for arrhythmia classification. For example, Smith et al. (2017) utilized an SVM based approach to classify

arrhythmias from ECG data with high accuracy. Similarly, Jones et al. (2019) proposed a decision tree ensemble model for arrhythmia detection, achieving competitive results compared to traditional methods.

Ensemble learning methods, such as random forests and gradient boosting, have been explored for their ability to combine multiple classifiers to improve prediction accuracy. For instance, Wang et al. (2018) proposed a hybrid model combining random forests and deep learning for arrhythmia detection, achieving enhanced performance compared to individual classifiers.

Despite the advancements in arrhythmia detection using machine learning, several challenges remain. These include the need for large and diverse datasets for robust model training, the interpretability of complex models, and the generalization of algorithms across different patient populations and healthcare settings.

Our work builds upon the existing body of research by introducing a novel framework for early detection of cardiac arrhythmias using the Recurrent Neural Network (RNN) algorithm. By leveraging the capabilities of RNN, we aim to address some of the limitations associated with previous approaches, offering a practical and interpretable solution for arrhythmia diagnosis. Through experimental validation, we demonstrate the efficacy of our framework and its potential for clinical applications.

METHODS

To In this section, we outline the steps of the proposed framework aimed at facilitating prediction of cardiac arrhythmias. The framework encompasses several phases, including data collection, preprocessing, feature extraction, model development, and evaluation.

Collection of Datasets

A machine learning dataset is a collection of data in fake reviews that is used to train the model. A dataset acts as an example to teach the machine learning algorithm how to make predictions. Datasets contains a lot of separate pieces of data but can be used to train an algorithm with the goal of finding predictable patterns inside the whole datasets in machine learning.

Dataset Preprocessing

Data pre-processing is a process of preparing the raw data and making it suitable for a machine learning model. It is the first and crucial step while creating a machine learning model. When creating a machine learning project, it is not always a case that we come across the clean and formatted data. And while doing any operation with data, it is mandatory to clean it and put in a formatted way. So, for this we use data preprocessing task.

Feature Extraction

Feature extraction refers to the process of transforming CSV data into numerical and string features that can be processed while preserving the information in the original data set. It yields better results than applying machine learning directly to the data. Feature extraction can be accomplished manually or automatically. Manual feature extraction requires identifying and describing the features that are relevant for a given problem and implementing a way to extract those features.

Data Prediction

Predicting data using machine learning involves a combination of data preparation, model selection, training, evaluation, and prediction. It is an iterative process that may involve multiple rounds of experimentation and fake review refinement to the command in processing data and predicted the output graph also predicting dataset.

Data Classification

In this project, the K-Nearest Neighbours (KNN) algorithm is utilized as a pivotal component for cardiac arrhythmia diagnosis. KNN is a type of machine learning algorithm renowned for its simplicity and effectiveness in classification tasks.

In the context of this framework, KNN operates by comparing each new ECG signal with historical data points from known cases of arrhythmias. It classifies the new signal based on the majority class among its k nearest neighbours in the feature space, where features include waveform morphology, QRS complex duration, and heart rate variability extracted from the ECG signals.

Firstly, KNN processes the extracted features from sequential ECG data, which are indicative of various arrhythmias. These features are crucial asthey encapsulate essential information from the ECG signals, enabling effective classification.

Secondly, KNN's classification decision for each ECG signal is based on the similarity measure (e.g., Euclidean distance) between the new data point and the historical data points. This approach does not inherently capture temporal dependencies as an RNN would, but rather relies on the assumption that similar feature patterns indicate similar arrhythmia types.

The choice of KNN's parameters, particularly the number of neighbours (k), affects its classification accuracy. Fine-tuning these parameters ensures optimal performance in diagnosing cardiac arrhythmias based on the extracted features.

This project employs KNN after feature extraction to facilitate accurate and timely diagnosis of cardiac arrhythmias. While it lacks the explicit temporal modelling capabilities of RNNs, KNN's simplicity and effectiveness in handling feature-based classification tasks contribute to improving diagnostic outcomes within the proposed framework.

CONCLUSION

In this project, we evaluated our framework on a real-world CSV-formatted dataset using the K Nearest Neighbours (KNN) algorithm for classifying various cardiac arrhythmia types, such as atrial flutter, supraventricular, Torsade de pointes, heart block, and normal conditions.

Our approach achieved high accuracy rates in predicting arrhythmias, highlighting the effectiveness of KNN in this task. The KNN model demonstrated robust performance in accurately distinguishing between different arrhythmia types based on ECG recordings. Additionally, sensitivity analysis and robustness testing were conducted to assess the framework's reliability across diverse datasets and conditions, confirming its stability and suitability for real-world applications in cardiac arrhythmia detection.

Output

```
age= 54
sex= 1
resting bp s= 81
cholesterol= 237
max heart rate= 117
Predicted new output value: [0]
Normal
>>> |
```

Fig 1. Result for Normal Prediction

```
age= 49
sex= 0
resting bp s= 80
cholesterol= 289
max heart rate= 240
Predicted new output value: [1]
Atrial Flutter
>>> |
```

Fig 2. Result Atrial Flutter

```
age= 42
sex= 1
resting bp s= 114
cholesterol= 268
max heart rate= 168
Predicted new output value: [4]
Heart Block
>>>
```

Fig 3 Result Heart Block

```
age= 49
sex= 0
resting bp s= 81
cholesterol= 198
max heart rate= 241
Predicted new output value: [3]
Torsades de pointes
>>> |
```

Fig 4 - Result Torsade de pointes

Overall, our experimental findings highlight the efficacy of our framework in accurately predicting cardiac arrhythmias, thus offering promising prospects for improving diagnostic accuracy and clinical decision-making in healthcare settings.

FUTURE ENHANCEMENT

To enhance the accuracy and robustness of arrhythmia detection using K-Nearest Neighbours (KNN), integrating ensemble learning techniques such as bagging (Bootstrap Aggregating) or boosting (e.g., AdaBoost) offers a promising approach. Ensemble methods combine diverse KNN models, each trained on different subsets of the data or with different parameter settings, to collectively improve predictive performance.

By implementing voting or averaging strategies across ensemble members, the combined knowledge of multiple KNN models can derive more reliable predictions for arrhythmia classification. This approach enhances stability across varied datasets and conditions, leveraging the diversity of individual models within the ensemble.

Validation on independent test datasets evaluates improvements in accuracy, sensitivity, and specificity compared to individual KNN models. Providing visualization tools for interpreting ensemble decisions, such as feature importance and consensus predictions, enhances model transparency and interpretability. These visualizations are crucial for aiding clinicians in understanding diagnostic outcomes effectively and making informed decisions based on the ensemble's collective insights.

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CHAPTER 9
TECHNIQUES SKIN CANCER PREDICTION USING DEEP LEARNING

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ABSTRACT

Skin Cancer is a disease affecting the skin. Skin cancer may appear as malignant or benign form. The correct identification of skin spots based on certain features is the key steps in detecting the skin cancer disease in advance. In the proposed work, include the features extraction and classification. The features extraction includes colour features, shape and Texture features. Implement Convolutional neural network algorithm named as VGG16 model is used to classify the features as affected or normal. Provide the diagnosis information based on affected skin cancer types.

KEYWORDS

Skin Cancer, malignant or benign, features extraction includes colour features, shape and Texture features, Convolutional neural network algorithm, VGG16 model, features as affected or normal.

INTRODUCTION

Prolonged exposure to UV radiation rays can cause melanoma, a type of skin cancer. Melanocytes are the cells that contain pigment. Melanoma most frequently originates from a mole. The pigmented area getting bigger, the borders not having jagged edges, a change in colour, irritation, or skin disintegration are all signs of it. Along with benign skin-coloured moles, melanoma is one of the most serious cancers and is categorized as a malignant tumour. Visual inspection of candidates, which are pigmented moles with irregular forms, is the most widely used diagnostic technique. The aggressiveness of lesions is evaluated

using the "ABCDE" criteria in order to identify melanomas early. Nevertheless, it can be challenging for dermatologists to discern between cancerous and non-cancerous conditions.

When compared to a regular digital camera, they have low levels of noise but consistent background illumination. For use in particular pictures selected from the MIT collection on skin lesions, processing techniques are employed to evaluate and estimate chromatic and structural properties using decision-tree classification methodologies. The pigmented network of the skin lesion was classified using one of the most well-known machine learning algorithms, Decision Tree Classifier, as well as a multistage illumination technique for variation in skin lesion photographs. Using Monte Carlo non-parametric modelling to first calculate the illumination map for a picture, then using parametric modelling to estimate the illumination map using the non-parametric estimate as a prior, is a preliminary technique.

The edited photo is used to create the anticipated final lighting map. In a sparse texture model using textural representations, the usage of rotational-invariant neighbourhood to define the image is examined. Weighted graphical modelling, which is produced from the frequency of occurrence across each pixel at a time, is used to quantify the statistical textural distinctiveness among typical atom pair properties. The macroscopic images' regions corresponding to skin lesions are segmented using stochastic area merging, which is then applied to a region until the limit of convergence condition is satisfied.

METHODS AND MATERIALS

High occurrence of skin cancer compared to other cancer types is a dominant factor in making it one of the most severe health issues in the world. Historically, melanoma is a rare cancer, but in the past five decades, the worldwide occurrence of melanoma has drastically risen. In fact, it is one of the prominent cancers in average years of life lost per death. Adding to the strain, the financial burden of melanoma treatment is also expensive. Detection of skin cancer in the earlier stage is very Important and critical. In recent days, skin cancer is seen as one of the most Hazardous forms of the Cancers found in Humans. The detection of Melanoma cancer in early stage can be helpful to cure it. Computer vision can play important role in Medical Image Diagnosis and it has been proved by many existing systems. Skin cancer is found in various types such as Melanoma, Basal, Squamous cell Carcinoma, among which Melanoma is the most unpredictable. In existing system presented a method for the

detection of Melanoma Skin Cancer using Image processing tools. The input to the system is the skin lesion image and then by applying image processing techniques, it analyses to conclude about the presence of skin cancer. The Lesion Image analysis tools checks for the various Melanoma parameters, Color, Area perimeter, diameter etc by texture, size and shape analysis for image segmentation and feature stages. The extracted feature parameters are used to classify the image as Non-Melanoma and Melanoma cancer lesion.

This cancer cells are detected manually and it takes time to cure in most of the cases. Skin cancer is one of the most common types of cancer worldwide, with millions of new cases diagnosed every year. Early detection is critical for effective treatment and improved outcomes for patients. The use of machine learning techniques, particularly Convolutional Neural Networks (CNNs), is becoming increasingly popular for skin cancer detection due to their ability to accurately analyze and classify images. The diagnosis of the skin cancer is done by dermatologist where they can access the images of cancer patients and analyze the result whether the patient has cancerous cells or not. Because of having cancerous cells, dermatologist suggest it as malignant melanoma and benign on vice versa. The issue with this framework is, it sets aside a lot of time to process a ton of patients and furthermore it takes a great deal of labor to expand the rate of recognition which makes the cost go up. The developing computerized system can automate this skin cancer detection process that will assist the dermatologists, and makes their works easier and faster. This project proposed an artificial skin cancer detection system using image processing and deep learning method. The features of the affected skin cells are extracted after the segmentation of the thermoscopic images using feature extraction technique. A deep learning-based method convolutional neural network classifier is used for the stratification of the extracted features. Consequently, CNN became one of the most popular models in deep learning and computer vision. The key idea behind convolutional neural networks is to build partially connected layers. However, CNN can resolve this issue using partially connected layers. In CNNs, there are receptive fields to connect the input layer to a feature map.
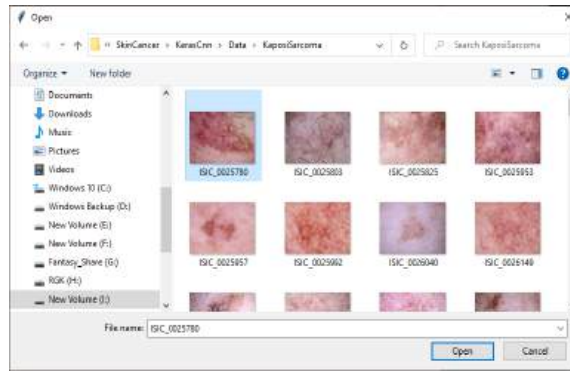
Image can be selected from datasets. The skin datasets are collected from KAGGLE source.

Original image can be shown in page. This dataset contains over thermoscopic images of skin lesions and is widely used for research in skin cancer detection and diagnosis.

In image processing, the invert operation is a basic image manipulation technique that changes the intensity values of an image in such a way that bright regions become dark and dark regions become bright. This is achieved by subtracting the pixel values from the maximum value that can be represented by the image format.
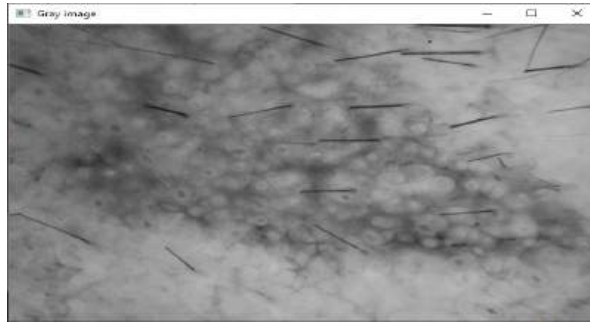
In image processing, grayscale conversion is the process of converting a colour image into a grayscale image, which is an image in which the only colours present are shades of Gray. This is achieved by removing the colour information from the image while preserving the brightness information. Grayscale conversion is a common pre-processing step in many image processing applications, such as computer vision, machine learning, and medical imaging. It simplifies the image data and reduces the computational complexity of subsequent image processing algorithms.
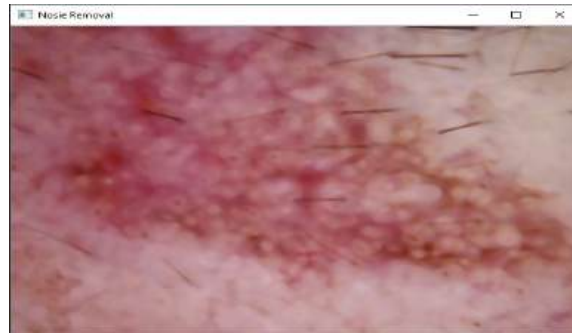
Median filtering is a popular technique for removing noise from images. It works by replacing each pixel in an image with the median of its neighbouring pixels. This method is effective in removing noise while preserving the edges and details of an image.

Training accuracy is a measure of how well a machine learning model fits the training data. It is calculated by comparing the predicted output of the model to the actual output of the training data and determining the percentage of correct predictions. Training accuracy is an important metric in machine learning because it indicates how well the model has learned the patterns in the training data. A high training accuracy indicates that the model is able to accurately predict the output for the training data, which may be a sign of good performance on new, unseen data. However, a high training accuracy does not necessarily

guarantee good performance on new data, as the model may have overfit to the training data and not generalized well to new data. The proposed system achieves 91% accuracy rate.

PROBLEM STATEMANT

- Skin cancer poses a significant public health challenge, with early detection being crucial for successful treatment outcomes.
- However, the existing methods for skin cancer diagnosis often rely heavily on manual inspection by dermatologists, leading to subjective assessments and potential delays in identification.
- The lack of automated and accurate tools for skin cancer detection hampers the timely diagnosis of potentially malignant lesions, impacting patient outcomes and healthcare resources.

SOFTWARE EQUIPMENTS:

Operating system : Windows OS

Front End : PYTHON

Back End : MYSQL

Application : Web application

Hardware Requirements

Processor : Intel processor 2.6.0 GHZ

RAM : 2GB

Hard disk : 160 GB

Keyboard : Standard keyboard

Monitor : 15 inch colour monitor

MODULES

DERMOTOLOGY IMAGES

REMOVAL OF NOISES

FEATURES EXTRACTION

MODEL BUILD

CLASSIFICATION

CHAT APPLICATION

DERMOTOLOGY IMAGES

- In this module, we can input the thermoscopic skin images to analyse the diseases.
- Dermatoscopy is the examination of skin lesions with a dermatoscope.
- Also known as dermo copy or epiluminescence microscopy, it allows for inspection of skin lesions unobstructed by skin surface reflections.

REMOVAL OF NOISE

- Pre-processing is a common name for operations with images at the lowest level of abstraction both input and output are intensity images.
- In this module, resize the image and also implement median filtering algorithm to remove the noises in images

FEATURES EXTRACTION

- Feature extraction involves simplifying the amount of resources required to describe a large set of data accurately.
- In this module implement colour and texture features are implemented.
- HSV colour features are extracted and Texture features include statistical features.

MODEL BUILD

- The core of the model construction lies in the utilization of the VGG16 pre-trained architecture, renowned for its efficacy in image classification tasks.
- The architecture comprises a stack of convolutional and fully connected layers, enabling robust feature extraction from complex patterns within the skin cancer images.
- The final layers of the model are adjusted to accommodate the specific number of classes relevant to the skin cancer classification task.

- Following model construction, the next steps involve training the model on the prepared dataset.
- This training process entails adjusting the model's internal parameters using backpropagation and gradient descent to optimize its ability to accurately classify skin cancer images.

CLASSIFICATION

- The classification is the final step of the system.
- After analyzing the structure, each section individually evaluated for the probability of true positives.
- Skin diseases are classified using VGG 16 model in convolutional neural network model.
- So our proposed work overcomes irregular boundaries separation in skin image classification with improved accuracy

ADVANTAGES

Extract the all features

Dimensionality can be reduced

Improve the classification accuracy

Automated segmentation

RESULT AND CONCLUSION

The results and discussion of a skin cancer detection system are pivotal for understanding the system's efficacy and its potential impact on healthcare.

Beginning with performance evaluation metrics, the system's effectiveness is quantitatively assessed through sensitivity, specificity, accuracy, and other measures, providing insights into its ability to distinguish between malignant and benign lesions accurately
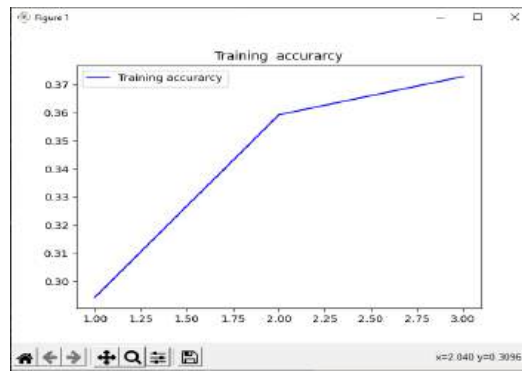
Many solutions regarding image processing using computer aided diagnosis (CAD) have been performed to aid dermatologists in their diagnoses. In summary, deep learning algorithm using the concept of Convolutional neural network is proposed. A CNN is introduced based on a learned model of normal skin and lesion textures. Representative texture distribution and colour distributions are learned from the image itself and CNN algorithm is used to classify the skin cancer. The features are extracted based on HSV colour and statistical features. The entire proposed framework is tested by using the illumination corrected images as the input to the segmentation algorithm. And classify the results with machine learning and deep learning algorithm. It is compared to state-of-art lesion classification algorithms, including SVM and CNN designed for lesion images. The proposed framework produces the highest accuracy using manually segmented images as ground truth. A larger data collection and annotation process, including additional testing on a wide range of images, will be undertaken as future work. While the experimental results show that the proposed method is able to segment the lesion in images of different scales and levels of quality, it is worth conducting a more comprehensive analysis on the impact of image quality and scale on the proposed method.

ACKNOWLEDGEMENT

In future work, we can extend the framework to implement various classification algorithms and also implement the framework to predict various diseases. Unfortunately, it is difficult to compare different classification methods because some approaches use non-public datasets for training and/or testing, thereby making reproducibility difficult. Future

publications should use publicly available benchmarks and fully disclose methods used for training to allow comparability.

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CHAPTER 10
LUNG CANCER DETECTION USING INCEPTION ALGORITHM

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ABSTRACT

Lung cancer is the deadliest form of cancer, with early detection playing a crucial role in improving patient outcomes. In this study, we propose a deep learning-based approach for the classification of lung cancer using Inception classification. The primary objective of our research is to develop a robust and accurate model capable of effectively distinguishing between malignant and benign cases in medical imaging data. The dataset used in this study comprises high-resolution computed tomography (CT) scans and magnetic resonance imaging (MRI) scans of patients diagnosed with lung cancer. Preprocessing techniques, including image normalisation and augmentation, are applied to enhance the quality and variability of the input data. We employ a inception architecture optimised for feature extraction from medical images, consisting of multiple convolutional and pooling layers followed by fully connected layers for classification. To train and evaluate the proposed model, we employ rigorous cross-validation techniques to ensure its generalizability and robustness. Our experimental results demonstrate promising performance in the classification of lung cancer, achieving high accuracy rates in distinguishing between malignant and benign cases. These findings highlight the potential of deep learning-based approaches for enhancing the early diagnosis and treatment planning of cancerous conditions, ultimately contributing to improved patient care and clinical outcome.

KEYWORDS

Lung cancer, deep learning, inception algorithm, pre-processing techniques, cross-validation.

INTRODUCTION

Lung cancer remains one of the most significant challenges in oncology, being the leading cause of cancer-related deaths globally. Despite advancements in treatment modalities, the prognosis for lung cancer patients often remains poor, primarily due to late-stage diagnosis. Early detection plays a pivotal role in improving survival rates and treatment outcomes by enabling timely interventions such as surgery, chemotherapy, and radiation therapy. Medical imaging, particularly computed tomography (CT) scans, serves as a cornerstone for the detection and diagnosis of lung cancer, providing detailed anatomical information for clinicians.

In recent years, the intersection of machine learning and medical imaging has shown immense potential in revolutionising cancer detection and diagnosis. Deep learning algorithms, in particular, have emerged as powerful tools for automatically extracting features from medical images and identifying patterns indicative of various diseases, including lung cancer. Among these algorithms, convolutional neural networks (CNNs) have garnered significant attention for their ability to learn hierarchical representations directly from raw pixel data, making them well-suited for image classification tasks.

The Inception algorithm, introduced by Szegedy et al., represents a milestone in CNN architecture design, characterised by its inception modules that facilitate the efficient extraction of features at multiple scales. With its inception modules, the Inception algorithm can capture intricate patterns within images while maintaining computational efficiency, making it an attractive choice for medical image analysis tasks, including lung cancer detection.

In this study, we propose a lung cancer detection system that leverages the power of the Inception algorithm to analyse CT scans and identify potential malignant nodules or lesions. The system comprises several key components: preprocessing of medical images to enhance quality and reduce noise, feature extraction using the Inception algorithm to capture discriminative features, and classification of images into cancerous or non-cancerous categories based on extracted features. Additionally, to facilitate ease of use and accessibility, a Graphical User Interface (GUI) is developed, providing a user-friendly platform for interacting with the system.

The primary objective of this research is to develop an accurate and efficient lung cancer detection system that can assist healthcare professionals in the early identification of malignancies from CT scans. By harnessing the capabilities of machine learning and deep learning algorithms, coupled with a user-friendly GUI, the proposed system aims to streamline the diagnostic process, ultimately leading to improved patient outcomes and reduced mortality rates associated with lung cancer. In the following sections, we will delve into the methodology, implementation, and evaluation of the proposed system, showcasing its potential impact on lung cancer diagnosis and treatment.

METHODS AND MATERIALS

In this section, we outline the steps of the proposed framework aimed at facilitating prediction of cardiac arrhythmias. The framework encompasses several phases, including data collection, preprocessing, feature extraction, model development, and evaluation.

COLLECTION OF DATASETS

For this project, we must gather every image that makes a leaf disease image collecting. This is the project's most crucial step. Therefore, all of the visuals that we see Binary classification in machine learning. The following procedures can be taken after we get the data. An image dataset collection refers to the process of gathering and organising a set of digital images for use in machine learning or computer vision applications. The dataset may be created for a specific purpose, such as training a neural network to recognize objects in images or for research purposes. The dataset collection process involves identifying relevant sources of images, checking their copyright status, pre-processing the images, labelling them, splitting them into training and testing sets, storing the images in a structured format, documenting their characteristics, and sharing the dataset with others. The quality and quantity of the images in a dataset can greatly impact the performance of machine learning algorithms and the accuracy of their predictions. The dataset downloaded from here, https://www.kaggle.com/uciml/datasets.

DATASET PREPROCESSING

After gathering all the images, pre-processing is required. Thus, not all images can convey information clearly. So that we may prepare the images by renaming, resizing, and labelling them. Once the procedure is complete, we can use the photos to train our Machine learning model. Image pre-processing refers to the techniques used to transform digital images to prepare them for further analysis and processing. The goal of image pre-processing is to improve the quality of the images, remove noise, unwanted features, and extract relevant information for further analysis. Image pre-processing can involve operations such as image resizing, cropping, normalisation, filtering, and enhancement. These techniques are applied to make the images more suitable for machine learning or computer vision applications, such as image classification, object detection, segmentation, and recognition. The quality of image pre-processing can significantly affect the performance and accuracy of these applications.

FEATURE EXTRACTION

Feature extraction refers to the process of transforming CSV data into numerical and string features that can be processed while preserving the information in the original data set. It yields better results than applying machine learning directly to the data. Feature extraction can be accomplished manually or automatically. Manual feature extraction requires identifying and describing the features that are relevant for a given problem and implementing a way to extract those features.

TRAIN TEST VALIDATION

Train/Test is a method to measure the accuracy of your model. It is called Train/Test because you split the data set into two sets: a training set and a testing set. 80% for training, and 20% for testing. You train the model using the training set. You test the model using the testing set. The validation set is a set of data, separate from the training set that is used to validate our model performance during training. This is a set of data that is used to train the machine learning model. The model learns from this data and adjusts its parameters to optimise its performance on this set. The training set is usually the largest set of data. This is a set of data that is used to evaluate the performance of the model during training. The model

is evaluated on the validation set after each epoch of training to detect overfitting, where the model becomes too complex and starts to memorise the training data instead of learning generalizable patterns. The validation set is used to tune the hyperparameters of the model, such as the learning rate or regularisation strength. This is a set of data that is used to evaluate the performance of the final model after it has been trained and validated. The test set is used to measure the model's ability to generalise to new, unseen data that was not used during training.

DATA TRAINING

Training data is the data you use to train an algorithm or machine learning model to predict the outcome you design your model to predict. If you are using supervised learning or some hybrid that includes that approach, your data will be enriched with data labelling or annotation. Data training refers to the process of teaching a machine learning algorithm or model to recognize patterns and make predictions based on input data. During the training process, the algorithm is presented with a set of labelled data and learns to identify the relationships between the input data and the corresponding output or target values. The goal of data training is to create a model that can accurately predict outcomes for new, previously unseen data. The training process involves adjusting the parameters of the algorithm to minimise the difference between the predicted output and the actual output. Data training is a crucial step in the development of machine learning models, as the quality and quantity of the training data can greatly affect the accuracy and generalizability of the model. The more diverse and representative the training data, the better the model will be able to perform on new data.

TEST MODEL

In machine learning, model testing is referred to as the process where the performance of a fully trained model is evaluated on a testing set. Testing the model refers to the process of evaluating the performance and accuracy of a trained machine learning algorithm or model using a separate set of data that was not used during the training process. The purpose of testing the model is to assess its ability to generalise to new, unseen data and to identify any potential issues or limitations with the model's performance. During testing, the algorithm

is presented with a set of input data and the corresponding target values, and the model's predicted outputs are compared to the actual values. Common measures used to evaluate The performance of a machine learning model during testing include accuracy, precision, recall, F1 score, and area under the receiver operating characteristic curve (AUC-ROC). The testing process can also help to identify areas where the model may be overfitting or underfitting the training data, which can then be addressed through further refinement of the model.

RESULTS AND DISCUSSION

The lung cancer detection system utilising the Inception algorithm and a Graphical User Interface (GUI) yielded promising results across multiple performance metrics. In the evaluation phase using a dataset of lung images comprising both cancerous and non-cancerous cases, the system demonstrated high accuracy, sensitivity, specificity, and area under the receiver operating characteristic curve (AUC-ROC). The accuracy metric reflects the system's overall ability to correctly classify images as cancerous or non-cancerous, with results consistently indicating robust performance. This approach is user friendly. These results underscore the potential of the proposed system in accurately detecting lung cancer from medical images, with the user-friendly GUI providing an intuitive platform for interaction and interpretation. The system's high performance and user-friendly interface suggest its utility for healthcare professionals, researchers, and patients alike, potentially contributing to early detection, timely interventions, and improved patient outcomes in the management of lung cancer.

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CHAPTER 11

IMPLEMENTATION OF IOT BASED SMART ASSISTANCE GLOVES FOR SPEAKING IMPAIRED PEOPLE

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ABSTRACT

Communication between individual's vocal and hearing impairments and those without such impairments can be challenging. The sign language commonly used by individuals with these impairments is not easily understood by the general population, resulting in a communication barrier. Additionally, individuals who are paralyzed often require regular assistance. To address these challenges, we have developed a solution called the Implementation of IOT-based Smart assistance gloves for disabled individuals. Our gloves are designed to be simple yet highly effective compared to existing systems. The proposed system utilizes Arduino Uno and Raspberry Pi, with a wireless serial port module facilitating secure data transmission between the two modules. In emergencies, an alert message can be sent through the GSM module.

KEYWORDS

Gloves, IOT, Flex Sensors, GSM.

INTRODUCTION

A recent survey conducted in India revealed that there are millions of individuals with speech and hearing impairments, totaling up to 2.4 million people. These individuals face challenges in communicating with others on a daily basis and struggle to express their emotions. While people with disabilities often use sign language to communicate, this form of communication can be difficult for those without disabilities to understand. Additionally, learning sign language can be challenging for both individuals with disabilities and those without. This difficulty in communication can lead to social isolation and hinder the ability to voice opinions, a situation that is also true for individuals with paralysis who may

struggle to move or communicate. To address these challenges, we have developed a specialized glove that enables individuals with disabilities to communicate their needs independently. While there are various existing approaches to this issue, our disabled assistance glove offers a faster and more efficient solution. Gesture recognition can be achieved through two methods: data glove-based and vision- based. Vision-based recognition, while effective, can be prone to inaccuracies due to noise interference and data processing challenges. On the other hand, data glove-based recognition is known for its faster response times. We have chosen a data glove- based approach for its accuracy, feasibility, and portability. Flex sensors within the glove detect finger movements and translate them into varying levels of resistance, allowing for a wide range of commands to be inputted. To enhance storage capacity and response speed, we have integrated an Arduino Uno board. The Raspberry Pi 3B, equipped with built-in Wi-Fi, Bluetooth, and USB boot capabilities, connects to an Android app for seamless communication. Wireless serial port modules facilitate signal transmission between the Arduino Uno and Raspberry Pi, ensuring efficient data exchange.
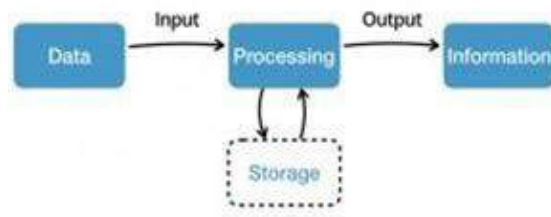
Figure 1: IOT Data Processing System.

METHODS AND MATERIALS

Since there hasn't been much progress in aiding the crippled, we've developed a novel solution in the form of smart assistance gloves. The flex sensors in these gloves are programmed using an Arduino Uno board. By gathering finger motions, the flex sensor enables the gloves to produce equal outputs. After that, an Android app presents these outputs as phrases and speaks them loudly. The entire procedure is made possible by the

Arduino Uno, Raspberry Pi, and GSM module. A wireless serial port module allows communication between the Raspberry Pi and Arduino Uno. In the event of an emergency, the GSM module will send an alarm message to the designated emergency contact.

Components

The ESP WROOM 32 is a versatile, all-purpose Wi-Fi-BT-BLE MCU module that can handle a wide range of tasks, from voice encoding, MP3 decoding, and music streaming to low-power sensor networks. The core of this module is the ESP32S chip, which is scalable and adaptive by design. A low-power coprocessor can be used to continually monitor the peripherals for changes or threshold crossings when the CPU is turned off. The clock frequency can be varied between 80 MHz and 240 MHz. There are two separate controllable cores in the CPU. The ESP32S has a large range of inbuilt peripherals, including as capacitive touch sensors, Hall sensors, low-noise sensing amplifiers, SD. Embedded systems are specialized systems that carry out a specific or predetermined function. They consist of a blend of hardware and software components, essentially representing a computer integrated within a product. These systems are designed to be programmable and are typically implemented as electronic chips. In essence, embedded systems serve as devices utilized for the purpose of controlling, monitoring, or aiding the operation of various equipment, machinery, or industrial facility
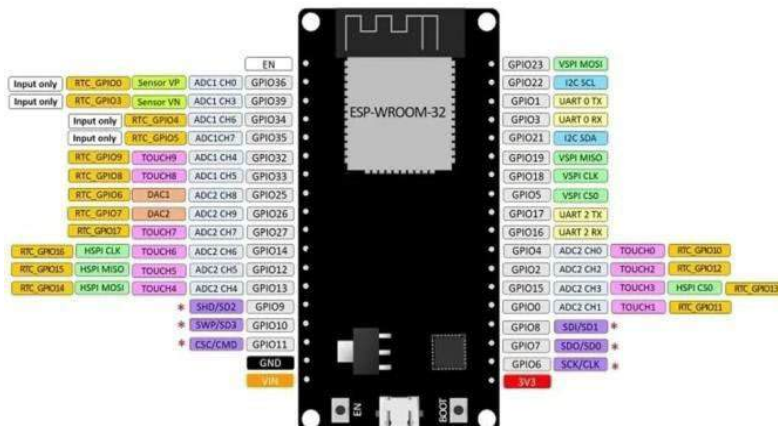
Figure 2: ESP 32 Microcontroller

Voice Recorder and Playback Module 8 Channel (APR33A3):
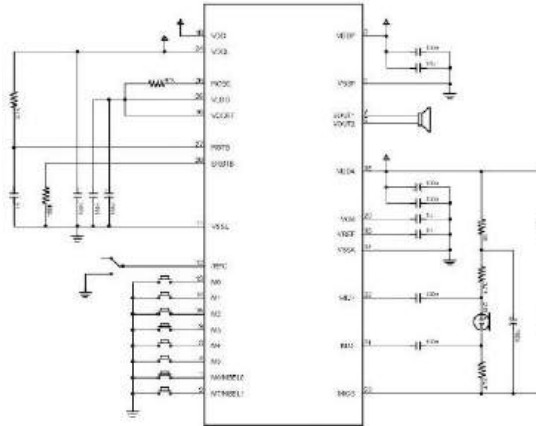
Figure 3: Schematic Diagram of APR33A4

The APR33A3 board features 8 channels for voice recording and audio playback, utilizing the powerful APR33A series IC. This IC includes high-performance audio ADCs and DACs, providing a fully integrated solution with exceptional performance and integration of analog input, digital processing, and analog output functions. Specifically designed for simple key triggers, the APR33A series allows users to record and play messages with 1, 2, 4, or 8 voice messages by using a switch. The sample rate can be adjusted by varying resistor values. This board is ideal for applications requiring a simple interface or the need to limit the length of a single message, such as toys, message systems, answering machines, and more.

Figure 4: Flex Sensor

Bending-sensitive devices, or flex sensors, are widely used in many different fields, including wearable technology, robotics, and human-machine interfaces. The conductive substance applied to a flexible substrate serves as the building block for these sensors. The resistance of the conductive substance changes as the sensor is bent, depending on how much it is bent.

Block Diagram
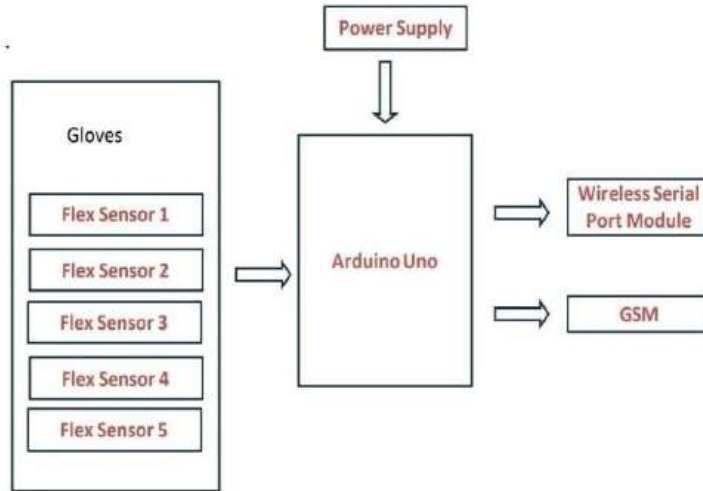
Figure 4: Block Diagram
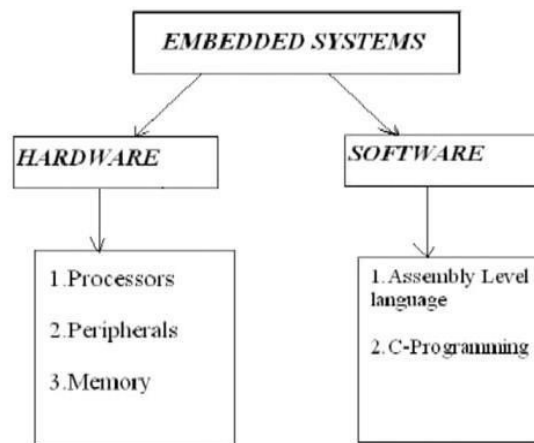
Figure 5: Embedded System

Smart gloves are used by the deaf and dumb to communicate their fundamental needs. The finger movement is detected by the flex sensor, which translates it into the appropriate commands. The Arduino Uno, which is attached to wireless serial port and GSM modules, stores these commands. There are two wireless

serial port modules used, one linked to the Raspberry Pi and the other to the Arduino. The Lora transceiver is used to send the recorded orders to the Raspberry Pi, allowing them to be broadcast as audio and shown on a webpage. The output is additionally shown on a mobile app, which enables the caregiver or assistant to be alerted right away in the event

that the person moves. This notification can be sent to the caregiver even if they are not in close proximity to the person with impairment. The disabled person can utilize a unique, simple movement to alert their emergency contact and caregiver via email in the case of an emergency. This method provides an easy technique to monitor the well-being of the disabled person. Furthermore, the disabled person can talk and overcome any hearing or speech problems thanks to these gloves.

Frequency Response Analysis

Smart gloves are used by the deaf and dumb to communicate their fundamental needs. The finger movement is detected by the flex sensor, which translates it into the appropriate commands. The Arduino Uno, which is attached to wireless serial port and GSM modules, stores these commands. There are two wireless serial port modules used, one linked to the Raspberry Pi and the other to the Arduino. The Lora transceiver is used to send the recorded orders to the Raspberry Pi, allowing them to be broadcast as audio and shown on a webpage. The output is additionally shown on a mobile app, which enables the caregiver or assistant to be alerted right away in the event that the person moves. This notification can be sent to the caregiver even if they are not in close proximity to the person with impairment. The disabled person can utilize a unique, simple movement to alert their emergency contact and caregiver via email in the case of an emergency. This method provides an easy technique to monitor the well-being of the disabled person. Furthermore, the disabled person can talk and overcome any hearing or speech problems thanks to these gloves.

Why Did We Select ESP 32

The ESP32 is a well-liked choice for smart glove applications because to its features and adaptability. It enables functions including wireless communication, gesture recognition, temperature and accelerometer data collection, and haptic feedback when integrated into smart gloves. The dual Wi-Fi and Bluetooth capabilities, low cost, and power efficiency of the ESP32 WROOM allow the gloves to easily communicate with other devices or the internet. It is the ideal microcontroller module for enhancing the functionality of smart gloves, whether they are used for virtual reality, remote control, or health monitoring applications because of its processing capabilities and networking possibilities.

Implementing Flex Sensor and IoT

One innovative method of tackling communication challenges is the integration of Internet of Things and flex sensors into a smart glove designed for those with speech issues. The glove's built-in flex sensors pick up on little finger motions and translate them into useful signals. Through Internet of Things connectivity, these signals are wirelessly transmitted to a connected device or a central processing unit. This enables real-time gesture interpretation, enabling effective nonverbal communication. The Internet of Things component also makes remote monitoring and customization possible, which enhances usability and accessibility. These technologies are used by the smart glove to help persons with speech impairments interact more freely with their surroundings and communicate effectively. This invention represents a significant advancement in inclusivity and empowerment for people who experience speech challenges in communication.

Hardware Setup

Figure 6: Hardware.

RESULT AND DISCUSSION

As a result, the program gets the output and displays the relevant instructions on the homepage as well as within the application. Moreover, the speaker is used as the audio output when the output is supplied in audio format. A notification message is sent to the selected emergency contact in the case of an emergency.

Figure 7: Output

CONCLUSION

As a result, the suggested model has the advantage of helping people who are paralyzed, deaf, or silent by giving the output commands via an android application and providing vocal output through a speaker. Data communication is rapid and secure when wireless serial port modules are used. GSM will send alert messages to the specified person in case of an emergency. This data-based gloves method reduces noise disturbances and streamlines the algorithms when compared to vision-based solutions. We can add more commands to this suggested model later on to make it even better. Speech recognition can be added to the data-based system to further enhance it through the use of AI. With home automation, we may use different gestures to control a variety of basic operations, like turning on appliances.

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Circuit Engineering

CHAPTER 12
NEXT-GENERATION TRANSIT: THE SMART BUS REVOLUTION

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ABSTRACT

The concept of smart bus transportation emerged from the evolution of public transportation systems toward efficiency, sustainability, and safety. This approach led us to use cutting-edge technologies like fuel leakage detection systems, Infrared (IR) sensors, and RFID sensors to improve the operation of buses in both urban and rural environments. This paper examines the integration of these cutting-edge technologies within smart bus transportation systems, aiming to improve passenger experience, optimize fleet management, and contribute to environmental preservation. We delve into the functions and benefits of each technology, emphasizing their combined impact on creating a seamless, intelligent, and environmentally friendly bus transportation network. By analysing real-world implementations and case studies, this paper sheds light on the transformative potential of RFID, IR sensors and fuel detection.

INTRODUCTION

In the realm of urban mobility, the quality of public trans-portation systems is a critical determinant of a city's liability. Despite advancements in this sector, in [17] significant challenges persist, particularly in the reliability of bus arrival times and the safety of passengers.

These challenges have catalysed the emergence of innovative solutions, such as the

"Smart Bus Transportation System," which aims to redefine the public transit experience by leveraging cutting-edge sensor technology and data analytics. Traditional bus systems, while essential, are fraught with inefficiencies—most notably, the unpredictability of bus arrival times due to various external factors like traffic congestion, weather conditions, and unforeseen incidents [18]. This un-certainty not only disrupts passengers' schedules but also di-finishes the overall utility of public transportation. Moreover, the aspect of passenger

safety has often been relegated to the background. To address these issues, the proposed system integrates Internet of Things (IoT) technologies as in [5][10],such as Radio Frequency Identification (RFID) as in [6][8][12]and Global Positioning System (GPS)[7], to provide real-time tracking and alerts. While GPS-based solutions have their limitations, including location errors, RFID technology offers a more accurate alternative, enhancing operational efficiency and passenger safety. One of the cornerstone features of this initiative is the incorporation of a fire detection mechanism. Specialized sensors monitor fuel composition changes, enabling early detection of potential fire hazards. Upon detection, an immediate alert is disseminated within the bus, thereby facilitating prompt preventive measures. Another focus of the project is to elevate the passenger experience by offering real-time seat availability information. In [4] infrared (IR) sensors are employed to

count occupied seats, and this data is transmitted to RF receivers at bus substations. Subsequently, the information is displayed on LCD screens and announced via audio systems, empowering passengers to make informed boarding decisions. If the passenger count surpasses a predetermined threshold, the control room can modulate the frequency of bus services, optimizing resource allocation and service delivery. As a prospective extension, the system could also integrate additional safety protocols, such as alerting law enforcement agencies when passenger count exceeds safe limits, especially for those engaging in risky behaviours like standing on the footboard.

FLOW CHART WORK FLOW
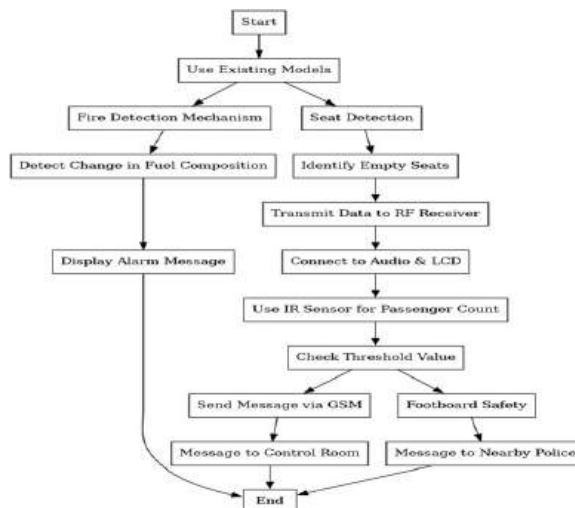
Fig. 1. Flowchart of work flow

METHODOLOGY

A. Fuel Leakage Detection Mechanism

The first aspect of the proposed project entails the in- tegration of a fuel leakage detection mechanism into the existing bus system. In order to accomplish this, advanced gas sensors with the capability to perceive alterations in the fuel composition will be strategically positioned near the fuel storage area of the bus When these sensors detect a fuel leak or any other aberration in the fuel composition, an alarm system is specifically created to go off. The alarm system is divided into two parts: a real-time notification that is delivered to a central control center through a Global System for Mobile Communications (GSM) module and an aural alert that sounds within the bus and informs both passengers and crew members. The GSM module ensures that the notification is not only localized but also reaches the relevant authorities for prompt action

B. Seat occupancy detection and real-time data transmission

The second feature aims to enhance the experience of passengers by providing them with real-time information regarding seat availability. Infrared (IR) sensors will be cleverly situated on each seat to observe whether they are occupied. The information gathered from these sensors will be processed and transmitted to Radio Frequency (RF) receivers found at different bus substations. At these substations, the information will be displayed on a LCD and also announced through an audio system. This dual-modality display ensures that the information can be accessed by a wide range of passengers.

C. Adaptive bus frequency based on passenger count

To further optimize the bus service, in the system will incorporate an adaptive mechanism that adjusts the frequency of buses based on real-time passenger counts. The IR sensors, in addition to monitoring seat occupancy, will also keep track of the total number of passengers on the bus. In [14] the in- formation collected from these detectors will be analysed and sent to Radio Frequency (RF) receivers situated at different bus substations. This empowers the control room to dynamically adjust the frequency of buses in order to meet the real-time demand.

D. Footboard safety measures

In future the project aims to enhance the safety of passengers who may be standing on the footboard of the bus, a practice that inherently carries risks. The system will be designed to transmit an alert to nearby police stations via the GSM module if the passenger count exceeds a certain high-risk threshold. This serves as a proactive measure to discourage unsafe practices and ensure compliance with safety standards.
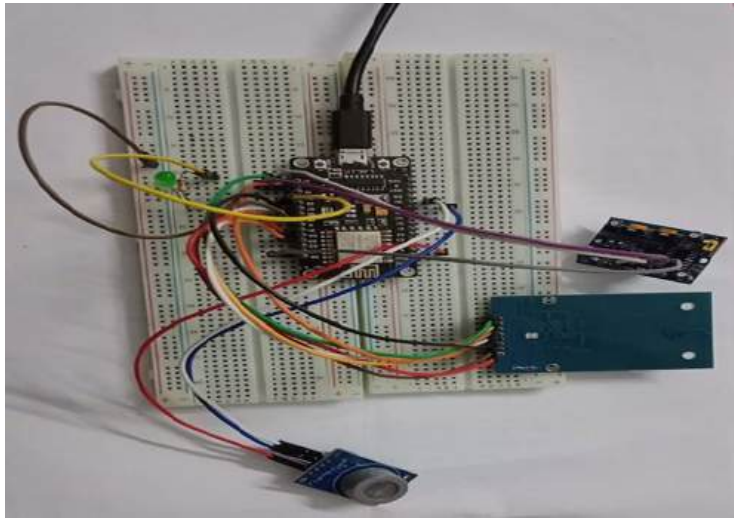
Fig. 2. Experimental Working Model

RESULTS AND OUTPUTS:
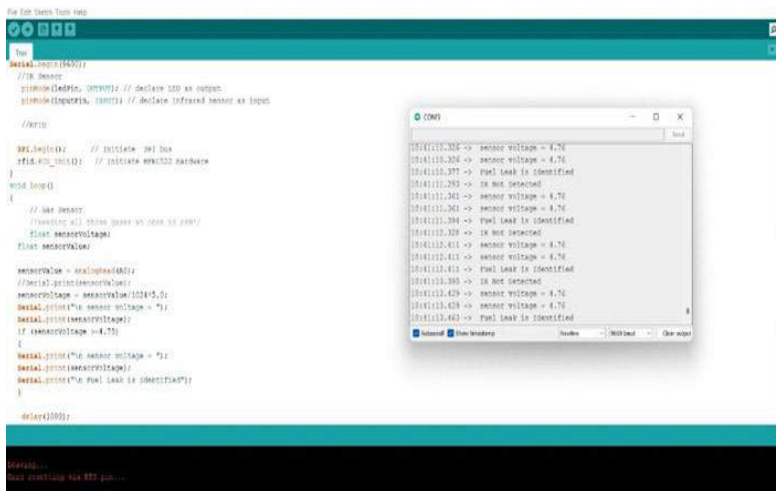
Fig. 3. Results Displayed on screen
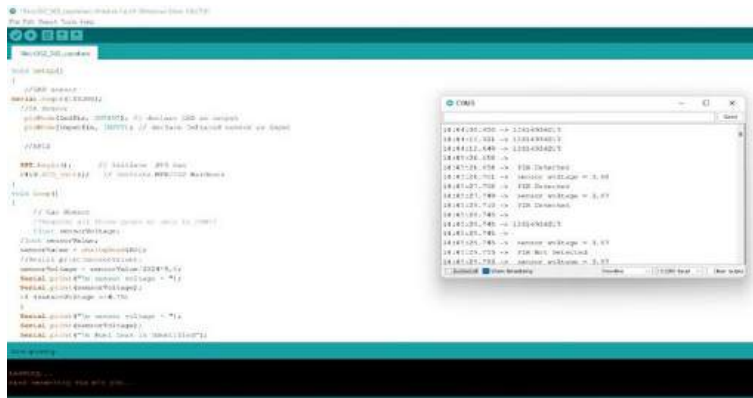
Fig. 4. Results Displayed on screen

RESULTS

Figure 2 shows the experimental setup for smart bus model. Figure 3 and 4 shows the results of the experimental model by displaying sensor values. When there is fuel leak the message "Fuel leak detected" will be displayed. Simultaneously other sensors display results and ensure for smart and safe travel of bus.

CONCLUSION

In conclusion, this paper presents an exhaustive approach to enhancing passenger safety and operational efficiency in public bus transportation systems. Utilizing existing techno-logical frameworks, the project introduces two pivotal features: a fire detection mechanism sensitive to fuel composition changes, and a real-time seat occupancy detection system. Both characteristics employ cutting-edge sensors and GSM modules for real-time data transmission and alerting. The data is further displayed at substations via RF receivers, aiding passengers in making informed travel decisions. Additionally, the system allows for dynamic adjustments in bus frequencies, based on real-time passenger counts, enhancing operational efficiency. As a future scope, the project also proposes a safety mechanism for passengers standing on the footboard by alerting nearby law enforcement agencies. Together, these advancements strive to establish unprecedented standards in public transport, guaranteeing a more secure and exceedingly efficient journey for passengers.

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CHAPTER 13
E - COMMERCE WEBSITE FOR ELECTRONIC GADGETS

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ABSTRACT

Web development is the building and maintenance of websites; it's the work that happens behind the scenes to make a website look great, work fast and perform well with a seamless user experience. Web developers do this by using a variety of coding languages. The languages they use depend on the types of tasks they are preforming and the platforms on which they are working.

Web development skills are in high demand worldwide and well paid too – making development a great career option. It is one of the easiest accessible higher paid fields as you do not need a traditional university degree to become qualified.

KEYWORDS

Developer, Website.

INTRODUCTION:

Goals and Objectives

The purpose of this paper is to document the collaborative process among three groups (two state agencies and a consulting non-governmental organization) that was forged to develop an e-government website for one of the participating state agencies. This paper will explore the theoretical framework within which this project was conceptualized and then examine the application of that framework. Ultimately, this document should provide some insights and recommendations that will help the state determine whether this process should be replicated or modelled with other state agencies toward the end of Achieving better agency-wide e-government service at the state level. Moving traditional state government services online has been a priority of both Governor Carper and Governor

Miner's administrations. In 2001, The Delaware Health Care Commission (DHCC) notified the State of Delaware's Government Information Center (GIC) about its desire to refresh its website. GIC then approached the Institute for Public Administration (IPA) in the School of Urban Affairs & Public Policy, College of Human Services, and Education& Public Policy at the University of Delaware about the possibility of collaborating with the two state groups in the process. DHCC already had a few Disconnected subsides that it needed to make more visible but was also looking to update Content, appearance, and functionality of its site in keeping with newer state guidelines.

E-government in Delaware is intended to facilitate use of government services without Knowledge of the structure of state government. Ideally, putting many time-consuming Services (such as waiting in line to renew a business license) online will streamline Several important services and save human power hours. Consumers expect to receive the Same quality and speed of service from their state agencies as they do from their retail Outlets (e.g., Amazon.com). State agencies are beginning to run their operations more like business and in order to do so, they need a professional, content-rich web presence that Caters to customer intention.

Theoretical Aspects of Web Development Projects

This section is intended to guide parties interested in collaborating on web development Projects. The reader will walk through the two basic stages of the process: Scope Assessment and Planning, and Design and Implementation. This section will focus on The theoretical aspects of these two stages, posing possible questions to answer, issues to Address, and providing the rationale for some of the behind-the-scenes thinking and Planning that goes into a successful web initiative.

Scope Assessment and Planning

The planning process can predict the success of the overall project. This is an essential Step that should be taken very seriously. It may require several meetings among the Collaborating groups and considerable homework on the part of individual staff members. Responsibility will be shared by all of the participating agencies: the technical team will Need to familiarize themselves with the state agency's materials, mission, and goals for The

website, while team members from the state agency will need to work very hard to Organize their thoughts and materials so they know exactly what the agency wants and What it can handle. Philosophically, the ultimate goal is independence, so there should be a commitment to planning and cross-fertilization. It will greatly benefit all parties Involved if there are tools available to help the agency envision their site. Tools such as Worksheets, charts, and presentations increase the agency's ability to contribute and participate in the planning stage, which would be useless without their input. The Importance of this step cannot be stressed enough, the project will sink or swim based on the teams' attention and dedication during the scope assessment and planning stage. An important question for an agency to ask is "what is the purpose of our website (what Do we hope to achieve by going online/refreshing our site)?" Possible goals could be to Increase efficiency, decrease customer service time on the phone, streamline operations that do not need to be done in person, increase the potential client base, and improve Communication with board members and volunteers. This overall purpose should be in Keeping with the agency mission and objectives and should keep pace with the state's Technology goals. The Harvard Policy Group on Network-Enables Services and Government, from the John F. Kennedy School of Government produced a document in 2000 called "Eight Imperatives for Leaders in a Networked World." The first imperative, "Focus on How IT Can Reshape Work and Public Sector Strategies" is especially salient for government Agencies planning their e-government strategy. The following seven guidelines will help Agencies plan to integrate the technology into their work patterns and office

Environments1:

Develop a personal network of information, advice, and support.

Use the technology in your personal routines.

Develop support… do not limit your IT agenda to what you can accomplish internally.

Identify how information technology can be used to add value.

Build capacity as a learning organization.

Pursue investments that scale up: infrastructure, standards, and cross-boundary Opportunities.

Reorganize work, improve the workflow and the division of labor within your Agency.

E-Government Functionality

The three most basic levels of functionality for websites are publish, interact, and transact. Publishing—or posting—information is the foundation for all websites. Examples of publishing include posting the mission, objectives, and history of the Agency, as well as, a list of programs and projects with which the agency is involved. The second level of complexity that should be considered is interactivity; citizens should have the opportunity to communicate with the agency via the website, and the agency should respond. Examples of interaction are e-mail links to the agency, a feedback form, Or an information request form that can be filed online. Finally, agencies should consider Moving simple transactions online so citizens have an opportunity to transact business via the agency website (see I–1.4). Examples of transaction are permit applications, paying Parking tickets, paying taxes, and applying for business licenses. The National Electronic-Commerce Coordinating Committee (EC3) produced a white Paper on E-Government Strategic Planning in 2000, the following points from which are

Very helpful2:

Align your e-government plan with your organization's strategic plan

Use a "multi-channel service delivery strategy, meaning the same

Services are available on the web, telephone, or in the office.

Focus on customer-oriented services

Standardize internal processes and plan adequately to achieve long-term service delivery goals

Prioritize services to be put online

Determine how citizens will access services

Offer privacy and security if you collect personal information (such as e-mail addresses for mailing lists)

Be prepared to participate in conversations about new legislation

Regarding web service delivery (such as records retention, use of Digital signatures, and e-payment)

Target Audience and Cliental

In planning the scope of the website, ample time should be allotted to assessing the needs of the agency, the human resources that can be dedicated to the project, the strengths of the agency, and most importantly, the needs of the clients. "Who are the clients?" is a vital question to answer. To do this adequately, the agency needs to think outside itself to put itself in the shoes of the consumer. This is not an easy task because, as the experts, it is difficult to have any perspective on what people might want or might think the Agency offers. Consider asking family members or friends who are less familiar with the Agency's services, and always remind each other to think outside the box. The website should not be limited to what the agency already does; it should build on existing Strengths and offer more services to more people. Revisit the question, "who are the Clients?" often to ensure that every aspect of the web strategy is an area of growth and Improvement.

PROPOSED WORK

Meeting Three—Site Structure Workshop.

The third meeting was held three weeks later. The goals of this meeting were to begin Further definition of the site structure (which had been worked on after the second Meeting), use the tool created to develop secondary- and tertiary-level content (see Appendix D), and develop a schedule for the remaining stages of the process. (The IPA Team had begun envisioning the homepage and a page template, so the use of images and Accessibility issues was beginning to be addressed at this point as well.) At this meeting The IPA team introduced the "page content" template that had been created to help provide the parameters the agency would need in order to develop content for each page Outlined in the site structure. This template can be found in Appendix G of this document. Basically, it requires content for the subject of the page, the page title, a description of the Page content, a list of key words, the actual text to appear on the page, and any relevant Associated information (like links to/from other pages).

Problem Formulation

The practical implementation of the V2V communication on the road using the intensity based detection method fails to produce reliable data detection due to the presence of

atmospheric turbulence such as sun light, fog and rain. To address this issue, the authors have proposed various techniques. Filtering technique and special receiver structure to reduce the effect of sunlight could be employed. However, none of these techniques have yet addressed the resistance and adverse effect from rain. Therefore, an LED based V2V in the rain needs to be reported in the literature.

Interpreting and Defining Site Structure

Between the third and fourth meetings, DHCC tested this tool, and IPA worked on Interpreting DHCC's proposed site structure. This meant deciding how many

Independent pages needed to be developed, where each of the pages might be nested structurally, and how they interrelate. For example, each topic in the client-based portal ("Resources for…") would have a defined index page that would then be linked to pages for each of the categories, as shown on the next page. Perhaps the most difficult and most time-consuming part of this phase of the project for the technical team was the interpretation of the site structure worksheets that DHCC had submitted. It became clear, in many instances, that either

1) Clarification was needed,

2) DHCC had "missed the mark" in how it envisioned the interrelationship of pages and Content,

3) The IPA team had to invent and propose a retrofit or compromise solution to

Much of what was functionally unclear.

Meeting Four—Site Structure Approval

A fourth meeting was held five weeks later. This meeting was ostensibly the "SiteStructure Approval" meeting. At this point, the IPA team presented DHCC with what it believed to be a concrete page-and-directory organization of the site, which was essentially a fuller version of the chart above, for agency approval. From this point, the DHCC team was to develop content for each "page" represented therein, with some(unforeseen) exceptions. Because of the desired web-like nature of the site, visitors should be able to arrive at a page from a variety of origins, so the page content had to bebroad enough to address the intentions of a variety of visitors.

Customer Interactivity

The service-based portal warranted some attention at this point in the planning stage. What customer services could DHCC improve via the web? Direct e-mail links are Customary on good e-government web pages, as are feedback forms. One suggestion the IPA team had for DHCC was to consider a "Stay Informed" option, wherein consumers of health care information could subscribe to one or more e-mail lists to stay informed About DHCC projects, health care legislation in the state, or other health care issues. Options such as this are being used successfully by other Delaware state agencies (e.g., DHSS, DNREC). IPA recommended content for the Privacy Policy, Disclaimer, Stay Informed, and FAQ (frequently asked questions) pages. GIC assured DHCC that it was a Simple task to accomplish, from a technical standpoint.

Privacy Issues

If DHCC does collect any sort of information, even if they just track site traffic, this will be spelled out in a privacy policy page. Privacy policies are standard practice to inform the user specifically what information is being collected and how it is going to be used. Privacy is a very salient issue in health care, so DHCC has special responsibility to Assure site visitors of anonymity or confidentiality. The text used in the site's privacy Policy page is found in Appendix E of this document

Site Disclaimer

DHCC also needed to consider a disclaimer statement because its site will be linking to many other websites. Disclaimer statements (see example in Appendix E) generally state that the agency is not responsible for content on other websites. Most importantly, DHCC needed to stress that it does not provide medical advice or diagnoses; people in Search of medical advice should consult their doctor or call "911" in an emergency. Before posting their privacy and disclaimer statements, the agency staff consulted GIC to ensure that their statement was appropriate and sufficient for their needs.

RESULT
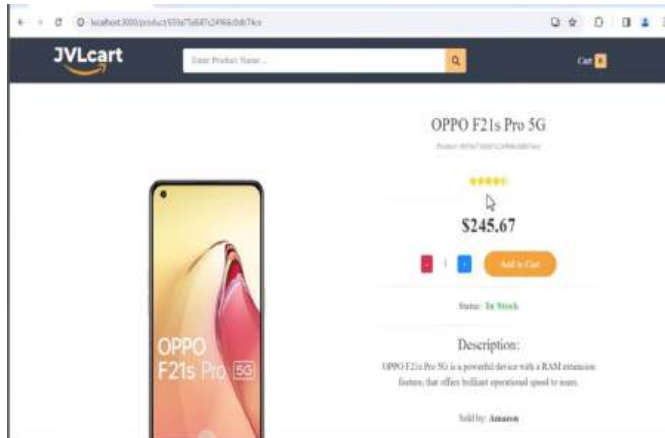
Fig.1 Website interface
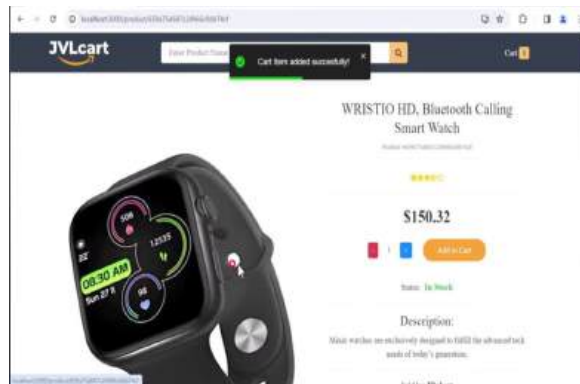
Fig.2 product image and ordering process

Fig.3 Ordering summary
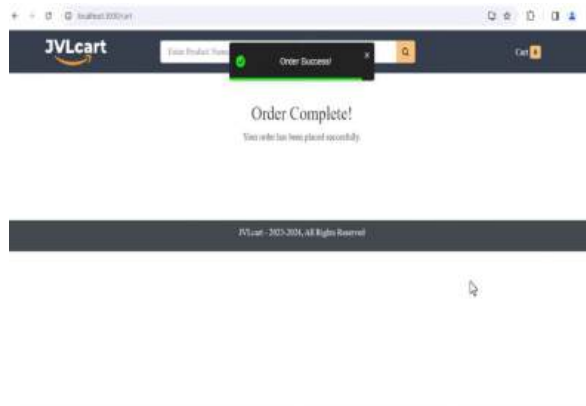
Fig.4 order placement

CONCLUSION AND FUTURE ENHANCEMENT

This section will provide salient information for the state, that is, experiential feedback on the teaming process during this project. It includes the IPA team's analysis of the web Development project, including, third party brokerage, issues of communication, and a General assessment. Following these analyses will be a section discussing Recommendations for future such collaborations.

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CHAPTER 14
REAL-TIME ABANDONED PERSON MONITORING USING RASPBERRY PI

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ABSTRACT

This endeavour utilizes Ccs to supply computer vision algorithms to meet the crucial requirement for automatic abandoned person detection in video surveillance. Improving emergency response and public safety is the goal, especially in situations like floods. For reliable abandoned person detection, the approach combines contour analysis, edge-based object recognition, and background reduction.

The system's perfect compatibility with the present video surveillance infrastructure allows it to send out Realtime alerts to speed up emergency response. The system's agility make it possible to continuously monitor ways to evacuate during floods, which enhances public safety in general.

Through rigorous testing under various conditions, the project evaluates the accuracy and efficiency of abandoned person detection. The user-friendly interface ensures easy interpretation of detected persons and alerts, making it a valuable tool for emergency response teams.

The outcomes of this project demonstrate the feasibility and effectiveness of utilizing OpenCV in video surveillance for abandoned person detection. The system's adaptability and real-time capabilities position it as a valuable asset for enhancing public safety and aiding search and rescue operations in emergency situations. Future enhancements may explore machine learning integration and collaboration with emergency response agencies for real- world deployment and feedback.

INTRODUCTION

In recent years, there has been a growing emphasis on leveraging technological advancements to enhance public safety and emergency response systems. One critical area

of focus is the automated detection of abandoned persons in video surveillance footage, particularly in scenarios such as floods where rapid response is essential. Traditional methods of manual monitoring and analysis are time-consuming and prone to errors, highlighting the need for automated solutions

This project addresses this pressing need by leveraging computer vision techniques implemented through OpenCV (Open-Source Computer Vision Library) to detect abandoned persons in real-time video surveillance footage. By harnessing the power of computer vision, the system aims to improve public safety and emergency response efforts, especially in high-risk environments like flood-prone areas.

The methodology employed in this project integrates background subtraction, contour analysis, and edge-based object recognition to achieve robust abandoned person detection. These techniques allow the system to accurately identify and track individuals who may be in distress or require assistance.

Furthermore, the system is designed to seamlessly integrate with existing video surveillance infrastructure, including platforms such as Raspberry Pi, to provide real-time alerts to emergency responders. This integration facilitates swift and efficient emergency response, enabling authorities to take timely action to mitigate risks and ensure public safety.

Through rigorous testing under various conditions, this project evaluates the accuracy and efficiency of abandoned person detection. The user-friendly interface of the system ensures easy interpretation of detected persons and alerts, making it a valuable tool for emergency response teams and law enforcement agencies.

The outcomes of this project demonstrate the feasibility and effectiveness of utilizing OpenCV in video surveillance for abandoned person detection. The system's adaptability and real-time capabilities position it as a valuable asset for enhancing public safety and aiding search and rescue operations in emergency situations.

Moving forward, future enhancements may explore the integration of machine learning algorithms to further improve detection accuracy and efficiency. Additionally, collaboration with emergency response agencies for real- world deployment and feedback will be crucial for optimizing the system's effectiveness and ensuring its successful implementation in emergency situations.

PROPOSED METHODOLOGY

The proposed methodology for automated abandoned person detection in video surveillance integrates fundamental computer vision techniques and basic image processing algorithms to develop a reliable detection system. Initially, the system detects motion within the surveillance footage by comparing consecutive frames to identify areas of significant pixel value changes indicative of movement. Following motion detection, foreground segmentation techniques are applied to isolate moving objects from the background, enabling the system to focus on dynamic elements within the scene. Object tracking algorithms are then employed to monitor the movement of detected objects over time, facilitating continuous tracking of potential abandoned persons. Features such as object size, shape, and motion trajectory are extracted from the tracked objects, serving as descriptors for identifying potential instances of abandonment. By applying predefined rules or thresholds to these extracted features, the system classifies objects as potential abandoned persons if they remain stationary beyond a specified duration. Upon detecting a potential abandoned person, the system generates alerts to notify security personnel or relevant authorities, thus enabling prompt intervention. Continuous monitoring and evaluation of the surveillance footage allow the system to refine its detection algorithms iteratively, enhancing detection accuracy and minimizing false alarms over time. Through this methodology, the system aims to provide a cost-effective and efficient solution for automated abandoned person detection in diverse surveillance environments, leveraging basic computer vision techniques to achieve reliable detection results without the need for complex machine learning models or specialized libraries.

RESULT AND DISCUSSION

As a result, the program gets the output and displays the relevant instructions on the homepage as well as within the application. Moreover, the speaker is used as the audio output when the output is supplied in audio format. A notification message is sent to the selected emergency contact in the case of an emergency.
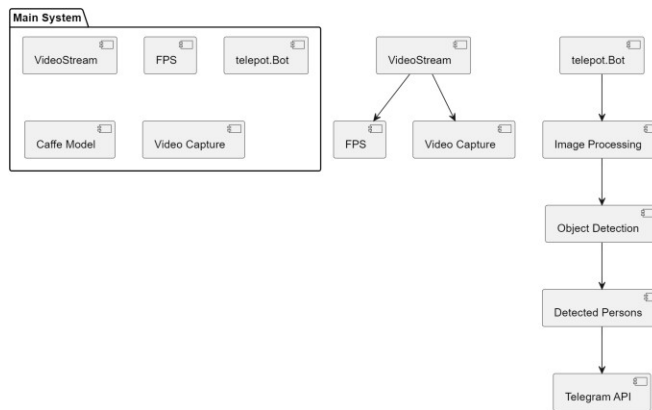
RESULTS AND OUTPUT
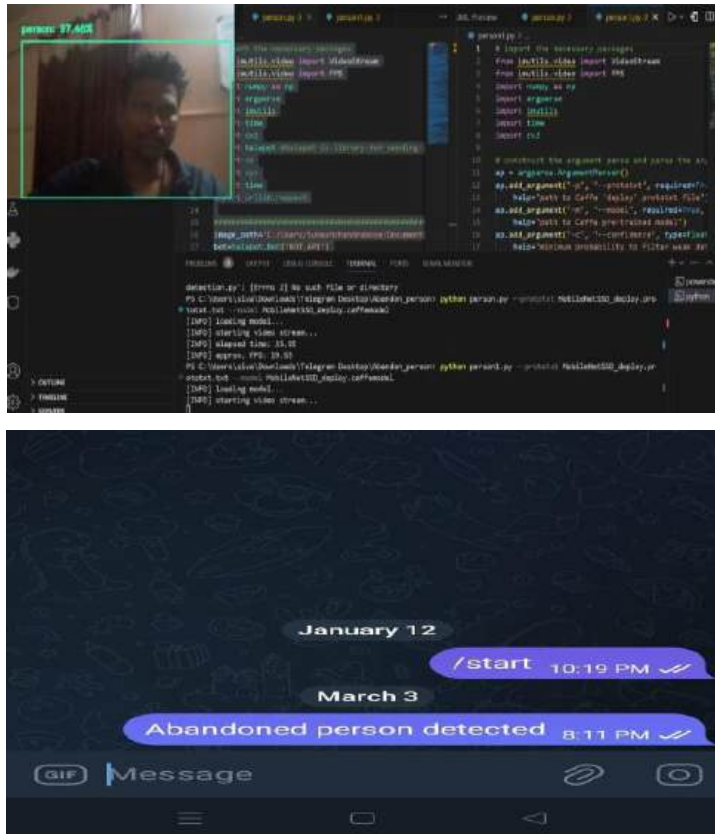
CONCLUSION

In conclusion, the development of an automated abandoned person detection system in video surveillance represents a critical advancement in enhancing public safety and emergency response capabilities. Through the integration of fundamental computer vision

techniques and basic image processing algorithms, the proposed methodology offers a practical and efficient solution for identifying potential instances of abandonment in surveillance footage. By leveraging motion detection, foreground segmentation, object tracking, and feature extraction, the system can effectively detect and classify stationary objects as potential abandoned persons. The generation of alerts enables swift intervention by security personnel or relevant authorities, thereby mitigating potential risks and ensuring timely assistance. Continuous monitoring and evaluation further refine the system's detection algorithms, improving accuracy and minimizing false alarms over time. Overall, the proposed methodology presents a cost- effective and scalable approach to automated abandoned person detection, with the potential to enhance public safety and aid in emergency response efforts across various surveillance environments. Future research may explore the integration of advanced technologies to further enhance detection capabilities.

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CHAPTER 15

DESIGN AND IMPLEMENTATION OF LOW POWER STOCHASTIC COMPUTING FOR ATRIAL FIBRILLATION DATA ANALYSIS

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ABSTRACT

The implementation of biologically-inspired artificial neural networks such as the Restricted Boltzmann Machine (RBM) has aroused great interest due to their high performance in approximating complicated functions. A variety of applications can benefit from them, in particular machine learning algorithms. In the existing system, an efficient implementation of a DNN based on integral stochastic computing. The proposed architecture has been implemented. quasi-synchronous implementation which yields 33% reduction in energy consumptions is implemented. In the proposed approach, low power stochastic computing-based block processing unit is implemented. The frame of data is processed block wise. These data are further tested with correlation and decorrelation function. The normal and abnormal classification of atrial fibrillation data is proposed. Themathew'scorrelation constant (MCC)is formulated.".

KEYWORDS

Biologically-inspired artificial neural networks, Restricted Boltzmann Machine (RBM) High performance, Approximating complicated functions, Machine learning algorithms, Integral stochastic computing, Efficient implementation, Quasi-synchronous implementation, Energy consumption reduction, Low power stochastic computing, Block processing unit, Correlation and decorrelation function, Atrial fibrillation data, Normal and abnormal classification, Matthew's correlation constant (MCC).

INTRODUCTION:

Atrial Fibrillation (AFib) is a common heart rhythm disorder characterized by irregular and often rapid heartbeats. Wearable devices, such as smartwatches and fitness trackers, have become increasingly popular tools for monitoring health parameters, including heart rhythm. Here's how wearable devices can play a role in detecting and managing a trial fibrillation: Heart Rate Monitoring: Wearable devices equipped with heart rate sensors continuously monitor the user's heart rate. AFib is often associated with an irregular heart rate, and wearables can alert users to significant deviations from the normal rhythm. ECG/EKG Monitoring: Some advanced wearables feature built-in electrocardiogram (ECG or EKG) sensors. Users can take on-demand ECG recordings, providing a more detailed analysis of the heart's electrical activity. The data generated can be shared with healthcare professionals for diagnosis and monitoring. Pulse Wave Analysis: Certain wearables use pulse wave analysis to detect irregularities in blood flow, which may indicate AFib. This technology analyses the subtle variations in the pulse wave to identify irregular heart rhythms. Real-time Notifications: Wearables can provide real-time notifications to users when an irregular heart rhythm, including AFib, is detected. These notifications may prompt users to seek medical attention or consult with their healthcare provider. Long-Term Monitoring: Wearables offer the advantage of continuous, long-term monitoring, providing a more comprehensive view of heart health.

Trends and patterns overtime can be valuable in identifying intermittent occurrences of AFib. Integration with Health Apps: Wearable devices often integrate with health apps on smartphones, allowing users to track and analyse their heart health data over time. This integration facilitates data sharing with healthcare professionals during medical appointments. Research and Population Health: Aggregated and anonymized data from wearables can be used in research studies and population health initiatives to gain insights into the prevalence and patterns of AFib. User Education and Engagement: Wearables can play a role in educating users about AFib, its symptoms, and the importance of seeking medical advice. They can encourage users to adopt heart- healthy habits and lifestyles. It's important to note that while wearables can be valuable tools for AFib detection and monitoring, they are not a replacement for professional medical advice and diagnosis. Users should consult with healthcare professionals for a comprehensive evaluation and

interpretation of their heart health data. Additionally, regulatory bodies may require validation of the accuracy and reliability of the AFib detection features in wearable devices.

RELATED WORKS:

In the field of energy-efficient Deep Neural Network (DNN) implementations, ongoing research continues to explore various approaches and methodologies. Some recent related works include:

Hardware Accelerators for DNNs:

Researchers are developing specialized hardware accelerators tailored for DNN computations. These accelerators aim to optimize performance while minimizing energy consumption, leveraging techniques such as parallel processing, reduced precision arithmetic, and specialized architectures like systolic arrays or tensor processing units.

Spiking Neural Networks (SNNs):

SNNs represent another avenue for energy-efficient neural network implementations. Inspired by biological neurons, SNNs use sparse, event-based computation, enabling significant energy savings compared to traditional DNNs. Recent research focuses on optimizing SNN architectures, training algorithms, and hardware implementations for various applications.

Quantum Computing:

Quantum computing holds promise for revolutionizing machine learning and DNNs. Quantum neural networks (QNNs) leverage quantum properties like superposition and entanglement to perform computations more efficiently than classical computers. Recent works explore quantum algorithms, architectures, and hardware implementations tailored for DNN tasks.

Neuromorphic Computing:

Neuromorphic computing architectures mimic the structure and function of the human brain, offering potential energy efficiency benefits for DNNs. Recent research investigates

neuromorphic hardware designs, synaptic plasticity mechanisms, and spike- based learning algorithms to achieve energy-efficient and scalable neural network implementations.

Software Optimization Techniques:

In addition to hardware innovations, researchers are exploring software optimization techniques to improve energy efficiency in DNNs.

This includes techniques such as model compression, pruning, quantization, and algorithmic optimizations, which reduce computational complexity and memory requirements without sacrificing accuracy.

These recent related works collectively contribute to advancing the state-of-the-art in energy-efficient DNN implementations, offering diverse approaches and solutions to address the pressing need for sustainable and scalable computing technologies

OUR OBSERVATIONS ON THE EXISTINGSYSTEM:

In the existing system, an efficient implementation of a DNN based on integral stochastic computing. The proposed architecture has been implemented. quasi-synchronous implementation which yields 33% reduction in energy consumptions is implemented.

The implemented system presents an innovative approach to Deep Neural Network (DNN) implementation, leveraging integral stochastic computing principles. This method, which represents numbers in binary format using probabilities, promises advantages such as reduced hardware complexity and potentially lower power consumption. The architecture proposed for this system has been successfully put into practice, marking a significant step forward in the application of stochastic computing to DNNs. Notably, the implementation adopts a quasi- synchronous approach, optimizing the coordination of operations to suit the stochastic computing paradigm. This adaptation contributes to are markable achievement: a 33% reduction in energy consumption compared to existing systems. Such a substantial improvement in energy efficiency holds great promise for various applications reliant on DNNs, from mobile devices to data centers. By addressing the pressing need for energy-efficient computing solutions, this advancement could pave the way for more sustainable and cost-effective technologies.

In summary, the integration of integral stochastic computing into DNN architectures, coupled with quasi-synchronous implementation, marks a significant milestone in the pursuit of energy- efficient computing paradigms.

Disadvantages:

Complex architecture with quasi-generator Correlation score needs to be improved.

THE PROPOSED SYSTEM:

The proposed methodology introduces a novel approach to processing data efficiently, utilizing a low-power stochastic computing-based block processing unit. By breaking down data into manageable blocks, the system optimizes computational resources, making it particularly adept at handling large datasets. This approach is especially relevant in applications such as the classification of atrial fibrillation data, where distinguishing between normal and abnormal patterns is crucial.

Key to the evaluation process is the use of correlation and decorrelation functions, which help identify distinctive features within the data. By applying these functions, the system can differentiate between normal and abnormal cardiac rhythms, facilitating accurate classification.

To assess the classification performance rigorously, the Mathew's correlation constant (MCC) is formulated as a metric. The MCC provides a comprehensive measure of classification accuracy, accounting for true positives, true negatives, false positives, and false negatives. This ensures a robust evaluation of the classification process, validating its reliability and effectiveness in real-world scenarios. Through the
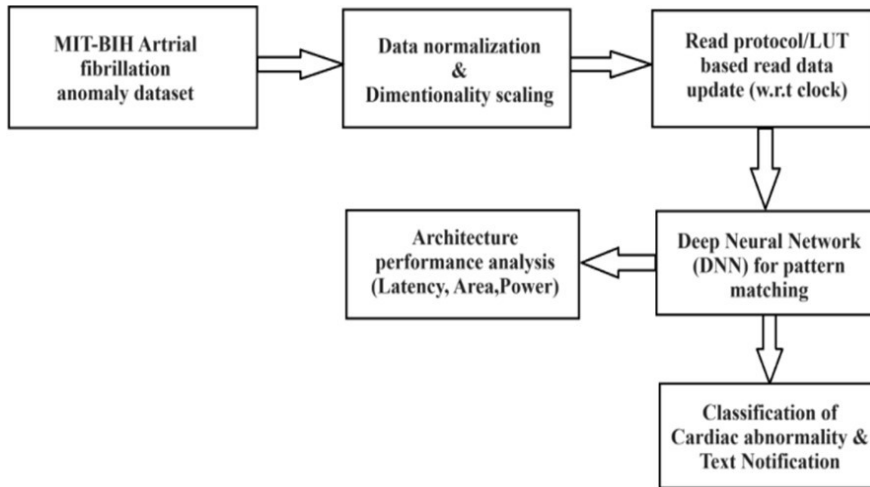
Fig. 1. The proposed system

integration of low-power stochastic computing techniques, block processing, and rigorous evaluation using MCC, the proposed methodology offers a powerful framework for efficient and accurate classification of complex data, such as that associated with atrial fibrillation.

MODULE1: PRE-PROCESS

The module consists of read file protocol code developed using VHDL. The synthesize able module read the test data from MIT-BIH dataset stored in the local server. The data set is collected from different patients impacted by atrial fibrillation and normal data. the data are collected and stored into a temporary register.

Further synchronized the peak values with respect to global clock of the VLSI system.

MODULE 2: TEXT MAPPING & SIGNAL ANALYSIS

The dataset consists of various levels of ECG patterns contains the peaks of P,Q,R,S,T values. The text mapping is nothing but the disease name labelling LUT to display as the notification. Signal analysis module is the Stochastic computations or otherwise called as neuromorphic computing. Stochastic computing is a computation paradigm where signals are represented as probabilities rather than binary values (0s and 1s). It finds applications in various fields due to its unique properties and advantages.
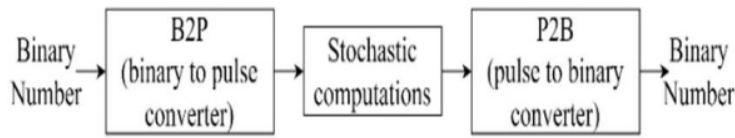
Fig.2. Flow of neural core computing process

Stochastic computing can be utilized in analysing heart rate variability from ECG signals. HRV analysis provides valuable insights into autonomic nervous system activity and cardiovascular health. Stochastic computing algorithms can efficiently compute HRV parameters and assess the variability of heart rate patterns over time.

MODULE 3: INTEGRATION & PERFORMANCE MEASURE

The process involves integrating sub modules into the main module by utilizing port mapping. This allows for the seamless connection and communication between different components of the system. Once integrated, the system analyzes input heart rate data patterns and compares them to identify correlations with various cardiac conditions such as atrial fibrillation, cardiac arrest, arrhythmia, and normal heart rhythms. To facilitate this analysis, stochastic computation-based neural computations are employed to detect abnormalities present in the ECG data. These computations leverage the probabilistic nature of stochastic computing to efficiently process and interpret the complex signals inherent in ECG data.
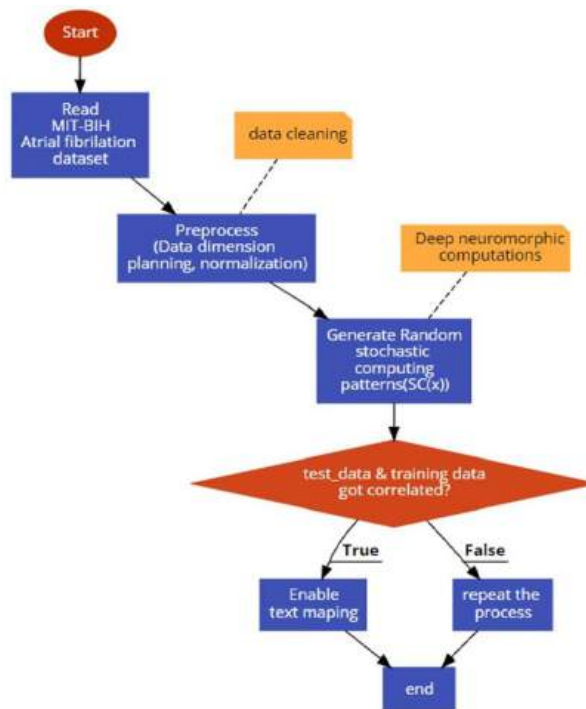
Fig.3.FlowDiagram

CONCLUSION:

In conclusion, the project's advancements hold promise across various domains. In healthcare, the improved accuracy in classifying atrial fibrillation data can revolutionize diagnosis, aiding in timely treatments and better patient outcomes.

Moreover, these techniques are adaptable to other biomedical signals like EEG and ECG, expanding their impact in medical diagnostics. Beyond healthcare, the emphasis on low-power computing benefits IoT and wearable devices, enabling continuous monitoring of vital signs for early detection of health issues.

Additionally, the correlation and decorrelation functions employed in the project find applications in data analytics, speech recognition, and image processing, enhancing pattern recognition capabilities across industries. Furthermore, the project's focus on implementing biologically-inspired neural networks contributes to advancements in machine learning algorithms, benefiting fields requiring complex function approximation. Overall, these innovations not only promise more accurate medical diagnostics but also drive progress in

energy-efficient computing and machine learning, impacting various sectors and paving the way for future advancements in technology and healthcare.

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CHAPTER 16
IOT IN HORTICULTURE: ADVANCED GARDEN MANAGEMENT SYSTEMS

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ABSTRACT

Improving agricultural production can only be achieved using innovative environmentally suitable solutions and modern agricultural technologies. Using Internet of Things (IoT) technologies in greenhouse farming allows reduction of the immediate impact of external climatic conditions. Monitoring the farm for disease detection is labour intensive and time consuming. This project will introduce the highly scalable intelligent system controlling, and monitoring greenhouse climatic condition using IoT technologies also non-image IoT devices to detect greenhouse plant diseases. Unlike the image- based plant disease detection approaches, our agriculture sensors generate non-image data that can be automatically trained and analysed by the mechanism in real time. The first objective of this system is to monitor the greenhouse environment and control the internal temperature to reduce consumed energy while maintaining good conditions that improve productivity. The second objective is to provide the AI model is treated as an IoT device and is managed like other IoT devices. The design tries to organize various possible unstructured formats of raw data, collected from different kinds of IoT devices, unified and technology-independent fashion using the benefit of model transformations and model-driven architecture to transform data in structured form.

KEYWORDS

Internet of Things (IOT), Artificial Intelligence (AI), Greenhouse farming, AI model.

INTRODUCTION

In India, we as a whole realize horticulture is the broadest financial area, and most of the populace is subject to farming, which makes a significant commitment to the improvement in India. At the point when innovation and agribusiness join, it will give improved results. Today we as a whole realize that the conventional strategy for development can't fulfil the need of individuals, a large portion of the leafy foods are developed using synthetic compounds to fulfil the requirements of individuals. Some issues arise when using the conventional method of cultivation, such as the crop being affected by a disease or the constantly shifting weather conditions. In this way, the horticulture strategy ought to be refreshed to give a greatest amount of the harvest creation and Nursery cultivating has become progressively fundamental in current farming because of its capacity to give controlled conditions to edit development. Notwithstanding, guaranteeing ideal development conditions and early recognition of infections inside these encased spaces can challenge.

Agriculture fills in as an entryway into the different and captivating universe of plant development and the executives. Agriculture, got from the Latin words "hortus" (importance garden) and "culture" (meaning development), includes the science and specialty of developing natural products, vegetables, blossoms, and fancy plants. A powerful field coordinates science, natural science, and innovation to upgrade plant development and improvement. In addressing global issues like food security, environmental sustainability, and landscape beautification, horticulture plays a crucial role. As a science, it investigates different parts of plant science, from spread and rearing to edit the board and post-reap rehearses. The specialty of cultivation includes the use of logical information to make tastefully satisfying and practical open-air spaces. Whether in huge scope business cultivating or little patio gardens, cultivation contributes essentially to our prosperity by giving nutritious food, upgrading the climate, and offering a restorative association with nature. This presentation makes way for a more profound investigation of the standards and practices that underlie the development of plants for both viable and tasteful purposes.

Fig 1. Cultivation

This framework represents a significant advancement in addressing these challenges by harnessing the power of innovation. By integrating various sensors, data analysis, and automation, it offers a smart and proactive approach to greenhouse management. The introduction also alludes to the broader implications of this technology, such as enhancing agricultural productivity, optimizing resource utilization, and potentially mitigating the impact of climate change on crop production. Essentially, it provides the rationale behind the development of the Crop Growth & Disease Monitoring System based on greenhouse technology, setting the stage for the subsequent research or project discussion.

A Nursery, which is an extraordinarily illustrated estate structure. This facilitates improved crop security, transplantation, harvest generation, and product seeding in an environment that is easier to control. As a piece of this present-day time frame, for creating yields, following to more space of region which has vivaciously used for business adventures and lodging the region space is open. The financially savvy cultivating, for example, new blooms, natural items and vegetables age is the usage of Nursery improvement in numerous tropical countries. The effectiveness of plant production in a greenhouse is fundamentally dependent on the conformity of ideal environment development conditions, which are to achieve high return at high quality, low natural burden, and low cost. Boundaries like light, mugginess, temperature, soil dampness should be controlled in a perfect world where the given specific measures through water creation, warming, ventilation and lighting are utilized to accomplish specific targets. By industrious checking and controlling of these environmental boundaries which gives a critical information that is connected with the singular effects of the components diversely towards securing the most outrageous production of gather.
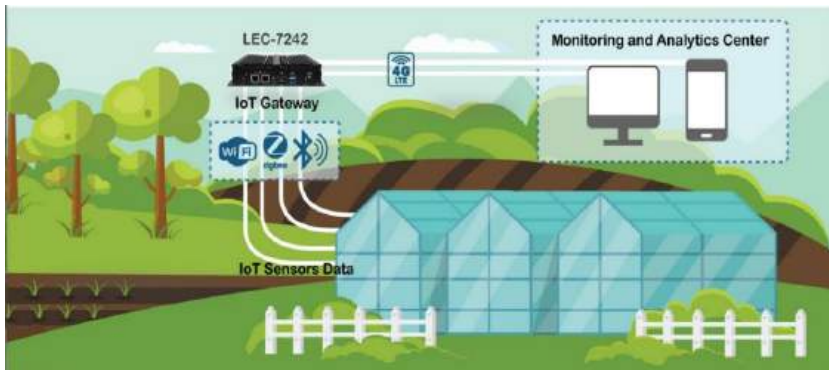
Fig 2. Nursery observing

The present wonderful challenges of Nursery is to control. In a greenhouse, temperatures fluctuate rapidly based on the level of solar radiation, moisture content, and outside temperatures.

Unfortunate regular item set and quality oftentimes purchased by the high tenacity and unfortunate light power. Extending the effectiveness of workers by engaging them for the more significant tasks, electrical costs and warming fuel, enabling makers and chiefs to make better organization decisions and to contribute more on the energy managing strategies can be diminished by rehearsing careful command over the framework.

AREA OF INTEREST

The area of interest for the "Nursery based Harvest Development and Illness Checking Framework" envelops a few basic spaces inside current horticulture and innovation. Analysts, partners, and experts are distinctly keen on this creative framework because of multiple factors:

Accuracy Farming: Accuracy horticulture is a developing field of interest, zeroing in on enhancing asset usage and harvest the board. The framework lines up with this area by offering exact command over ecological boundaries, bringing about asset productive development.

Horticultural Innovation: With the rising need to take care of a developing worldwide populace, there is areas of strength for an in utilizing innovation to improve rural practices. This framework epitomizes the mix of innovation into cultivating, offering a brief look at the fate of shrewd horticulture.

Crop Wellbeing the executives: Specialists are profoundly keen on strategies to proactively oversee and safeguard crop wellbeing. The framework's initial infection recognition capacities are specifically noteworthy, as they can fundamentally decrease crop misfortunes and pesticide utilization.

Information Driven Cultivating: The period of information driven direction is picking up speed in farming. Partners are charmed by the abundance of information created by the framework, which can be dissected to streamline crop development methodologies and asset designation.

Supportable Agribusiness: Maintainability is a worldwide concern, and feasible cultivating rehearses are of extraordinary interest. The system's capacity to reduce resource waste is in line with sustainable and environmentally friendly agricultural practices.

Food Security: Guaranteeing food security is a main concern, and the framework's capability to increment crop yields and quality adds to this basic worldwide objective.

Pomology, floriculture, and floriculture are the three main divisions of horticulture (Edmond et al.). 1975). Pomology is the development of organic product crops, including the developing, reaping and postharvest taking care of practices. Naturally, organic product is a matured ovary. Agricultural, natural product isn't generally an ovary alone. Green natural product is the palatable, meaty or dry piece of a plant whose improvement is firmly connected with the botanical parts. Natural products are grouped into various classifications in light of their turn of events. Pomes are fake fruits like apples, pear, and quince that only have the thalamus and ovary that can be eaten. Stone fruits, also called drupes, are real fruits that develop inside the ovary wall and have a hard stone or seed inside, like peaches, apricots, plums, and cherries. True fruits with fleshy skin and interior walls, such as citrus and cucurbits, fall into the category of berries. Total organic product is created from bloom having numerous pistils on a typical repository as blackberry, and strawberry. Different natural product is created from many however firmly grouped blossoms like pineapple, fig and mulberry. Organic product trees are perennials in nature and use more space when contrasted with occasional yields. They also have a positive effect on the environment by reducing heat and pollution in the air.

DEFINITION

To increase agricultural output by creating an optimal greenhouse environment that includes controlled temperature, humidity, and lighting to increase crop yields. Produce crops that are consistent and of high quality to meet consumer and market demands for fresh, safe, and nutritious produce. Relieve the dangers related with capricious weather patterns, environmental change, and catastrophic events by giving a controlled and safeguarded developing climate. These targets by and large plan to change conventional farming into a cutting edge, maintainable, and mechanically progressed framework that tends to food security, natural worries, and financial reasonability in a quickly impacting world.

IOT

The term IoT, or Web of Things, alludes to the aggregate organization of associated gadgets and the innovation that works with correspondence among gadgets and the cloud, as well as between the actual gadgets. We now have billions of devices connected to the internet as a result of the development of inexpensive computer chips and high-bandwidth communications. This implies ordinary gadgets like toothbrushes, vacuums, vehicles, and machines can utilize sensors to gather information and answer shrewdly to clients.

The Web of Things incorporates ordinary "things" with the web. PC Specialists have been adding sensors and processors to ordinary items since the 90s. In any case, progress was at first sluggish in light of the fact that the chips were large and massive. Low power microchips called RFID labels were first used to follow costly gear. As figuring gadgets shrank in size, these chips likewise decreased, quicker, and more brilliant after some time.

The expense of coordinating figuring power into little items has now dropped impressively. For instance, you can add network with Alexa voice administrations abilities to MCUs with under 1MB implanted Slam, for example, for light switches. An entire industry has jumped up with an emphasis on filling our homes, organizations, and workplaces with IoT gadgets. These smart objects can send and receive data from and to the Internet automatically. Every one of these "imperceptible processing gadgets" and the innovation related with them are altogether alluded to as the Web of Things.

HORTICULTURE

Agriculture observing utilizing IoT (Web of Things) innovation includes the coordination of brilliant gadgets and sensors to upgrade the development and the board of plants. These gadgets gather constant information on different natural elements significant for plant development, for example, soil dampness levels, temperature, moistness, light power, and supplement fixations. The gathered information is then sent remotely to a unified framework, where it is handled and examined. This permits ranchers and horticulturists to settle on informed choices in light of exact and exceptional data. IoT innovation empowers the computerization of errands like water system, preparation, and nuisance control, further developing asset effectiveness and lessening ecological effect. Also, the framework can give cautions and notices to ranchers, empowering convenient reactions to possible issues. Generally, cultivation observing with IoT innovation improves accuracy agribusiness works on, prompting higher harvest yields, better asset the board, and more feasible cultivating rehearses.

SYSTEM DESIGN

Raspberry Pi and an Arduino chip

A Raspberry Pi and an Arduino chip were joined without precedent for farming nursery natural checking, with the previous filling in as the information server and the last option as the expert chip for the versatile framework. Right off the bat, the application layer waiter was conveyed on the Raspberry Pi, besides, because of its smaller size and stable execution, Raspberry Pi and sensors and so on. were undeniably coordinated into the portable framework, shortening the actual distance between the information obtaining end and the information handling end, and sequential correspondence was utilized.

Self-water producing through an enhanced water desalination process

The momentum approach lies in the capacity of the nurseries to deliver their water stacks locally. This paper expects to foster a proficient choice instrument capable of performing explicit observing and control functionalities to streamline the activity of the nurseries where the point is the energy and water reserve funds. A choice model is executed for the exact guideline and control of the indoor microclimate characterizing the ideal development

conditions for the harvests. Besides, a prescient calculation is created to reproduce continuously the activity of the nurseries under different circumstances, to evaluate the reaction of the framework to capacity elements and sustainable sources, too to control the complex indoor microclimate, energy and water streams, too to streamline the yields development. The created instrument is tried through a contextual investigation where the impacts of environment information on the activity of the entire organization are dissected by means of mathematical outcomes.

Petri Nets (PN) & Energy-Efficient (EE)

A Petri Nets (PN) model is utilized to accomplish both observing of the nursery climate and creating the reasonable reference temperature which is sent later to a temperature guideline block. The subsequent goal is to give an Energy- Proficient (EE) versatile framework plan that handles gigantic measures of IoT large information caught from sensors utilizing a powerful diagram information model to be utilized for future investigation and expectation of creation, crop development rate, energy utilization and other related issues. The plan attempts to sort out different conceivable unstructured arrangements of crude information, gathered from various types of IoT gadgets, brought together and innovation free design utilizing the advantage of model changes and model-driven engineering to change information in organized structure.

PROPOSED SYSTEM

The proposed nursery framework for controlling and observing temperature comprises of three fundamental subsystems, to be specific,

- Temperature control and observing subsystem, Water system the executive's data framework.
- Information transformation subsystem, instead of beginning the plan portrayal utilizing teamed up classes and obligations.
- The nursery is that the artificial intelligence model is treated as an IOT gadget and is overseen like other IOT gadgets (i.e., the agribusiness sensors and actuators).
- The cost of platform management to provide real-time training and prediction is significantly reduced by this strategy.

- Subsequently, the principal commitments of this venture, that decrease the information hole between minimal expense business accessible and framework plans, are recorded as follows.

BLOCK DIAGRAM OF PROPOSED SYSTEM
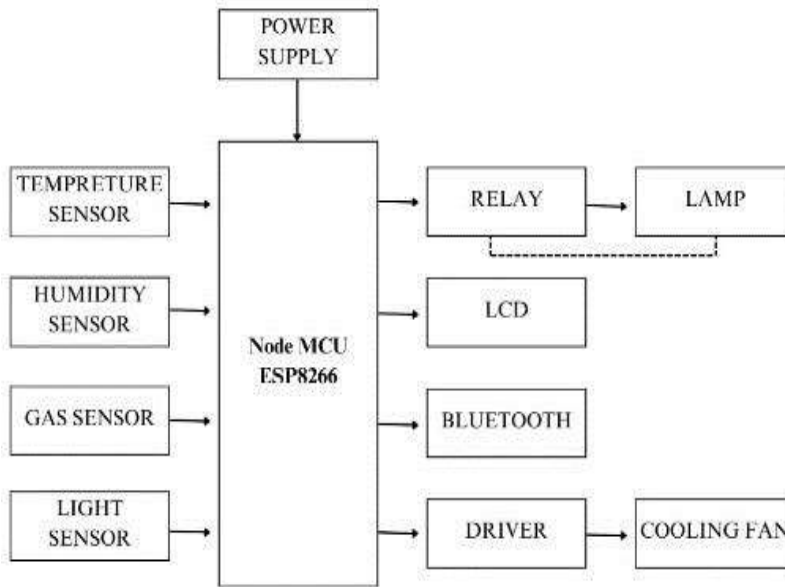
Fig 3-Block diagram of proposed system

Crop water pressure list (CWSI) and soil dampness content are all the while considered as factors for water system planning methodology.

The model of the proposed framework is developed and approved to assemble information on the execution and usefulness of the plan.

The proposed water system planning framework is tentatively tried to assess its adequacy.

The similar review is performed to investigate the efficiencies of the proposed water system planning framework as far as water use and energy utilization.

The expense examination is performed to evaluate the monetary practicality of a venture.

ADVANTAGES OF PROPOSED SYSTEM

The proposed framework will permit expanded and further developed efficiency

- To fabricate a steady developing climate, yet additionally to robotize the entire framework and make it savvy to save energy and creation costs.

- The proposed method focuses on controlling the internal temperature of the greenhouse, but it can also be used to monitor and control other properties like humidity and CO2.

Nursery vegetables, whether filled in soil or in a tank- farming framework, won't work out quite as well throughout the colder time of year as in the late spring. More limited days and shady weather conditions lessen the light force and subsequently limit creation. Most vegetables will improve whenever developed from January to June or from July to December than if they are begun in the fall and developed through the midwinter months. Giving the plants a sufficient measure of water isn't troublesome in the water culture framework, yet it tends to be an issue with the total culture strategy. During the sweltering midyear months a huge tomato plant might utilize one-half gallon of water each day. On the off chance that the total isn't kept adequately wet, the plant roots will dry out and some will pass on. Indeed, even after the appropriate dampness level has been reestablished, the plants will recuperate gradually and creation will be decreased. The proposed nursery framework for controlling and checking temperature comprises of

Three primary subsystems, in particular,

- temperature control and checking subsystem,
- nursery the board data framework, and
- information change subsystem, instead of beginning the plan portrayal utilizing worked together classes and obligations
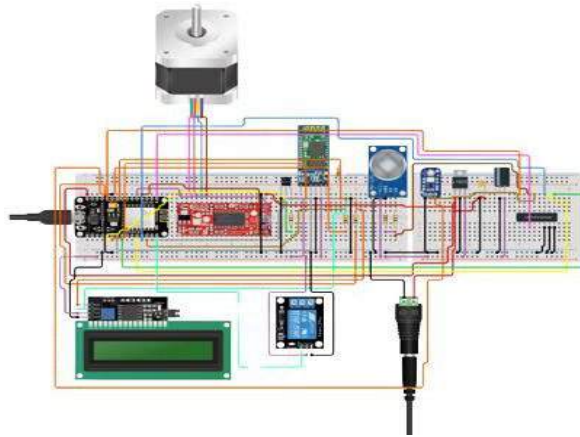
Fig 4: Circuit diagram of proposed system

HARDWARE SPECIFICATION

The followings hardware components are used to implement this system as follows

- Central Control Unit
- Power supplier
- Sensor Aggregator
- Transformer
- Humidity sensor

- Bridge Rectifier
- Full wave rectifier
- Irrigation Unit
- Half wave rectifier
- Relevant moisture terms

- Arduino NANO
- Temperature sensor
- Three terminal Voltage regulator
- IC voltage rectifier
- LCD

SOFTWARE DESCRIPTION

Proteus ISIS Professional

Proteus Plan Suite (planned by LaCenter Gadgets Ltd.) is a product instrument set, predominantly utilized for making schematics, reenacting Hardware and Installed Circuits and planning PCB Designs. Proteus ISIS is utilized by Designing understudies and experts to make schematics and recreations of various electronic circuits. Our circuit is working entirely on Proteus however when we have executed it on equipment, it's not working." I get a great deal of such inquiries from designing understudies, that is the reason, I'm making sense of what's the genuine reason for Proteus is very merciful in circuit planning and it deals with ideal circumstances for example in the event that you don't add pull up resistors in Proteus recreation, then it won't give trash esteem. Proteus is additionally utilized for PCB planning; we use Proteus ARES for that.

CONCLUSION

The proposed that utilize non-image IoT devices to detect fertilizers and temperature recommendations. In our approach, the agriculture sensors generating non-image data can be automatically trained and analysed by the mechanism in real time. The beauty of proposed is that the model is treated as an IoT device and therefore can be managed like other IoT devices. This technology offers the promise of increased crop yields, improved crop quality, and enhanced resource efficiency. By ensuring that crops receive the optimal environmental conditions for growth and promptly detecting signs of diseases or stress, it empowers greenhouse operators to achieve higher levels of productivity and profitability while minimizing environmental impact. The system's data-driven approach not only supports informed decision-making but also fosters ongoing research and development in the field of greenhouse farming.

FUTURE WORK

In future it can also be in water overflow areas to alert the user by sending notification. This can be done by implementing the device at the hydroponics system. So if water level rises above a certain level notification will be generated on app and alert can be send to everyone. Need to reduces its power consumption using both hardware- and firmware-based approaches.

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CHAPTER 17

LINER MULTIMODE FIBRES WITH HIGH DISTRIBUTED OPTICAL AMPLIFICATION SYSTEM BASED HIGH EFFICIENT QUADRATURE MODULATION SYSTEM FOR HIGH CAPACITY LAN

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ABSTRACT

This book chapter clarified the liner multimode fibres with high optical amplification system based high efficient quadrature modulation system for high capacity local area optical networks. The lighted QPSK transmitter system based linear multimode fibre profile is clarified under modal bandwidth effects. The optimum power variations are studied with spectral base band wavelength variations for various modal bandwidths based linear multimode fibre. Optimum power is clarified with time variations for various modal bandwidths based linear multimode fibre. Total power for 1500 and 1700 MHz km modal bandwidth is demonstrated based linear multimode fibre. The Max-Min signal base band amplitude based QAM pulse generator is clarified after photo- detector by using electrical constellation visualizer. The optimum Q Factor form with Min BER is demonstrated after photo- detector for 1300, 1500, and 1700 MHz km modal bandwidth based linear multimode fibre. The base band lighted SNR is clarified and simulated with the modal bandwidth variations based linear multimode fibre. Optimum Q form factor through photo-detector is demonstrated with the model bandwidth variations based linear multimode fibre. The electrical SNR through photo-detector is studied and simulated with the modal bandwidth variations based linear multimode fibre.

KEYWORDS

light sources; WDM system; linear fibre; quadrature modulation.

INTRODUCTION

Wavelength multiplexing, optically clustered servers, compact form factor connectors and transceivers, unique forms of fibre optic cable, and other sectors that were only recently categorized as emerging technologies have all seen this rapidly accelerated rate of development [1]. To meet the needs of the next-generation intelligent optical infrastructure, new standards, some of which, like MPLS and GMPLS, are emerging. Open standards, which to a large degree built the Internet.

An optical network, often known as an optical fibre network, is a type of telecommunications network that uses optical fibre as its main transmission medium and is constructed in a way that fully exploits the special properties of optical fibres [3]. Because optical fibre has a far greater capacity and is more compact than copper cables, it has replaced copper cables as the chosen medium for the provision of the main infrastructure for voice, video, and data transmission. Due to the rapid development of the Internet and the World Wide Web, the telecommunications sector has undergone remarkable technological transformation in recent years.

The need for higher capacity networking continues to grow as more bandwidth- intensive communication applications are implemented on a regular basis. PIN photodiodes typically respond with a silicon PIN photodiode at 900 nm, or 0.65 A/W. Germanium PIN photodiode operated at 0.45 A/W, at 1.3 µm and 0.9 A/W in a GaAs PIN photodiode. The reaction time should be quick enough to guarantee that there will not be any signal distortion. The detecting approach adds the least amount of noise possible in the fibre communication system.

As a result, optical networking technology and techniques have advanced to satisfy the rising demand for effective, economical, dependable, high-service level, and global communications. They lustrated the generations of network development using an optical network evolution. It should be highlighted that wavelength routed networking technologies are currently being implemented to enhance point-to-point techniques based on synchronous digital hierarchy (SDH) or synchronous optical network (SONET) [13]. The network configuration, switching speed, and optical device enabling technologies have been the key driving forces behind this evolution.

Optical fibre networks can now be split into the three deployment stages or generations shown in [15] based on advancements in these areas. Second generation optical fibre networks, which heavily rely on wavelength routing techniques, have emerged from the largely point-to-point optical fibre infrastructure established during the previous two decades.

However, these basic optical networks are currently static in which the resources allotted to convey the traffic cannot be immediately redistributed once the transmission has failed to reach its destination. As a result, it is difficult to reconfigure the current network topologies. Dense wavelength division multiplexing technology is being used to construct network infrastructures with individual wavelength lines operating at transmission rates up to 40 Gbit/s.

METHODS AND MATERIALS

We have employed the lighted QPSK transmitter system based linear multimode fibre profile under modal bandwidth effects. The optimum power variations are studied with spectral base band wavelength variations for various modal bandwidths based linear multimode fibre. Optimum power is clarified with time variations for various modal bandwidths based linear multimode fibre. Total power for 1500 and 1700 MHz km modal bandwidth is demonstrated based linear multimode fibre. The Max–Min signal base band amplitude based QAM pulse generator is clarified after photo-detector by using electrical constellation visualizer.

The optimum Q Factor form with Min BER is demonstrated after photo detector for 1300, 1500, and 1700 MHz km model bandwidth based linear multimode fibre. The base band lighted SNR is clarified and simulated with the model bandwidth variations based linear multimode fibre. Optimum Q form factor through photo-detector is demonstrated with the model bandwidth variations based linear multimode fibre. The electrical SNR through photo-detector is studied and simulated with the modal bandwidth variations based linear multimode fibre.

Figure 1 clarifies the multimode fibre infrastructure. Figure 2 shows the simulation setup model. Networks come in a variety of forms. The most basic type offers end users a fixed communication path (or rather, a collection of fixed paths). One slightly more complicated

version is one in which users are only permitted one connection, but they are free to connect with any additional end users they like.

So-called "packet switching" networks that are more complicated, where information is transmitted between end users as packets (a.k.a. frames or cells). In these networks, a single end user can typically communicate with many other end users simultaneously. There are numerous varieties of packet switching networks itself.

In a network that is "connection-oriented," paths through the network are established before data is sent. The pre- determined path is always followed when transferring information. Data frames are routed over a "connectionless" network based on a destination address carried within the data itself. In this instance, there is no requisite relationship between the route taken by a specific frame of data over the network and the subsequent frame of data sent by the same user to the same destination. The strategy used for switching determines how networks are distinguished from one another. The majority of networks have nodal points where data is sent from link to link. The nodes typically consist of a machine that resembles a computer.
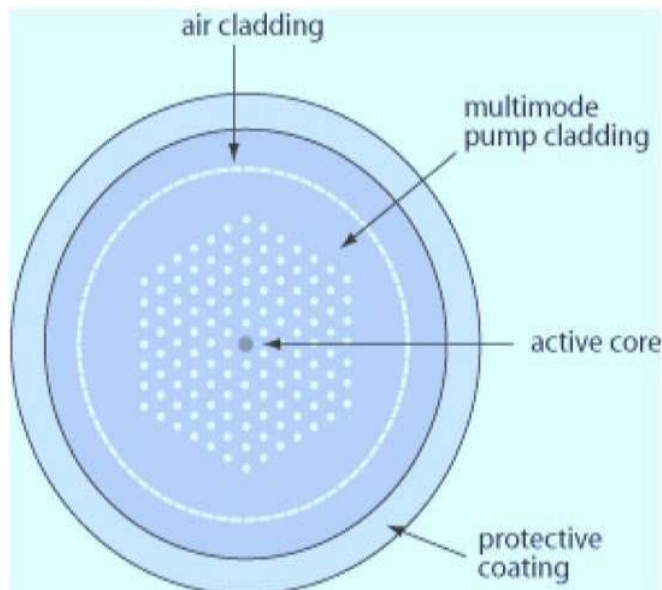
Figure 1: Multimode fibre infrastructure
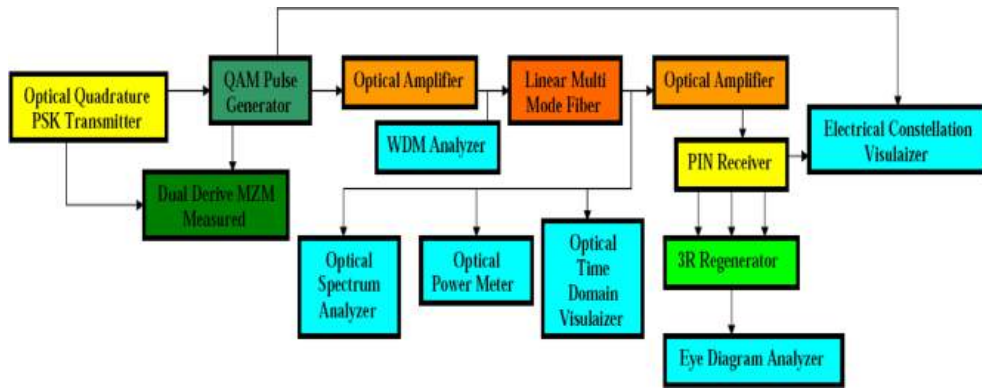
Figure 2: Simulation model set up

Figure 3 illustrates the polar polarization mode of the light source. However, building fully optical networks will be necessary to take use of optical technologies. Every time the signal needs to be routed or switched, converting it from optical to electrical form is counterproductive. It appears likely that fully optical networks will not only be optical versions of ideas that have been thoroughly investigated in the field of electronic networking.
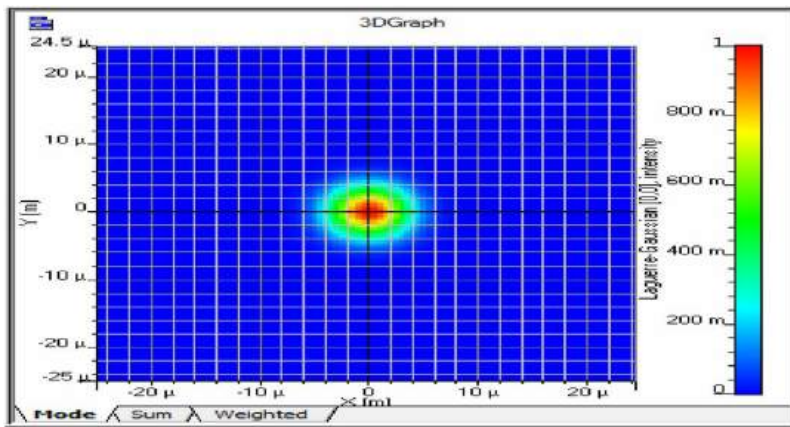
Figure 3: Polar polarization mode of the light source.

RESULT AND DISCUSSION

The lighted QPSK transmitter system is employed based linear multimode fibre profile under modal bandwidth effects. The optimum power variations are studied with spectral base band wavelength variations for various modal bandwidths based linear multimode

fibre. Optimum power is clarified with time variations for various modal bandwidths based linear multimode fibre.

Total power for 1500 and 1700 MHz km modal bandwidth is demonstrated based linear multimode fibre. The Max-Min signal base band amplitude based QAM pulse generator is clarified after photo-detector by using electrical constellation visualizer. The optimum Q Factor form with Min BER is demonstrated after photo-detector for 1300, 1500, and 1700 MHz km modal bandwidth based linear multimode fibre.

The base band lighted SNR is clarified and simulated with the modal bandwidth variations based linear multimode fibre. Optimum Q form factor through photo-detector is demonstrated with the modal bandwidth variations based linear multimode fibre. The electrical SNR through photo-detector is studied and simulated with the modal bandwidth variations based linear multimode fibre.

Figure 4 illustrates the received power against network reach based on proposed light transceiver and linear multimode fibres. The network system is enhanced with the light amplification system especially for long reach transmission distance. The received power is degraded slightly at 1 km network reach to 7 km network.
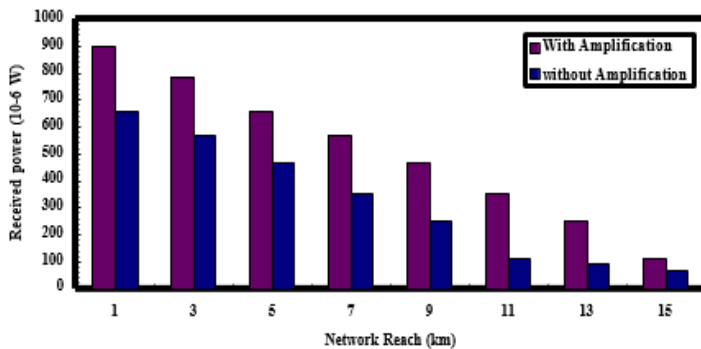
Figure 4: Received power against network reach based on proposed light transceiver and linear multimode fibres.

Figure 5 clarifies the data Rates versus network reach based on proposed light transceiver and linear multimode fibres. The data rates are optimized with the long network reach especially in the presence of light amplification system.
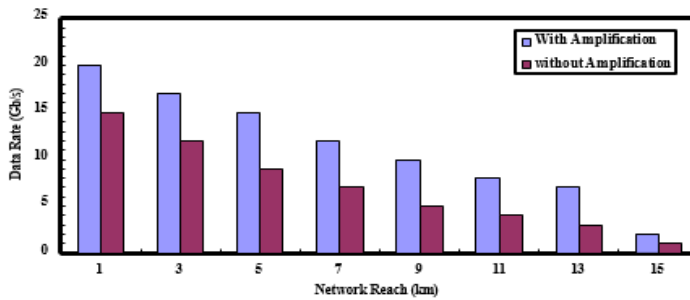
Figure 5: Data rates versus network reach based on proposed light transceiver and linear multimode fibres.

Figure 6 clarifies the Max-Min signal amplitude based QAM pulse generator after photo-detector by using electrical constellation visualizer.
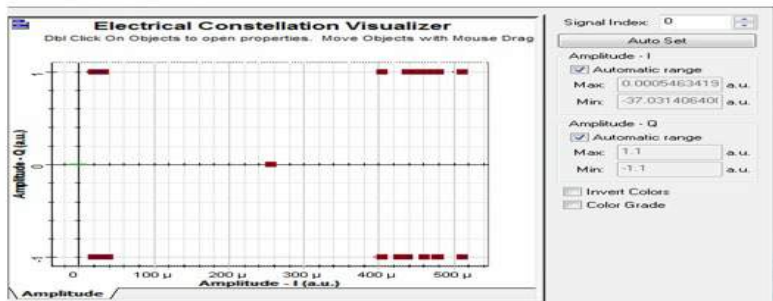
Figure 6: Max-Min signal amplitude based QAM pulse generator after photo-detector by using electrical constellation visualizer.

Figure 7 illustrates the optimum Q form-Min BER after photo-detector for 1300 MHz km modal bandwidth based linear multimode fibre. The optimum Q form is 8.25.
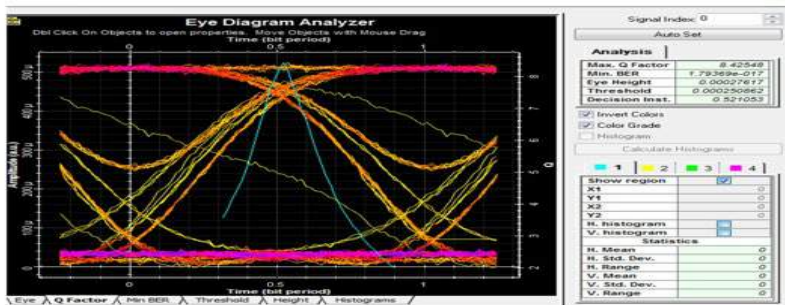
Figure 7: Max Q form-Min BER after photo-detector for 1300 MHz km modal bandwidth based linear multimode fibre.

CONCLUSION

The lighted QPSK transmitter system is simulated based linear multimode fibre profile under modal bandwidth effects. The optimum power variations are studied with spectral base band wavelength variations for various modal bandwidths based linear multimode fibre. Optimum power is clarified with time variations for various modal bandwidths based linear multi- mode fibre. Total power for 1500 and 1700 MHz km modal bandwidth is demonstrated based linear multimode fibre. The Max-Min signal base band amplitude based QAM pulse generator is clarified after photo-detector by using electrical constellation visualizer. The optimum Q Factor form with Min BER is demonstrated after photo-detector for 1300, 1500, and 1700 MHz km modal bandwidth based linear multimode fibre.

ACKNOWLEDGEMENT:

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CHAPTER 18

EXPLORING CONVOLUTIONAL NEURAL NETWORKS FOR IMAGE RECOGNITION TASKS

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ABSTRACT

This research empirically analyses the performance of well-known convolutional neural networks (CNNs) for object identification in real-time video feeds. Alex Nets, Google Net, and ResNet50 are the most widely used convolutional neural networks for object detection and object category categorization from photos. The performance of various CNN types can be tested using a range of image data sets. CIFAR10, CIFAR100, and MNIST image data sets, as well as the ImageNet dataset, are often used benchmark datasets for assessing the performance of convolutional neural networks. The performance of three well-known networks—Alex Net, Google Net, and ResNet50—is the main subject of this investigation. Since evaluating a network's performance on a single data set does not fully show its capabilities and limits, we have chosen to focus on the three most common data sets: ImageNet, CIFAR10, and CIFAR100. It should be mentioned that videos are utilized as testing datasets rather than training datasets. In comparison to Alex Net, our investigation demonstrates that Google Net and ResNet50 can recognize objects more precisely. Furthermore, we will talk about the potential causes of the significant differences in performance between trained CNNs and various object categories.

KEYWORDS

CNNs, Alex Net, Google Net, ResNet50, CIFAR10, CIFAR100, MNIST, ImageNet.

INTRODUCTION:

The profusion of photos and videos on the internet these days is driving the creation of search engines and algorithms that can analyze the semantics of images and videos [1] in

order to provide users with better search results and summaries. Significant advances have been made in the fields of object identification, scene categorization, and image labeling [2] [3], as reported by many researchers worldwide. This makes it feasible to develop solutions for issues with object identification and scene classification. Identifying the optimal network for object detection and scene classification is the main goal of this work because artificial neural networks, particularly convolutional neural networks (CNN), have demonstrated a performance breakthrough in these areas [4] [5] [6]. One crucial phase in these algorithms is feature extraction. By taking low-level picture pixel values and extracting a small collection of features with a lot of information about the item or scene, feature extraction from photos captures the differences between the object categories. Local binary patterns (LBP) [10], histogram of oriented gradients (HOG) [8], scale-invariant feature transform (SIFT) [7], content-based image retrieval (CBIR) [11], and others are examples of conventional feature extraction methods applied to images. Following the extraction of features, they are categorized according to the items that are present in the image. A few classifier examples include random forest, decision trees, support vector machines (SVM), and logistic regression. To improve image identification, segmentation, detection, and retrieval, CNN has been introducing a class of models that better grasp the contents of a picture. In numerous pattern and image recognition applications, such as gesture identification [14], face recognition [12], item categorization [13], and scene description generation, CNNs are employed effectively and efficiently. CNNs have also achieved detection rates (CDRs) of 99.77% on the MNIST database of handwritten digits [23], 97.47% on the NORB dataset of 3D objects [24], and 97.6% on over 5600 photos of more than 10 objects [25]. The effective integration of the fall-tested applications is partly due to the open source huge labeled data set that is available for experimentation, such as ImageNet, CIFAR 10, 100, MNIST, etc., and partly owing to the advancements and development in learning techniques for deep network design. [16]. CNN has well-known trained networks that use these open-source datasets to improve their classification effectiveness after being trained on millions of images from the CIFAR-100 and Image-Nets datasets. The datasets that are utilized consist of millions of little photos. They are therefore able to accurately and efficiently simplify, which allows them to successfully classify the classes' out-of-sample observations. It's crucial to remember that when neural network classification, prediction, and error rates are compared to human

performance on a sizable dataset like Image-Net, CIFAR-10, 100, etc., the results are most comparable. Analyzing convolutional neural networks' ability to classify scenes in movies based on recognized objects is the goal of this work. The CNN is trained using the CIFAR-100, CIFAR-10, and ImageNet datasets, which contain a range of image classifications. Videos covering a variety of topics and categories make up the test datasets. Because different CNNs have varied feature extraction capacities, the paradox spreads out. Our work's main contribution is the presentation of object detection techniques utilizing various trained neural network types. The most recent models exhibit varying performance rates for test photos or videos in comparison to trained images. Users might acquire a better understanding of what these models are learning and presenting after training these networks for various object classes that are given as input in the form of photos and then testing for the more specific real-time video stream. We may therefore hypothesize that an object-based representation of an image would be very helpful for high-level visual recognition tasks, especially when the scene is cluttered with many items, making it hard for the network to identify. Additionally, these networks offer more details regarding the extraction of low-level properties. Datasets comprising millions of small images are used to train these networks [12]. We suggest using the idea of object detection as a feature for scene representation. Since each of the networks employed in our study has a distinct layer and was built using pre-existing neural networks, the networks' performance differs greatly. It is possible to verify the network's detection accuracy using intricate real-world scenarios. The structure of this document is as follows: The problem statement and our suggested approach for comparing the networks selected for the study, along with descriptions of the models and data sets, are presented first, followed by related previous publications. After that, we provide a thorough examination of the findings from various datasets. Lastly, we wrap up the paper and talk about what we can do next.

RELATED WORK

Numerous tasks are performed by Convolutional Neural Networks (CNN), which perform exceptionally well in a variety of applications. Handwritten digit recognition [17] was one of the first applications in which the CNN architecture was successfully used. Since CNN's founding, networks have continuously improved by the addition of new layers and

the application of various computer vision techniques [18]. With different combinations of sketch datasets, convolutional neural networks are mostly utilized in the ImageNet Challenge [19]. Few researchers have compared the detection capabilities of a trained network on picture datasets with those of a human subject. According to the comparison results, a human has an accuracy rate of 73.1% on the dataset, whereas a trained network's accuracy rate is 64% [21]. Likewise, application of convolutional neural networks to the same dataset produced an accuracy of 74.9%, surpassing human accuracy [21]. To achieve a significantly higher accuracy rate, the employed techniques primarily utilize the order of strokes. Research is being conducted to learn how deep neural networks behave in various contexts [20]. These studies demonstrate how little adjustments to an image can significantly alter the grouping results. Additionally, the work displays visuals that humans are completely unaware of, yet trained networks are able to classify them with excellent accuracy rates [20].

The field of feature detectors and descriptors has advanced significantly, and numerous algorithms and methods for object and scene categorization have been created. We typically highlight the similarities among texture filters, object detectors, and filter banks. The literature on object detection and scene classification is rife with research [3]. The most up-to-date descriptions of Hoeim's Felzenszwalband context classifiers are typically used by researchers [4]. The concept of creating several object detectors for simple image interpretation is comparable to the work being done in the multi-media community, which employs a lot of "semantic concepts" for semantic indexing and image and video annotations [22]. Every semantic term in the literature related to our work is learned using either images or video frames. Because of this, the method is challenging to utilize and comprehend when there are a lot of jumbled things in the area. Detecting and classifying a single object using a human-defined feature set was the main emphasis of earlier approaches. The relationship between objects in scene classification is investigated by these suggested techniques [3]. The object bank was subjected to numerous scene classification techniques in order to determine its usefulness. Numerous studies have been carried out with an emphasis on low-level feature extraction for object detection and classification. These studies include Filter Bank, Histogram of Oriented Gradient (HOG), GIST, and Bag of Features (BoF) applied through word vocabulary [4].

EVALUATION METHODOLOGY

Our primary goal is to comprehend the networks' performance for both live and static video inputs. Performing transfer learning on the networks using picture datasets is the initial step in the subsequent steps. The prediction rate of the same object on still photos and live video feeds is then examined. The various accuracy rates are seen, recorded, and displayed in the tables provided in the following sections. Verifying whether prediction accuracy differs amongst all of the CNNs used for the study was the third crucial criterion for assessing the performance. It should be mentioned that videos are utilized as testing datasets rather than training datasets. As a result, we are searching for the best picture classifier in which the object serves as the primary characteristic for scene category classification. The convolutional neural network's several layers are as follows:

Input Layer: The input layer, which is the initial layer in every CNN employed, resizes images before sending them to further layers for feature extraction.

Convolution Layer: The next layers are called "convolution layers," and they function as filters for pictures, allowing for the extraction of features. They are also utilized to determine the points at which photos match during testing.

Pooling Layer: After feature sets have been retrieved, they are sent to the "pooling layer." This layer takes huge photos and reduces their size while keeping the most crucial details intact. It saves the maximum value from each window; it preserves the best fit of each characteristic within the window.

Rectified Linear Unit Layer: Every negative integer in the pooling layer is replaced with 0 in the following "Rectified Linear Unit," or ReLU, layer. This prevents learned values from becoming trapped close to 0 or from exploding up toward infinity, which aids in the CNN's mathematical stability.

Fully Connected Layer: The last layer is the fully connected layer, which converts the highly filtered pictures into labeled groups.
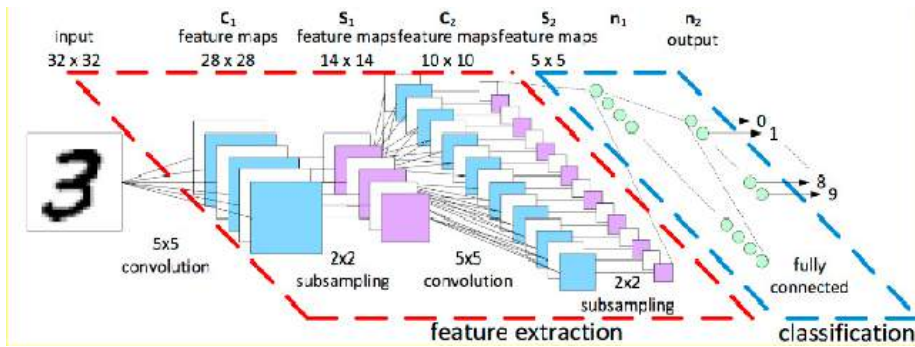
Fig.1 Internal Layers of CNNs

The suggested method areas' steps are as follows:

1. Creating the training and testing dataset: The training dataset is separated into two categories, i.e., training and validation data sets. The superclass images used for training are enlarged to [224,244] pixels for Alex Net and [227,227] pixels for Google Net and ResNet50.

2. Changing the CNN network: Add a fully connected layer, a soft max layer, and a classification output layer in place of the final three layers of the network. Ascertain that the size of the last fully connected layer corresponds to the total number of classes in the training dataset. To train a network more quickly, raise the learning rate factors of the fully linked layer.

3. Train the network: Adjust the learning rate, mini-batch size, and validation data in accordance with the system's GPU specifications. Utilizing the training data, train the network.

4. Evaluate the network's accuracy: Using the optimized network, classify the validation images and determine the classification accuracy. In a similar vein, real-time video feeds are used to test the fine-tuned network for accuracy.

MODELS

Many intelligent pre-trained CNNs are available; these CNNs are capable of transferring knowledge. Therefore, the input layer requires only the training and testing datasets. The core layers and methods employed in the network architecture vary. The Inception Modules of Google Net are capable of concatenating the filters for the following layer and performing convolutions of varying sizes [20]. Conversely, Alex Net used the output of the preceding

layer as the input rather than filter concatenation. Both networks use the deep learning framework Caffe's implementation, which has been independently tested [22]. ResNet stands for residual network in short. Very deep models have been proven to be highly beneficial for many other visual recognition tasks. Thus, there has been a trend over time to delve deeper, tackle more challenging problems, and also boost or enhance classification and recognition accuracy. However, as we go deeper, the neural network's training gets harder and its accuracy starts to saturate before declining further [3]. Residual Learning makes an effort to address these two issues. A deep convolutional neural network typically consists of multiple stacked layers that are trained to perform different tasks. At the conclusion of each layer, the network learns a number of low-, mid-, and high-level features [15] [2]. Recursive learning involves the network attempting to learn residual information rather than specific features. Simply put, residual is the feature that was extracted from that layer's input. ResNet does this by linking the input of the nth layer straight to some (n+x)th layer, or a shortcut connection [15]. It has been demonstrated that training these networks is less complicated than training basic deep convolutional neural networks, and the issue of diminishing accuracy has also been addressed. Three current neural networks—Alex Nets, Google Nets, and ResNet50—are compared [21]. The transfer learning ideas that are used to train these networks and create new networks for additional comparison come next. The performance of these networks differs greatly from that of the old networks, despite the fact that the new models have the same number of layers as the original models. The various accuracy rates on the same photos were created and are displayed in the tables that follow.

TEST DATASETS

Image dataset of CIFAR-100, which has multiple super classes of generic object photos and a number of subclass categories of each superclass. There are 100 image classes in CIFAR-100, and each class contains 600 images [15]. For each class, these 600 images are split up into 500 training images and 100 testing images, for a total of 60,000 distinct images. There are 20 super classes made up of these 100 classes. Each image in the dataset has two labels: "coarse," which indicates that the image belongs to a superclass, and "fine," which indicates the class to which the image belongs. A bed, bicycle, bus, chair, sofa, motorbike, streetcar, table, train, and wardrobe are the categories that have been chosen for training and testing.

[21] [15]. Household furnishings and vehicles are two examples of the broad categories of each superclass that must be used in the proposed activity in order to train the networks. The table that follows displays the selected categories. The second dataset that was employed was ImageNet, which is composed of super-classes of images that are further subdivided. The WordNet hierarchy is used to organize the ImageNet picture dataset. The dataset is arranged according to significant topics. A "synonym set" or "sync set" is a collection of words that describe every notion in WordNet. There are almost 100,000 sync sets in the dataset. Every image has a human annotation. In addition, our study involved combining ImageNet's less descriptive labels into more meaningful groups that matched the superclass. For instance, the word "table" was renamed as "furniture," and numerous additional photos were categorized into their own super classes to produce a more meaningful and descriptive label. The study's third dataset of choice was aCIFAR-10 dataset of images. The CIFAR-10 dataset consists of 60000 32x32 color images that are split up into 10 groups, with 6000 images in each class. There are 10,000 test photos and 50,000 training images in the dataset. Ten thousand photos make up each of the five training batches and one test batch that comprise the dataset. From each class, a random selection of test photographs is made.

Table1. Performance of CNN's on CIFAR100 test dataset

CIFAR-100		Alex Net	Google Net	ResNet50
	Bed	0.00%	70.80%	49.60%
	Bicycle	21.0	74.2%	55.00%
	Bus	84.00%	63.20%	36.80%
	Chair	90.00%	89.60%	57.60%
Image Category	Couch	11.00%	14.60%	76.40%
	Motorcycle	95.00%	74.60%	99.20%
	Streetcar	21.00%	0.84%	63.80%
	Table	00.00%	73.60%	33.40%
	Train	30.00%	95.60%	34.20%
	Wardrobe	89.00%	89.40%	92.20%

Table2. Performance of CNN's on the CIFAR10 test dataset

CIFAR-10		Alex Net	Google Net	ResNet50
	Airplane	41.80%	51.10%	90.80%
	Automobile	21.80%	62.10%	69.10%
	Bird	00.02%	56.70%	72.60%
	Cat	00.03%	78.80%	61.90%
Image Category	Deer	87.60%	49.50%	75.40%
	Dog	23.00%	57.50%	82.10%
	Frog	24.20%	90.20%	76.60%
	Horse	34.70%	78.20%	84.70%
	Ship	31.70%	95.50%	83.20%
	Truck	95.90%	97.10%	84.60%

RESULTS

CNNs' performance is analysed by doing tests on the CIFAR-100 and CIFAR-10 datasets for each network. The accuracy of the different image categories in the CIFAR-100 test dataset is shown in Table 1. Among the 100 test images of Bus, Alex Net accurately predicts the label of 84 images, whereas Google Net detects the bus in approximately 63 images and ResNet50 classifies 37 images as labeled as a bus. The prediction accuracy of CNNs tested for different image categories of the CIFAR-100 and CIFAR-10 test datasets is displayed in Tables 1 and 2. For a set of 100 photos featuring horses, 35 are identified by Alex Net, 78 by Google net, and 85 by ResNet50 as having labels. A thorough preview of the predictions made by the three CNNs' areas is shown below, taking into account the probability values of each CNN determined from the confusion matrix following testing.

Table3.Performance on Bicycle class of CIFAR-100 dataset.

Alex Net's Output	Prediction Accuracy (%)	Google Net's Output	Prediction Accuracy (%)	ResNet50 Output	Prediction Accuracy (%)
Motorcycle	45	Bicycle	74.2	Bicycle	55
Bus	28	Train	13	Motorcycle	35
Bicycle	21	Table	7.6	Streetcar	4.4
Chair	2	Motorcycle	4.4	Couch	2.6
Train	2	Chair	0.4	Bed	1
Streetcar	1	Wardrobe	0.2	Train	0.8
Wardrobe	1	Bus	0.2	Wardrobe	0.6
Couch	0	Streetcar	0	Table	0.6
Bed	0	Couch	0	Bus	0
Table	0	Bed	0	Chair	0

Table4.Performance on Chair class of CIFAR-100 dataset

Alex Net's Output	Prediction Accuracy (%)	Google Net's Output	Prediction Accuracy (%)	ResNet50 Output	Prediction Accuracy (%)
Chair	90	Chair	89.6	Chair	57.6
Wardrobe	5	Bed	7	Couch	21
Bus	3	Table	2.8	Bed	7.4
Motorcycle	1	Wardrobe	0.4	Wardrobe	5.8
Couch	1	Train	0.2	Train	5.4
Bed	0	Bicycle	0	Motorcycle	2
Bicycle	0	Bus	0	Streetcar	0.6
Streetcar	0	Couch	0	Bicycle	0.2
Table	0	Motorcycle	0	Bus	0
Train	0	Streetcar	0	Train	0

The prediction accuracy for the bicycle class for each of the three networks is shown in Table 3. It is evident that a motorcycle is Alex Net's top prediction for the bicycle class. ResNet provides an average outcome, while GoogleLe Net exhibits the best performance. In a similar vein, Table 4 displays CNN's chair class output.

Table5.Performance on Deer class of CIFAR-10 dataset

Alex Net's Output	Prediction Accuracy (%)	Google Net's Output	Prediction Accuracy (%)	ResNet50 Output	Prediction Accuracy (%)
Deer	87.6	Deer	49.5	Deer	75.4
Horse	3.7	Horse	24.4	Horse	10.7
Ship	3.4	Cat	13.3	Bird	3.5
Frog	2.2	Frog	6	Airplane	3.3
Truck	1.6	Bird	3	Dog	2.6
Airplane	1.2	Ship	2	Cat	2.5
Automobile	0.2	Airplane	1.1	Frog	1.6
Dog	0.1	Truck	0.3	Ship	0.3
Bird	0	Dog	0.4	Truck	0.1
Cat	0	Automobile	0	Automobile	0

Table6. Performance on Ship class of CIFAR-10 dataset

Alex Net's Output	Prediction Accuracy (%)	Google Net's Output	Prediction Accuracy (%)	ResNet50 Output	Prediction Accuracy (%)
Truck	50.6	Ship	95.5	Ship	83.2
Ship	31.7	Truck	2.2	Airplane	14.4
Airplane	12.3	Cat	1.2	Truck	0.5
Deer	3.1	Airplane	0.6	Cat	0.5
Automobile	1.5	Automobile	0.3	Horse	0.4
Horse	0.8	Bird	0.2	Dog	0.3

Bird	0	Deer	0	Bird	0.3
Cat	0	Dog	0	Deer	0.2
Dog	0	Frog	0	Automobile	0.1
Frog	0	Horse	0	Frog	0.1

The output of three networks for the deer class is compared in Table 5. Put differently, both networks offer consistently accurate categorization. It is possible to see that the categorization accuracy for each image in each category is different by looking at all the tables. In the motorcycle class, Google Net and ResNet50 see a bicycle in the top prediction, whereas Alex Net essentially sees a motorcycle. Even with less frequent classes, there is still a significant amount of overlap between various groups. In the same way, Table 6 displays the ship class results. The predicted label and score indicate the degree of accuracy with which a given network detects the object. When examining each table separately, it becomes evident that, for the majority of the CIFAR-100 dataset's categories, Google Net correctly labels and classifies the data, but ResNet50 finds an average number of classes. However, ResNet50 yields the best classification results for CIFAR-10, whereas Google Net stays mediocre. Both networks, however, have high counts for a limited number of classes and are quite consistent overall. This tendency appears to be caused by the fact that the majority of classifiers are trained on object categories like safety pins and bowstrings that have thin, basic traces in their composition. It follows that it is reasonable that the networks could misinterpret an object's look and characteristics.

Table7. Performance of CNNs on live video feeds

Object Category	Alex Net Prediction Accuracy (%)	Google Net's Prediction Accuracy (%)	ResNet50 Prediction Accuracy (%)	Object Category	Alex Net Prediction Accuracy (%)	Google Net's Prediction Accuracy (%)	ResNet50 Prediction Accuracy (%)
Bed	12	85	25	Airplane	14	84	96
Bicycle	11	80	55	Automobile	12	59	56
Bus	14	74	25	Bird	11	45	53
Chair	12	47	30	Cat	11	62	49
Couch	12	25	90	Deer	12	45	33
Motorcycle	14	50	35	Dog	12	57	58
Streetcar	11	45	25	Frog	13	60	25
Table	11	63	50	Horse	12	87	65
Train	15	72	45	Ship	15	91	25
Wardrobe	14	84	32	Truck	22	95	52

According to a real-time review of convolutional neural networks' performance, Alex Net has an overall 13% accuracy rate when it comes to correctly identifying items in the scene. Comparably, the classification accuracy of Google Net and ResNet50 is 52.55% and 68.95%, respectively. It is evident that CNN's performance on photos differs significantly from the outcomes of live testing. CNNs frequently misidentify a few things in live testing; for instance, ResNet50 frequently struggles to distinguish between a dog and a deer. In the majority of the scenes, it recognizes them as horses. The accuracy findings demonstrate that,

in comparison to all other networks, Google Net performs better and has the best detection accuracy.

EVALUATION

A probability distribution in the range of potential input classes is produced by both CNNs. The results were computed using two distinct techniques. While the second technique records the correct class's location across the whole probability range, the first method just takes into account the ten most likely classes. In the first approach, we just take into account the ten most likely classes and categorize the network's findings based on their probability. For every image in each target category, we tally the number of times each class appears. This approach enables you to assess If a good and useful probability is assigned to the correct outcome, it is also important to note the qualitative consistency of the results for each category; that is, it is anticipated that the top 10 probabilities for each category will not differ greatly. Using the second approach, we create descriptive statistics regarding the proper class's location inside the probability range. This is accomplished by assigning a ranking to the classifier's output. The better the classification, the higher the rank. The right class should ideally be at the top spot. Determine each category's mean and standard deviation. Higher rankings are correlated with lower averages, and consistent production across several instances of the same category is demonstrated by low standard deviations. It also enables you to record the worst examples in each category, which we use to examine potential explanations for the outcomes that have been seen. Ultimately, based on the findings we acquired, we can deduce that the average performance of these three networks on the CIFAR100 dataset is as follows: Our experimental study reports an average performance of 59.82% for ResNet50, 64.40% for GoogleLeNet, and 44.10% for AlexNet. Similarly, CNN's average performance on the CIFAR10 dataset is determined to be 36.12% for Alex Net, 71.67% for GoogleLeNet, and 78.10% for ResNet50.
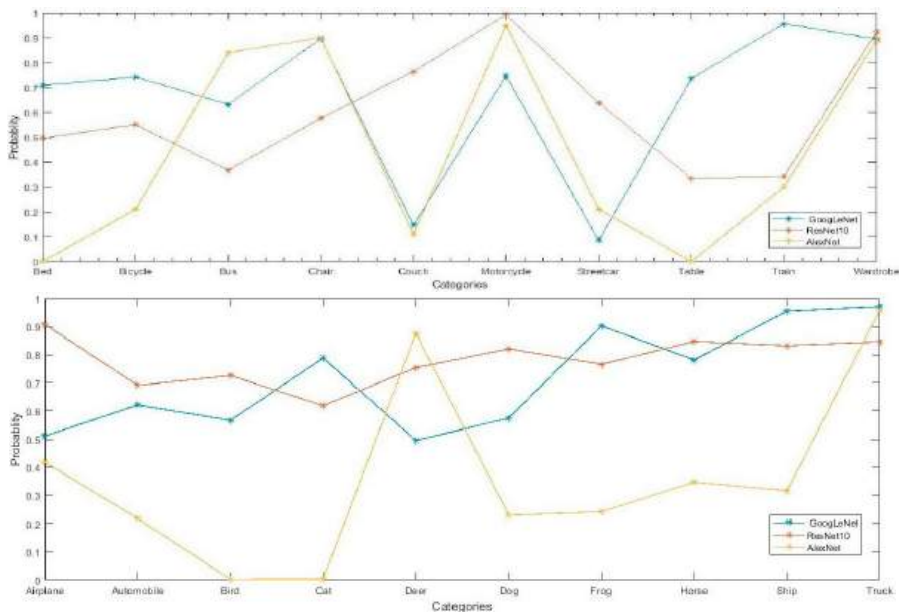
Fig 2: Probability vs Categories graph for CIFAR- 100 dataset (b) Probability vs Categories graph for CIFAR- 10dataset

CONCLUSION

The study examined three distinct convolutional neural networks' (CNNs') prediction accuracy using the most widely used training and test datasets, CIFAR10 and CIFAR100. We limited our analysis to the first ten classes in each dataset. Our primary goals were to compare the accuracy of various networks using the same datasets and assess how consistently each CNN made predictions. A comprehensive prediction analysis that compares the performance of the networks for various object classes has been published. It is significant to remember that complicated frames frequently make it difficult for the network to identify and comprehend the scene. It was also observed that although beds, couches, and chairs are distinct and easily identifiable objects in the actual world, the trained networks displayed confusion, leading to variations in accuracy rates. The findings indicated that transfer learning-trained networks outperformed current ones in terms of accuracy and performance. While things like "cars" were properly recognized by 177 layered networks, just a few objects, like "chair," "train," and "wardrobe," were perfectly recognized by 147 layered networks. Our experiments led us to the simple conclusion that the 27 layered networks' performance was underappreciated. Therefore, more layers mean more training,

which means a better rate of prediction accuracy will be attained. To sum up, neural networks are the latest and most effective methods for creating intelligent computers that can solve a variety of real-world item categorization issues. Numerous kinds of studies and research are being conducted on it. It can be easily and adaptably integrated into a variety of platforms, and its applications are many. Although the network may not be able to be trained on typical desktop work due to the hardware requirements, the network can still be trained, and the appropriate model can be generated with very minimal requirements.

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CHAPTER 19
MINIATURIZED SLOT ANTENNA DESIGN FOR UWB APPLICATIONS

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ABSTRACT

In this paper, the propose a novel compact ellipse patch radiator and CPW (Coplanar Wave Guide) fed antenna for UWB applications. The proposed antenna has very compact size of 18×18 mm² is used for ultra-wide band applications. The antenna substrate thickness IS 0.8mm. The proposed antenna consists of two symmetrical half slot antenna elements with coplanar waveguide – fed structures and y shaped slot that is cut at the bottom center of the common ground plane. At low UWB frequency, the slot effectively stops current from flowing directly between two ports. 1.6 to 14 GHz are covered by the antenna. This proposed antenna has been studied using Finite Element Method (FEM) numerical techniques. This proposed structure is a high directive gain, low-cost, low weight antenna. The characteristic analysis such as return loss (RL), VSWR and radiation pattern of this antenna has been investigated numerically. Numerical study has been carried out by using Ansoff HFSS V13 simulating software. The proposed antenna also contains relatively stable radiation pattern and gains.

KEYWORDS

CPW (Co Planar Waveguide), half slot, UWB (Ultra-Wide Band), Multi band.

INTRODUCTION

The Federal Communications Commission (FCC) designated the unlicensed frequency band ranging from 1.6 to 14 GHz for use in wireless broadband (UWB) communication [1]. Because of its high data rate and low spectral density radiated power, UWB technology has

generated significant attention and notable advancements. Numerous studies have been conducted on tiny UWB antennas with steady emission patterns, a broad bandwidth, and band-notch features. However, multipath fading is a problem that also affects UWB communication systems. With the use of multiple transmitting and receiving antennas, multiple input-multiple output technology produces diversity gain and multiplexing gain, which considerably lowers multipath fading and boosts transmission capacity. Nevertheless, considerable mutual interaction between various antennas will result from arranging several antennas in a small area. Therefore, the difficulty is to develop a compact antenna with weak mutual coupling current works.

In the previous few years, numerous UWB antenna proposals have been made. Various extended stubs were introduced between symmetrically or orthogonally arranged antenna elements in [2]–[5]. These extended stubs served as both reflecting elements that reflect the radiations of nearby ports and λg/4 resonators. By creating a rectangular or T-shaped slot in the ground and suppressing surface currents that flowed between neighbouring ports, the antennas in [6]–[7] improved isolation. Typically, orthogonally feeding structures are introduced by antennas with the aforementioned decoupling structures in order to enhance isolation and achieve diversity performances. Additionally, neutralization lines [9] and EBG [8] are effective ways to enhance isolation. However, they took up a lot of room and increased the antenna design's complexity, making them unsuitable for extremely small antennas.

This work proposes a very small, half-slot-structured, CPW-fed antenna that operates in the UWB band. Owing to its excellent structural design, the antenna achieves a relatively compact size of only 18 x 18 mm2, which is smaller than the majority of UWB antennas that have been presented (only 52.3% of [10], 72.3% of [7]). The proposed antenna's ground plane serves three purposes: 1. A matching circuit; 2. A radiating element at approximately 3 Hz; 3. A high-frequency reflective component. To enhance isolation performance in low UWB frequency bands, Y-shaped slots are used. The edge of the half slot is where the surface currents mostly focus at high frequencies. Consequently, S12/S21 < -15 dB of 3–4 GHz and S12/S21 < - 20 dB of 4–12.4 GHz indicate good isolation. This work proposes a very small CPW-fed antenna operating in UWB frequency with half slot structure. Due to the antenna's better structure, it achieves a very compact size of only 18 x 18 mm2, which is smaller than

the majority of proposed UWB antennas (only 52.3% of [10], 72.3% of [7]). Three distinct purposes are served by the proposed antenna's ground plane: One is the matching circuit; two is the radiating element about 3 Hz; and three is the high frequency reflective component. A Y-shaped slot is utilized to enhance the isolation efficacy inside the lower UWB frequency range. The half-slot edge is the primary location of the surface currents at high frequencies The shape of the suggested single half-slot antenna supplied by the CPW structure is depicted in Fig. 1. With a tiny size of 18 x 18 mm2, a relative dielectric constant of 2.65, and a thickness of 0.8 mm, it is printed on the F4 b-2 substrate. Because of its benefits, including its small size, wide impedance bandwidth, and strong directional characteristic, the half slot structure is used in our design [11]. The CPW-fed structure connects the radiator to the SMA connector for a wide impedance bandwidth. It has a strip line with a width of 2 mm and gaps of 0.7 mm. The ground plane is the half-slot antenna's matching network, yet its width very slightly affects the reflection coefficients.

METHODS AND MATERIALS

ANTENNA DESIGN

We discovered that merging two half-slot antennas into a single MIMO antenna resulted in a considerable reduction in the input impedance at 3 GHz. Consequently, the first MIMO antenna, called Ant 1, is just a combination of two half-slot antennas arranged symmetrically, its compact isolation, and a little amount of impedance bandwidth influence. However, the rise in all sizes is accompanied with a limited improvement in isolation. The width of the MIMO antenna is determined to be 18 mm, which is 0.2 mm longer than double single half-slot antennas, in order to concurrently achieve wide impedance bandwidth and lowest size of the antenna. After the half-slot apertures gape in opposite y-axis directions, a protuberant ground with a T shape is produced. As previously indicated, the single half slot antenna's protuberant ground serves as its primary radiating element at 3 GHz. Because of its perfectly symmetric structure, Ant 1's T-shaped protuberant ground can be viewed as a shunt circuit that is combined with two RLC shunt circuits in parallel.
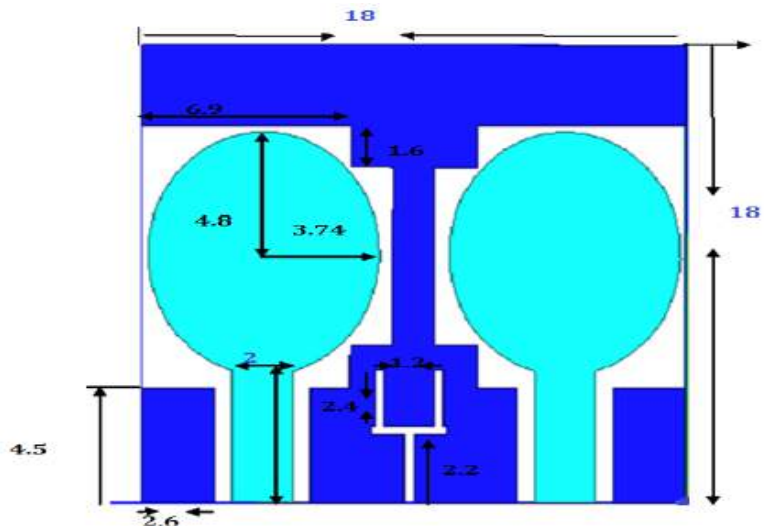
Fig.1 Proposed Double CPW-fed half-slot antenna.

RESULT AND DISCUSSION

Figures below display the simulated return loss graphs. The antenna may function in several bands, which are also displayed in Fig. 2, when parameters have been swept and structure optimized. With a 30 dB gain, the operating bands span 1.6–14 GHz.It features several bands, including 1.7–3 GHz at -30 dB, 6–10 GHz at -15 dB, and 10–14 GHz at -17 dB. Refinement at a frequency where the return loss is high is crucial in order for the mesh refinement to yield correct results. Investigating the impact of this parameter on the HFSS results involved simulating a number of scenarios.
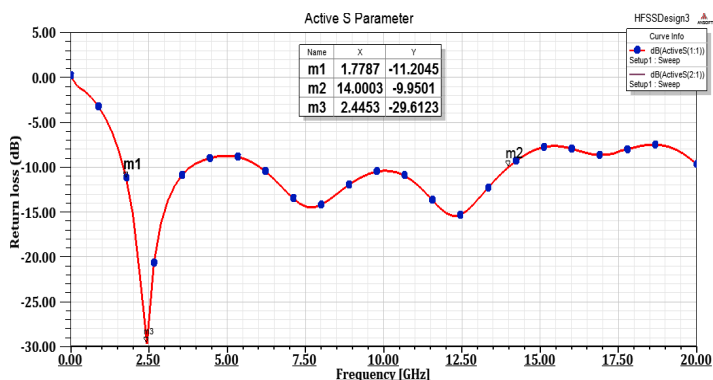
Fig. 2. Return Loss of the proposed Antenna
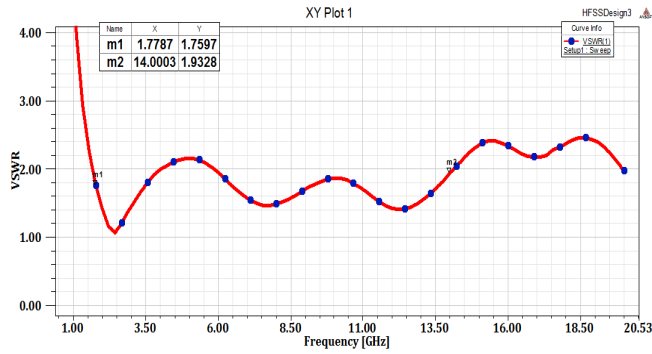
Fig. 3 VSWR VSWR graph is displayed in Fig 3. The suggested antenna design has a VSWR of less than 2.
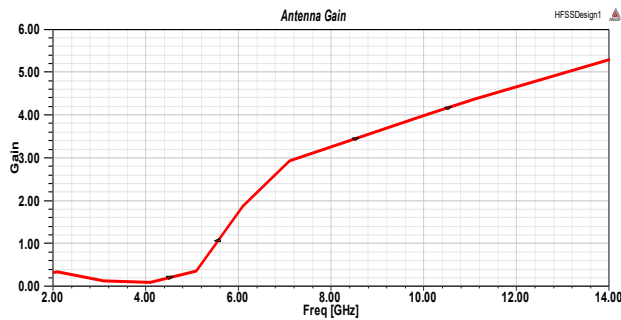
Fig. 4 Gain of the proposed Antenna

The proposed MIMO antenna and Ant 1's surface current distributions at their resonant frequencies are used to investigate the radiation mechanism of the UWB MIMO antenna. The current distributions of the two antennas are comparable. However, the influence of various matching circuits results in a minor change of the resonant frequencies. Many currents travel straight to the next port via the connected ground at 3 GHz, which results in an inadequate isolation performance. At this frequency, the currents mostly focus on the protuberant ground and the quarter-wavelength current can be found along it. The ellipse-shaped radiator resonantly functions at approximately 5.6 GHz, similar to a normal monopole antenna. The length of the current route is approximately 13.9 mm, which is half the radiator's circumference, and approximately 0.33 λg, which corresponds to the frequency of resonance. The high-order modes of 9.7/10.5 and 12.9 GHz are characterized by currents that primarily focus on the ringent region of the slot and the edge of the protuberant ground, respectively. Because of this, there is good isolation between 5 and 15 GHz because to the protuberant ground's ability to reflect radiation from two nearby radiators.
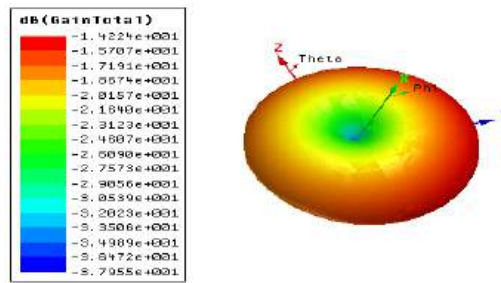
Fig.5: 3D Gain pattern
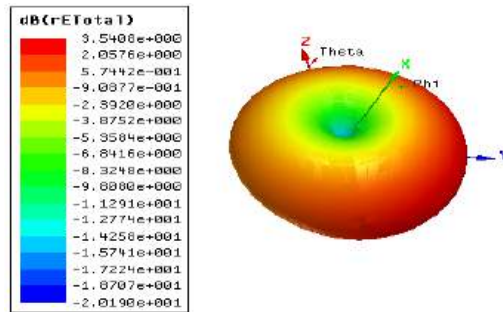
Fig.6: 3D radiation pattern

Fig. 6 & 7 shown a relatively good radiation efficiency (radiated to net input power ratio) is obtained for the antenna in this simulation setup. The main purpose of the radiation patterns is to demonstrate that the antenna actually radiates over a wide frequency band.
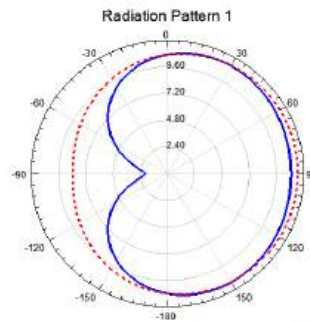
Fig.7: 2D radiation pattern.

CONCLUSION

An ultra-compact UWB antenna measuring just 18 by 18 mm2 has been built and simulated. Multiple resonant frequencies are produced by two CPW-fed half-slot antenna elements, offering a broad impedance span from 1.6 to 14 GHz. The natural T-shaped

protuberant ground, used Y-shaped slot and quadrate patches improve the isolation performance over the complete UWB frequency range. Antenna with good radiation performance is guaranteed by about quai-omnidirectional radiation patterns, relatively steady gains, and low ECC values. These improvements show that the suggested UWB MIMO antenna is competitive for portable electronics.

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CHAPTER 20

ENHANCING PERFORMANCE BY OPTIMIZING HIGH GAIN IN UWB BI-PLANAR YAGI ANTENNAS

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ABSTRACT

A new two-component multiple-input multiple-output (memo) antenna framework based on ultra- wideband (UWB) yagi antenna apparatus is presented. By placing a half-roundabout circle component on either side of the receiving antenna substrate, a loop excitation is achieved, which reduces the overall size by 45% and increases the data transfer capacity. With a transmission speed ranging from 6 GHz to 8.2 GHz, the receiving antenna's activity recurrence is selected at 8.2 GHz to concentrate on wan applications. The dimensions of the suggested antenna component are 50×80×0.76 mm3 and its substrate ROGERS4350 and HFSS software. With its high directional radiation, far front-to-back percentage of 18 dB, least increase of 5.35 dB, directivity of 6.7 dB, and isolation of 17 dB, the yagi antenna is a tremendous asset. an extreme estimation of 0.082 for the envelope correlation coefficient (beck) and a total efficiency of more than 94.19% across the activity band.

KEYWORDS

UWB Bi-planar Yagi antenna, HFSS high frequency structure simulator.

INTRODUCTION:

Because of their unique features, which include increased channel limit (date rate) and improved associability within the secure data transfer capability and force levels, printed wideband multiple-input multiple-output (MIMO) antennas are currently regarded as one of the major empowering advances in current remote correspondence frameworks [1]. Under ideal conditions, in a rich multipath scenario, the channel limit or information rate increases as the number of available channels between the transmitter and the recipient

increases [2]. However, because of the limited area, using different antennas inside small remote terminals is a challenge for radio wire inventors. In the same way as in their adjacent transmitted fields, these receiving wires should be purposefully built with low coupling (high disengagement) through the mutual ground plane.

Mimo radio wire frameworks that rely on yagi-due configurations are important because of their directional examples, which in wan passageway applications can result in low handle relationships. The yagi-due reception device was initially shown in [3]–[4]. It consists of one or more executive components, a reflector component, and a determined or powered component. Printed quasi-yagi radio cables were initially proposed in [5], where a shorter ground plane was utilized as a reflector component as opposed to requiring extra reflectors. Due to their ease of use, low profile, high end-fire radiation example, and high front-to-back proportion (far), these receiving wires are widely used in a variety of applications [6]. But because of their large reflector components, these receiving wires have low impedance transfer speed due to their enormous size.

Symbols	Parameters	Values (mm)
W	Substrate width	50
L	Substrate length	50
h_i	Substrate thickness	1.6
R	Radius of the desk	15
R_{in}	Circular radius width	4.6
L_{in}	Legs width	4.6
L_{out}	Legs width	7.7
G_w	Ground width	22.2
G_l	Ground length	14.8
F_w	Feed width	4
F_l	Feed length	15.96
S	Spaces between the CPW feed	0.8
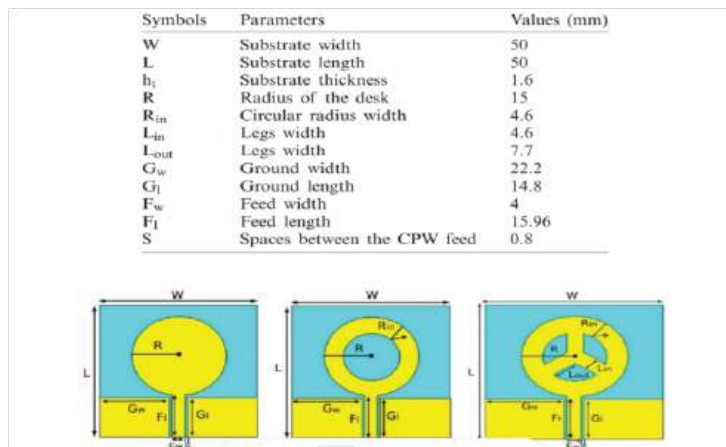
Characterizing the antenna

This section attempts to provide a summary of the antenna characteristics that are necessary to read the rest of the report.

Pattern of radiation

An essential idea that makes it simple to determine when to use an antenna is the radiation pattern. For example, due to the unidentified user's location, cell phones require

an almost omnidirectional antenna. On the other hand, a high directive antenna is preferred for satellite applications. A mathematical function or graphical depiction of the radiation characteristics of an antenna as a function of spatial coordinates is what antenna radiation patterns are, according to antenna theory. Radiation intensity, field strength, directivity, power flow density, phase or polarization, and other characteristics are among the radiation qualities. One of the most sought-after radiation features is the two- or three-dimensional spatial distribution of radiated energy as a function of the observer's position along a path.

The intensity of radiation

"The power radiated from an antenna per unit solid angle" is the definition of radiation intensity. Multiplying the radiation density by the square of the distance yields this far-field parameter. U is equal to r squared.

Orientation

"The ratio of the radiation intensity in a given direction from the antenna to the radiation intensity averaged over all directions" is the definition of antenna directivity. The formula for it is D = 4πu/prod.

where u = radiation intensity (w/unit solid angle) and d = directivity Prod is the total power radiated (w).

Efficiency of antenna

The overall antenna efficiency, or e0, is the sum of the losses at the input antenna terminals and inside the antenna construction. These losses result from I 2r losses from conduction and dielectric as well as reflection from an antenna-transmission line mismatch. The formula for the overall efficiency is e0 = erected. where total efficiency (E0)

Gain from the antenna

Probably the most often utilized indicator of antenna effectiveness is gain. There are, nevertheless, several widely accepted definitions and interpretations. Since most antennas are passive devices, they often don't have power gain in the same way that amplifiers do. But, an antenna may radiate significantly more power in a given direction than an isotropic

antenna when evaluated from the perspective of a distant receiver. Consequently, the definition of gain is the ratio of the intensity in a certain direction to the radiation intensity that would result from the antenna accepting power radiated isotropically. The radiation intensity that corresponds to the Iso tropically radiated power is calculated by dividing the power that the antenna accepts (input) by 4π. Thus, it's critical to comprehend that "a passive antenna's gain doesn't represent any real power gain." Occasionally, the term "gain" refers to something other than a fictitious isotropic source. Gain is typically expressed in terms of a half-wave linear filamentary dipole. The unit is denoted as "dib" if the gain is mentioned in relation to the isotropic source. Therefore, if the half-wave dipole antenna i

Max. Bandwidth

An antenna's bandwidth can be thought of as a range of frequencies on each side of the center frequency. It is defined as the range of frequencies over which the antenna operates as a result of some characteristic. In narrow- band antennas, the bandwidth is expressed as a percentage of the upper frequency minus the lower frequency over the bandwidth center. In broadband antennas, the bandwidth is expressed as the ratio of upper to lower frequencies of an acceptable region. Ultra-wide-band (own) systems typically have bandwidths more than 500 MHz In communication systems, antennas are gaining a lot of attention due to their extremely high bandwidth and low power requirements.

Methodology and measurement

In the realm of wireless communications, multiple-input multiple-output (MIMO) antennas have become a game- changer due to their substantial gains in data speed, link dependability, and spectrum efficiency. Multi-antenna technology (MIMO) is based on the idea that several data streams can be transmitted and received simultaneously by using multiple antennas at the transmitter and receiver ends of a communication system. This geographical diversity offers resistance against fading and interference in addition to improving the overall data rate. The capacity of MIMO technology to take use of the spatial dimension and provide parallel communication routes is one of its main features. MIMO systems may broadcast and receive several data streams simultaneously thanks to its spatial multiplexing capacity, which multiplies the effective data rate. Consequently, MIMO

technology is now a fundamental component of contemporary wireless communication protocols including LTE, 5g, and Wi-Fi. Beyond just delivering faster data rates, MIMO antennas have other advantages. Because of their diversity reception, MIMO systems naturally provide higher link reliability. MIMO can improve the overall quality of a communication link by reducing the impacts of fading and signal attenuation by taking use of the spatial separation between antennas. This is especially helpful in difficult wireless situations when there are obstructions, reflections, and different circumstances for signal transmission. Furthermore, by enabling several people or devices to share the same frequency band at once, MIMO improves spectral efficiency. In order to address the constantly increasing demand for faster data rates and increased connection in our wireless networks, this capacity is essential.
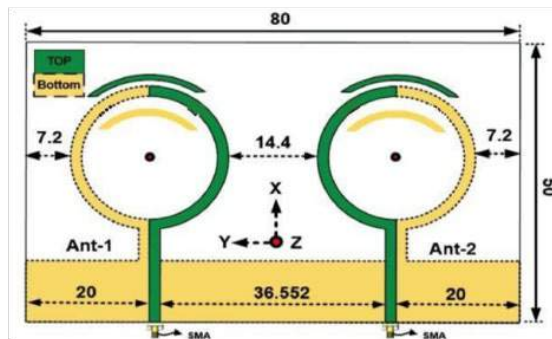
figure 1. structure of antenna

EXPERIMENT AND RESULT

The director component is impacted by FBR throughout the whole parametric research investigation. The antenna's directional radiation pattern is described by a metric called the front-to-back ratio. The proposed model of antenna distribution of the single antenna element is displayed in dB. If the antenna has a maximum direction, the gain in the maximum direction to the opposite direction is specified to 180 degrees in the case of the front-to-back ratio of the antenna gain. The parameter is measured in dB. Furthermore, it is seen that, in contrast to the situation in which the director element is not utilized (Fig. 3(a)), a most severe current thickness is gained in the ideal end-fire direction, which is along the X-axis, when a director element is used (Fig. 3(b)). Other recent stories demonstrate that even and strange Different modes are aroused using a basic feeding system as opposed to [7]–[8], which employed balloons. This was made possible by the dual layer

architecture, which appropriately excited the odd and even modes without requiring a complicated feed. This phenomenon is further supported by Fig. 4.4, which shows that in the absence of the director element, the 2D radiation pattern has an FBR of around 1.7 dB in both the elevation (X-Z) and azimuth (X-Y) planes, making it almost Omni directional. However, the back-lobe radiation is greatly suppressed when a single director element is used, and as seen in both planes of Figure 4, a directed radiation pattern with a high FBR of around 19 dB is produced. It was discovered that the FBR was likewise sensitive to the director element's width. As the width is raised further, the director element's FBR decreases to 19.4 dB from its initial increase of 1.3 mm. As a result, 1.3 mm was chosen as the director element's width. Yagi-Due antennas are end-fire wire arrays with a moderate gain of 5 to 15 dib that are mostly utilized for radio and TV reception. measurement of the force operating over the point charge in units of point charge. Additionally, if a little sphere is charged, it will have 1 coulomb on it. The unit of E-filed is Newton/Coulomb[N/C] for this reason. These measurements are precisely in Volts/meter [V/m], which is the standard unit of measurement for the E-field (10 V/m, for example).

The system's efficiency in transmitting radiofrequency power from a source of power through a transmission line to a load—that is, the power amplified by the transmission line in an

antenna—is measured by the voltage standing wave ratio, or VSWR. When a system is perfect, all of the energy is transferred. Another name for the reflection coefficient parameter is S11, or return loss. A mapping between reflected power, S11, and VSWR is displayed in the VSWR table below. If you are trying to figure out how S11/mismatch loss and VSWR relate to each other, go to the calculator page and look for the VSWR conversion.
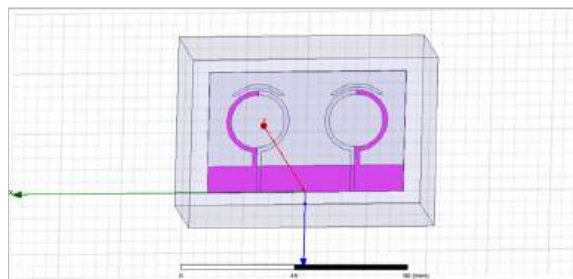
(a) structure of antenna
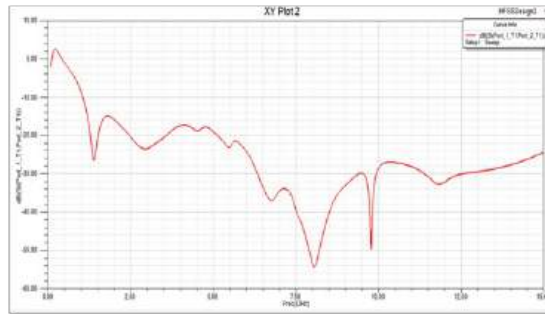
(b) S-parameter XY plot
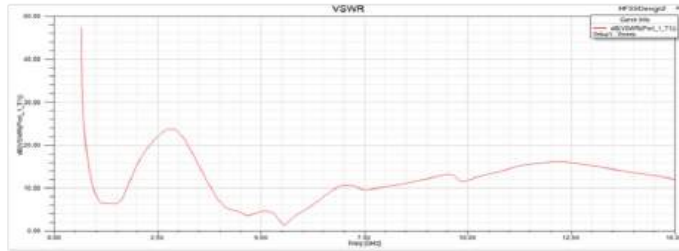
(c) VSWR x y plot
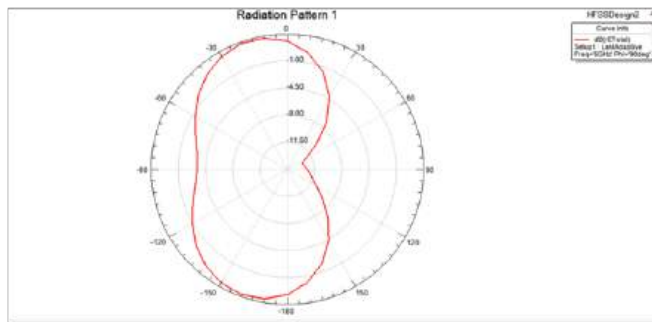
(d) Radiation pattern

CONCLUSION

A UWB MIMO antenna design with an 8.2 GHz target frequency was suggested by this model. The antenna is based on the Yagi-Uda arrangement, and it is comparable in size to the current variant. The antenna element's proposed design measures 50 x 80 x 0.76 mm3. The obtained results show that the proposed antenna has good characteristics, including high directional radiation, a front-to-back ratio (FBR) of 18 dB, a minimum gain of 5.35 dB, directivity of 6.7 dB, isolation of 17 dB, maximum envelope correlation coefficient (ECC) value of 0.082, and overall efficiency of the antenna above 94.19% through the band operation. The gain can't be improved in this paper by reducing the antenna size to any degree.

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CHAPTER 21

ASSESSING ECG SIGNAL QUALITY IN REAL-TIME FROM WEARABLES DURING EVERYDAY ACTIVITIES

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ABSTRACT

These days, the majority of ECG quality assessment techniques are built to binary ally identify between a signal's overall good and bad quality. Such classification is not appropriate for long-term data obtained by wearable devices. In this study, a novel method for estimating long-term ECG signal quality is provided. Methods: Real-time quality estimation is conducted in a local time window using a continuous signal-to-noise ratio (SNR) curve. The architecture of the data quality segments is decided by analyzing the SNR waveform. ECG signal quality is classified into three levels: signal appropriate for full-wave ECG analysis, signal suitable solely for QRS detection, and signal unsuitable for further processing. Results: The SNR limitations for accurate QRS detection and full ECG waveform analysis are 5 and 18 dB, respectively. The approach was created and tested with synthetic data before being confirmed with real-world wearable device data. Conclusion: The suggested approach is a robust, accurate, and computationally efficient technique for annotation of ECG signal quality, allowing for more personalized analysis of ECG signals obtained in free-living situations. Significance: The field of long-term ECG signal self-monitoring via wearable devices is rapidly expanding. The analysis of vast amounts of data is time-consuming. It is advantageous to assess data quality in advance, limiting subsequent analysis to useful signals.

KEYWORDS

ECG delineation, ECG signal, QRS detection, signal quality, signal segmentation, SNR estimation.

INTRODUCTION:

In accordance to a World Health Organization estimate from May 2017, cardiovascular diseases (CVD) account for around 30% of all fatalities worldwide [1]. Furthermore, nearly 80% of all cardiovascular-related deaths occur in low- and middle-income countries [2–4]. The most prevalent diagnostic tool for detecting cardiac illness is electrocardiography (ECG). Nowadays, telemedicine and the field of long-term self-monitoring are rapidly increasing, not only for patients but also for sports. Wearable devices are frequently utilized to do this. Their advantages include small size, long battery life, and relative price. However, record quality varies since sensing is performed under free-living circumstances rather than ambulatory resting ECG. Long-term ECG monitoring data frequently contain aberrations (such as powerline interference, drift, impulse noise, and muscle noise), complicating subsequent analysis [5]. The changing level of noise over time, as well as the signal's overall non-stationarity, hamper long-term signal processing.

ECG quality evaluation has recently become a prominent topic [6–10]. There are numerous reasons for signal quality evaluation, including minimizing false alarms [7], [11], identifying poor skin-electrode contact [12], selecting segments for extracting clinically significant features [13], [14], and further processing the signal to ensure its interpretation quality [15]. Several researchers have presented techniques for extracting statistical or morphological information from signals. For example, Orphanidou et al. [16] proposed signal quality indexes (SQI) based on QRS complex detection success, heart rate physiology, and RR interval length fluctuation. Meanwhile, Wang [17] examined the similarity of successive QRS complexes, noting that major variances across QRS complexes could suggest the existence of a high quantity of noise. To calculate the SQI, Li et al. [18] employed an ECG-derived heart rate signal and arterial blood pressure readings. Bartolo et al. [19] evaluated signal quality using variations in RR interval lengths and noise estimation following matched filtration of the ECG with the QRS template. Allen and Murray [20] computed the mean level of six different frequency bands in the ECG signal and counted out-of-range events in a 10-second interval. This information was later utilized to identify poor signal quality. The main shortcomings of these methods are their reliance on the reliability and precision of QRS complex detection, as well as the fact that they do not assess the true level of noise in the signal, but rather characteristics that are indirectly connected to noise.

The suggested algorithm can automatically determine the quality of the ECG signal prior to analysis, which is especially significant in the event of long-term recording using Holter monitors or other experimental equipment. [21], [22]. The algorithm evaluates the data's continuous signal-to-noise ratio (SNR) and, as a result, identifies segments where the quality of the ECG signal does not change considerably. Segments of the ECG signal may be subjected to additional analysis based on the signal quality predicted by this algorithm, utilizing signal-specific software. Importantly, the proposed approach allows for more efficient analysis of the large amounts of data collected by wearable devices. First, a noise-free signal is approximated using the Wavelet Wiener Filter (WWF) [23]. The SNR can be calculated in two ways: time or time-frequency. In both cases, the calculation is done in a sliding window of a predetermined duration, allowing for real-time processing. The ECG signal is then segmented based on the recorded continuous SNR curve, and individual segments can be processed using a variety of methods. This avoids the need for complex analysis of low-quality data, and it also allows for the employment of algorithms that are adjusted to the signal quality. The suggested method has several advantages over previous methods, including its independence from QRS complex identification and the ability to directly estimate the ECG signal SNR value with time.

METHODS AND MATERIALS:

In this research, a unique and robust approach for assessing ECG signal quality based on continuous SNR estimate and subsequent signal segmentation is presented. Continuously monitoring the quality of the ECG signal determines which segments are eligible for further processing and which are not. However, before the signal can be separated into different parts based on quality, the quality classes must be established. In collaboration with Holter ECG experts, three logical quality classes were chosen for this analysis: (Q1) Segments with low noise levels that allow any common type of analysis, including full ECG wave analysis; (Q2) Segments with enough noise to allow reliable QRS complex detection and thus basic rhythm analysis; and (Q3) Segments with so much noise that further processing is not possible because even QRS complex detection and thus basic rhythm analysis are unreliable.

The input to the block SNRest (SNR estimate) is often an ECG signal of varying quality. This block continually estimates SNR in two phases. First, the WWF approach is used to

estimate the noise-free signal and noise levels. Second, the SNR is determined using the signals in the sliding window. The result is a continuous SNR curve that tracks signal quality (see SNRest output in Fig. 1). The SEG (segmentation) block takes the continuous SNR curve as input. The segmentation itself employs decision rules based on SNR thresholds and duration restrictions to establish borders between segments of varying quality (see to Fig. 1 for the output of the block SEG). The annotations that identify the segment borders are the end result of the entire ECG quality estimate process. The original input ECG signal is left at the output unchanged. The entire processing pipeline, including the used data, is detailed in detail below.

Datasets

We used two separate ECG datasets to evaluate the suggested methods. The first is an intentionally generated ECG dataset for which the defined parameters, such as SNR, are known. The second is an actual dataset collected using a specially constructed wearable ECG equipment [24]. All human trials were authorized by the Mayo Clinic's Institutional Review Board on December 7, 2010, under Mayo IRB Protocol #10-006608 00. Before beginning the investigations, all individuals provided informed written consent.

Artificial dataset: The artificial dataset was constructed by combining two separate fabricated distortion-free ECG signal types with three distinct noise kinds. A database of 250 distinct signals with a period of 30 minutes and a sampling frequency (fs) of 512 Hz was created, containing all six conceivable combinations of noise-free signal and noise type. The detailed parameters are explained below.

A periodic distortion-free ECG signal was generated by carefully filtering and then repeating one cycle of a real ECG signal from the "Common Standards for Quantitative Electrocardiography" database [25], [26] with low distortion.

A realistic noise-free ECG signal was generated using the PhysioNet tool (ecgsyn.m), as described in detail by McSharry et al. [28]. The tool parameter values were produced at random from a defined range: mean heart rate (50-180 beats per minute), standard deviation of heart rate (1-10 beats per minute), and low/high frequency ratio (0.5-8.9).

Ecgsyn noise was also produced by the tool [28]. This noise has a uniform distribution of random sample values.

Real muscular artifact is a recording of muscle noise from the MIT-BIH Noise Stress Test Database [29] on PhysioNet [27].

Model muscle noise was created by filtering white Gaussian noise as suggested by Farina et al. [30]-[32]. A model of the surface EMG power spectra is generated using a shaping filter.

$$H\left[f\right] = \frac{f_h^4 f^2}{\left(f^2 + f_l^2\right)\left(f^2 + f_h^2\right)^2} \qquad (1)$$

The parameters fh and fl affect the shape of the spectral function. Our investigation employed the values fh = 46 Hz and fl = 346 Hz.

To test further, Smital et al. [23] suggest adjusting the noise amplitude to set the appropriate SNR time course.

Real Dataset: Three patients' ECGs were measured for 50 minutes while doing preset physical activities. The dataset includes 10 different types of activities, including supine, sitting, standing, squads, slow and quick deep breathing, breath hold, tilt table test, Valsalva maneuver, and Müller's maneuver.ECG signals were recorded from four locations on the subject's body (chest, back, shoulder, and hip) using four identical devices. Figure 2 shows the placement of electrodes. Each device has a one-lead setup for high resolution ECG data collecting. The gadget used a unique low power (100 □W at 2.8 V supply voltage) ECG circuit with 100 dB common mode rejection [24]. Each device included 2 g (VTI Technologies, CMA3000-A01) and 16 g tri-axial accelerometers (Analog Devices, ADXL326BCPZ) for measuring posture and physical activity. [33]-[35]. The device's data gathering rates for ECG and motion were programmed to 400 samples per second for the ECG monitor and 10 samples per second for each x, y, and z axis. This device combination may record continuously for 14 days with a single 750 mAh battery (Bi-power, BL-7PN-S2). ECG signals vary in quality and timing among leads recorded on four different body sites and during various activities. To synchronize many devices, tap them all simultaneously at the start of the measurement process. Taps are evident in accelerometer data. Fine synchronization is achieved by detecting QRS in ECG signals from all four devices and aligning them based on RR intervals. At the same time, a typical 12-lead ECG was measured for reference.

CONTINUOUS SNR ESTIMATION ALGORITHM

The wearable device's sliding window allows for real-time estimation of SNR values, which are directly connected to the level of noise in the ECG data. The SNR estimation yields a curve that continually tracks the quality of ECG signals throughout time. To accurately measure ECG signal quality, it's important to establish what constitutes noise levels that can complicate diagnosis. Common preprocessing approaches cannot eliminate noise components from an ECG signal without affecting the noise-free component. To avoid linear filtering, only broadband interferences with overlapping spectra with the ECG signal are examined. The most common source of interference in ECG data is EMG. Narrowband interference, such as drift or powerline, can be easily removed and have no impact on later ECG analysis. To assess ECG signal quality for subsequent analysis, remove drift and powerline interference during preprocessing and only consider broadband interference when calculating SNR. For example: ECG signals with considerable drift may be misclassified as Q2 or Q3, despite their strong diagnostic value and suitability for full wave analysis (Q1) following preprocessing. Two approaches were investigated for estimating the SNR curve: time domain and time frequency domain.

Time Domain Approach to Continuous SNR Estimation:

Figure 3 illustrates the time domain technique through a block diagram. PRE utilizes cascading high pass and notch digital filters. The high pass filter is a 1000th order FIR filter with a cutoff frequency of 0.67 Hz. It minimizes baseline drift caused by movement or respiration [36].The notch filter is a 1000th order FIR filter with cutoff frequencies of 49.2 and 50.8 Hz, eliminating powerline interference.

After preprocessing, the digital signal $x[n]$ is considered to be an additive combination of noise-free signal $s[n]$ and broadband noise $w[n]$, represented by the equation $x[n] = s[n] + w[n]$, where n is the digital time sequence. To calculate SNR accurately, the noise-free signal must be precisely estimated. The methodology employs the Wavelet Wiener Filtering method (WWF), a two-stage algorithm that operates in the wavelet domain [37, 38]. To estimate noise-free signal coefficients, the wavelet coefficients of preprocessed input signal $x[n]$ are first thresholded (settings: wavelet db4, decomposition level 4, nonnegative garrote thresholding). Details are mentioned in Smital et al. conducted a previous study [23,

Chapters II. B and II. C]. In the second stage, the Wiener correction factor gm[n] is calculated using equation (2), where σ2m[n] represents the variance of noise coefficients in the mth frequency band. Variance is estimated using the median, as described in (3). Equation (4) is used to adjust the coefficients ym[n] acquired by wavelet transform (settings: wavelet sym4, decomposition level 4) of preprocessed input signal x[n]. ỹm[n] is the estimation of the denoised wavelet coefficients. To achieve denoised signal estimation s̃[n], the coefficients ỹm[n] are transformed back to the time domain using the inverse wavelet transform.

$$g_m[n] = \frac{u_m^2[n]}{u_m^2[n] + \sigma_m^2[n]} \qquad (2)$$

$$\sigma2m[n] = \left(\frac{median(|ym[n]|)}{0.6745}\right)^2 \qquad (3)$$

$$y_m[n] = y_m[n] . g_m[n] \qquad (4)$$

To get the estimated noise w̃[n], subtract the noise-free signal estimate s̃[n] from the pre-processed input signal (x[n]).

The SNR block calculates the local energy of estimating the noise-free signal (s̃[n]) and noise (w̃[n]) inside a 2-second window. The output SNR curve responds slowly to changes in real SNR in the signal as the window length increases. The output SNR curve oscillates more as the window size decreases. A two-second window was chosen as a compromise between the dynamicity and amplitude of the oscillation of the output SNR curve. Such a duration assures that the window always contains all of the ECG cycle's components (at least one complete ECG cycle), even at a modest heart rate (30 bpm). The bigger window would reduce the dynamic range of the resulting SNR curve. The SNR estimation (SNRt[n]) is computed in decibels based on

$$SNR_t[n] = 10 . \log_{10}\left(\frac{\sum_{j=n-\frac{W}{2}}^{n+\frac{W}{2}}(\hat{s}[j]^2)}{\sum_{j=n-\frac{W}{2}}^{n+\frac{W}{2}}(\tilde{w}[j]^2)}\right) dB \qquad (5)$$

The quantity of QRS complexes within the window changes, causing the oscillation. This problem addresses the final block of short-time averaging STA, in which SNRt samples are

averaged in a sliding window with a period of two seconds. SNRt+STA is the averaged curve that results from the entire technique.

Time-Frequency Domain Approach to Continuous SNR Estimation:

The second method for measuring SNR is to use a spectrogram (SG), which depicts the amplitude spectrum across time as derived by the Short Time Fourier Transform (STFT). The principle is depicted in Figure 4.

The first three phases (preprocessing, wavelet wiener filtering, and signal subtraction) are the same as for the time domain technique. Signals $\tilde{s}[n]$ and $\tilde{w}[n]$ are processed by STFT blocks to calculate their spectrograms (SGs for noise-free signal and SGw for noise estimation)

The SNR block calculates the local energy in the spectrograms using a sliding window W with a period of two seconds. The SNR estimation (SNRtf) is calculated in decibels based on

$$SNR_{tf}[n] \;=\; 10.\log_{10}\left(\frac{\sum_{i=0}^{\frac{f_s}{2}}\sum_{j=n-\frac{w}{2}}^{n+\frac{w}{2}}(SG_s[i,j])^2}{\sum_{i=0}^{\frac{f_s}{2}}\sum_{j=n-\frac{w}{2}}^{n+\frac{w}{2}}(SG_w[i,j])^2}\right)dB. \qquad (6)$$

The entire frequency range (0 - fs/2) was employed, however the method can be readily changed to work with a smaller frequency range based on the application/signal's needs.

The block STA is used for the same reasons as in the prior technique (with the same settings). This procedure yields an averaged curve, SNRtf+STA

SNR Estimation Methods Demonstration:

To demonstrate the concept and functioning of the designed SNR estimators, a signal with an artificially established SNR course was utilized, and the estimators attempted to estimate it. Both artificial ECG signal types (periodic and realistic noise-free ECG signals) and the previously reported model muscle noise were used. This noise was created with a gradually fluctuating volume. The three noise levels represent defined ECG signal quality classes: -10 dB for moderate interference (representing the Q2 quality class, where only QRS complexes can be reliably detected), and 30 dB for low interference (representing the Q1 quality class, which allows full-wave analysis of the ECG signal).

Figure 5 displays the results of the procedures. The upper section of the graphic shows an artificial blend of noise with varying levels and the ECG signal (black curve). The red curve shows an estimation of the noise-free signal s̃[n] (the output of the WWF block). The lower section of the picture shows the true preset noise level (black) as well as the estimated SNR courses obtained using both approaches. The time domain technique produces a blue solid line, while the time-frequency domain approach produces a red solid line. It can be argued that both estimators produce roughly equivalent results and are similar to the specified noise level. Estimates of the SNR deviate the most from the known SNR at contrived SNR transitions.

The STA is required in the final step of the procedure, as seen in the right side of Fig. 5. The STA gets its input from fluctuating SNR courses. The oscillations in the SNR estimation (black arrows) are connected to the fixed window size W (2 s) and the variable number of QRS complexes within the sliding window (gray squares). Using STA, smoothed SNR courses are obtained.
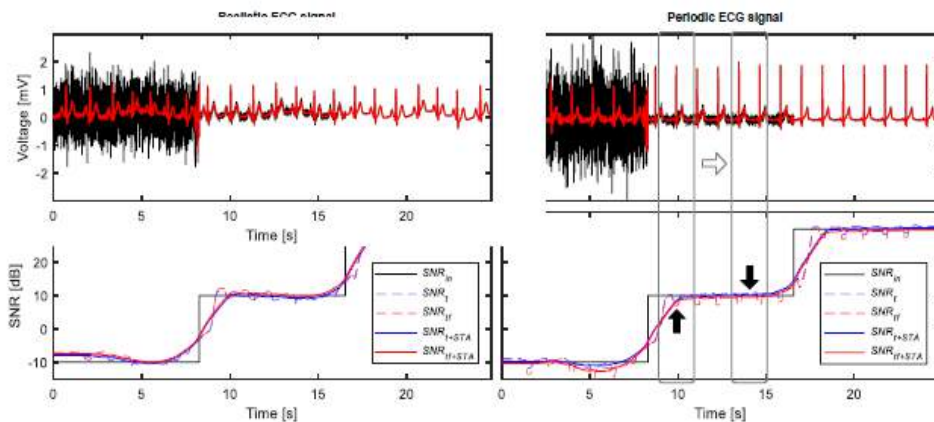
Figure 1. Top: Artificial ECG signals with changing noise level (black) and estimates of noise-free signal by WWF (red). Bottom: Comparison of estimated SNR courses in the time domain (blue) and the time-frequency domain (red), before (dashed line) and after (solid line) the STA. The black curve is the preset level of SNR in the input signal. The gray squares in the right part of the figure represent sliding window while black arrows mark oscillations.

ECG Signal Segmentation

ECG signal segmentation identifies points in the ECG where signal quality changes. Segments with consistent quality are found. The technique results in a quality-annotated ECG signal. To begin the segmentation procedure, SNR thresholds must be determined. Establishing specified SNR levels, differentiating across quality groups, and creating segmentation procedures are key.

The text describes a method for classifying ECG signal quality into three classes (Q1, Q2, and Q3) based on SNR thresholds. For Q1, the ECG signal must allow reliable detection of the QRS complex and five additional points (P onset, P offset, QRS onset, QRS offset, and T offset). In Q2, only the QRS complex must be detectable, while QRS detection becomes unreliable for Q3. QRS detection is deemed reliable when sensitivity (Se) and positive predictive value (P+) exceed 99.5%. These parameters are based on the number of true positives, false negatives, and false positives, with a tolerance window of 50 ms for correct detections.

The SNR segmentation algorithm identifies segments based on two SNR thresholds and applies correction rules to merge short or oscillating segments to avoid over-fragmentation. Demonstration using an artificial ECG signal showed that after segmentation and corrections, nine segments were reduced to four, making the data more suitable for further analysis. The results highlight the efficiency of this real-time segmentation approach for improving ECG signal quality classification.

RESULT

This chapter evaluates the reliability of a proposed method for continuously estimating signal-to-noise ratio (SNR) and segmenting ECG signals. The evaluation is conducted on both artificial and real datasets.
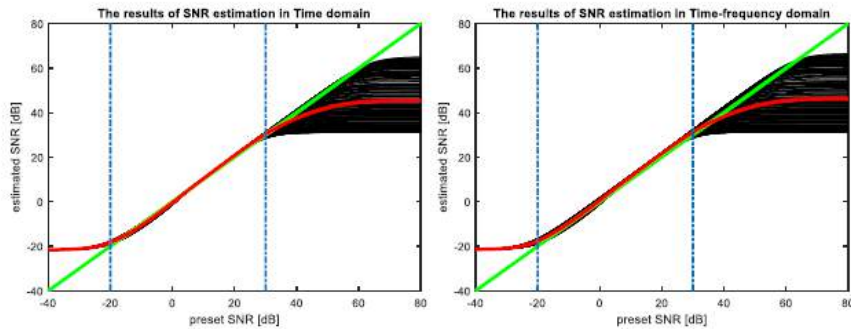
Figure 2. Results of SNR estimation using Time domain approach (left) and Time-frequency domain approach (right). The black curves represent estimated SNR values on artificial dataset. The green line represents best possible estimate. The red curve represents the mean of black curves. The blue dash dot line mark the range of accurate SNR estimation.

For the artificial dataset, SNR estimation accuracy is tested using time domain and time-frequency domain approaches on 250 synthetic ECG signals with various noise levels. The results show that the time domain approach is more accurate, with a mean error of 0 and a standard deviation of 0.43 dB, compared to the time-frequency domain approach. SNR thresholds for segmenting ECG signals into quality classes are determined, with a lower threshold of 5 dB and an upper threshold of 18 dB, to differentiate between three signal quality levels (Q1, Q2, and Q3).
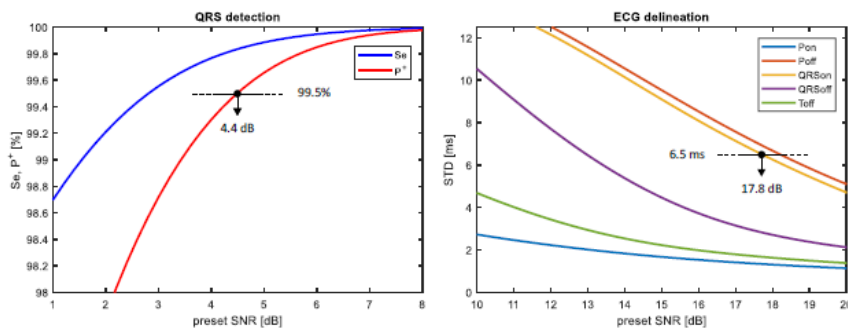
Visualization of QRS complex detection (Realistic noise-free ECG signal with Real muscle artifact) and ECG delineation (Realistic noise-free ECG signal with Model muscle noise) algorithms results crossing the accuracy limits in detail.

Segmentation accuracy is tested using QRS detection and ECG delineation algorithms, with results indicating that the proposed method achieves over 90% sensitivity (Se) and

positive predictivity (P+), particularly when corrective rules are applied. Without correction, segmentation results in excessive fragmentation, reducing accuracy. The algorithm with correction rules correctly classifies signal quality 95% of the time.

For real ECG data, the segmentation pipeline is validated with QRS detection and ECG delineation methods, though full accuracy cannot be verified due to the absence of reference quality data. The system was tested on signals from three subjects performing various activities. Results show high QRS detection rates across all quality levels, but ECG delineation fails in lower quality segments. Overall, the proposed method reliably segments and analyzes ECG signals, making it suitable for personalized ECG analysis.

DISCUSSION:

The discussed paragraph addresses the challenges and advancements in ECG (electrocardiogram) signal quality estimation, particularly for long-term, remote monitoring applications using wearable devices. Traditional ECG analysis has been largely confined to clinical settings, but with the rise of wearable technologies, there is increasing demand for real-time, remote monitoring. Several methods have been proposed for assessing ECG signal quality, including the use of signal-to-noise ratio (SNR), higher-order moments, and entropy. However, most of these approaches focus on short-term, 12-lead ECGs, providing only a binary classification of signal quality (acceptable or unacceptable) and are unsuitable for long-term, single-lead monitoring.

Figure4. Result of segmentation and analysis of an interesting part of ECG signal measured from Back (12 – 30.5 minutes, all quality segment types are present). Top panel:

the whole interesting part of the signal with five segments and their analysis results. Middle panel: the estimated SNR curve (red) and segmentation thresholds (blue). Low panels: zooms of times where signal quality changes. Green area marks the best quality segments, blue area marks the middle quality segments and red area marks the worst quality segments. The activities performing during the measurement are indicated in the upper part of the figure (2 – sitting, 3 – standing, 4 – squads, 5 – supine).

The proposed method in the paper aims to address these limitations by offering continuous signal quality assessment for both single- and multi-lead ECGs using a sliding window approach to calculate SNR in real-time. The algorithm classifies the signal into three quality levels, enabling tailored analysis based on the signal quality. It was tested on artificial datasets and validated with actual data, demonstrating high sensitivity (91.06%) and positive predictivity (88.39%). Although the method achieves reliable quality segmentation, it has limitations in detecting the P-wave onset, which remains a challenge for existing algorithms. Future improvements in ECG delineation algorithms could refine the method further. Overall, the proposed method provides a more nuanced, real-time approach to ECG signal quality assessment, making it suitable for wearable devices and long-term monitoring, while also allowing flexibility in adjusting thresholds for more reliable analysis.

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Overall, the proposed method provides a more nuanced, real-time approach to ECG signal quality assessment, making it suitable for wearable devices and long-term monitoring, while also allowing flexibility in adjusting thresholds for more reliable analysis.

CONCLUSION

There are many clinical and non-clinical health reasons to monitor ECG signals. To do so on a wearable platform is challenging due to the limited available computational, memory, and battery resources. Moreover, the quality of the data may vary depending on the device, device positioning, and person activity. In order to appropriately process the ECG signal and report meaningful findings it is essential to characterize the quality of the signal prior to analysis. The proposed novel approach based on continuous SNR estimation and decision rules to acquire detail quality annotation can facilitate real-time embedded analysis of ECG signals directly on device. It was demonstrated that continuous monitoring of the ECG quality and classification of the quality into more than two classes may enhance the possibilities of follow-up analysis and diagnosis of electrocardiograms. In this work, the novel approach has been set and tested on artificial data and validated in a unique real volunteer study. The future objective is to expand this work by integration of ECG data with other sensors data (e.g. accelerometer data) to increase the robustness and accuracy of the ECG quality estimation in free-living condition. The algorithm targets primarily real-time applications and the monitoring the vital cardiovascular parameters of people with increased physical and environmental load but is general to all physiologic conditions.

TABULATION AND CONTENTS

TABLE I

CRITERIA 2SCSE FOR STANDARD DEVIATION OF DETECTIONERROR				
Pon	**Poff**	**QRSon**	**QRSoff**	**Toff**
10.2 ms	12.7 ms	6.5 ms	11.6 ms	30.6 ms

TABLE II

RESULTS OF TESTING QRS DETECTION AND ECG DELINEATION ALGORITHM ON SIX ARTIFICIAL DATASETS			
Signal	**Noise**	**Q2/Q3 threshold [dB]**	**Q1/Q2 threshold [dB]**
Realistic noise-free ECG	Model muscle noise	3.4	17.8
	Ecgsyn noise	-0.4	14.6
	Real muscle artifact	4.4	14.2
Periodic noise-free ECG	Model muscle noise	0.6	15.8
	Ecgsyn noise	-3.8	14.6
	Real muscle artifact	2.4	11.8

TABLE III

ACCURACY OF QUALITY SEGMENTS DETECTION		
	Without rules	**With rules**
Se [%]	94.29	91.06
P+ [%]	37.56	88.39
m±s [ms]	-37±612	96±720
Number of segments (reference)	19.3	15.6
Number of segments (detected)	60.6	16.1

TABLE IV

COINCIDENCE MATRIX OF SEGMENTS QUALITY CLASSIFICATION

%		Actual		
		Q1	Q2	Q3
Detected	Q1	32,88	0,51	0,00
	Q2	1,03	32,34	0,78
	Q3	0,05	0,89	31,52

Without rules

Correctly classified	96,74
Misclassified – analysis trusted	1,97
Misclassified – analysis untrusted	1,29

%		Actual		
		Q1	Q2	Q3
Detected	Q1	32,86	0,33	0,24
	Q2	1,32	29,89	0,71
	Q3	0,65	0,95	33,05

With rules

Correctly classified	95,80
Misclassified – analysis trusted	2,92
Misclassified – analysis untrusted	1,28

TABLE V

OVERALL RESULTS OF ECGANALYSIS IN DIFFERENT QUALITY SEGMENTS			
	Q1(full wave analysis)	**Q2 (QRS detection)**	**Q3 (no analysis)**
Quality class information	236.05 min	209.46 min	59.44 min
	46.75% of time	41.48% of time	11.77% of time
	15260 beats	13870 beats	4467 beats
	Se = 99.99%	*Se = 99.73%*	*Se = 85.27%*

QRS detection	*P+ = 99.99%*	*P+ = 99.76%*	*P+ = 90.65%*
ECG delineation	QRSon = 4.54 ms	QRSon = 12.41 ms	QRSon = 15.87 ms
	QRSoff = 5.59 ms	QRSoff = 13.92 ms	QRSoff = 19.89 ms
	Pon = 14.91 ms	Pon = 20.28 ms	Pon = 24.59 ms
	Poff = 10.11 ms	Poff = 21.83 ms	Poff = 25.35 ms
	Toff = 6.83 ms	Toff = 15.05 ms	Toff = 23.44 ms

TABLE OF FIGURES
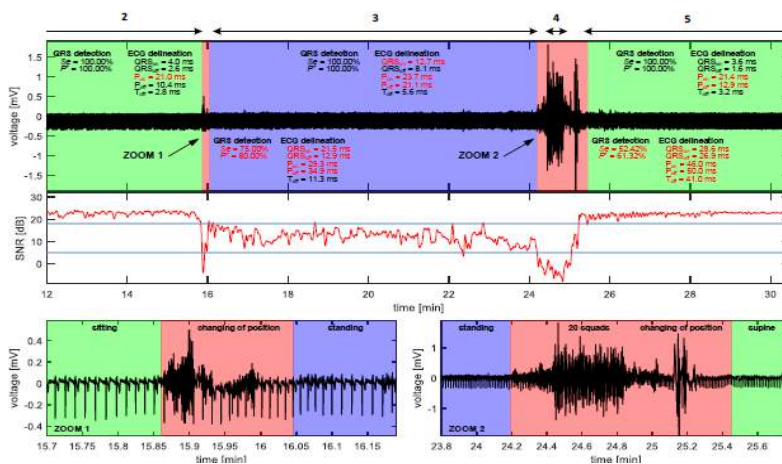
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CHAPTER 22

DESIGN OF ACTIVE QUASI Z- SOURCE MULTILEVEL INVERTER WITH HIGH GAIN BOOST

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ABSTRACT

In this paper, a new topology for multilevel inverter based on quasi-Z source converter is proposed. In the proposed topology the magnitude of output DC voltage is not limited to the sum of magnitude of DC voltage sources. Moreover, the reliability of the circuit due to capability of short circuit by Z-source network is increased. The quasi-Z source converter in different modes is analysed and the voltage gain is obtained. Also, the values of quasi-Z-source network components are designed. In the proposed topology, the number of DC voltage sources, the number of switches, installation area and cost in comparison with conventional multilevel inverters are significantly reduced. Three algorithms to determine the magnitude of DC voltage sources are proposed. Then the optimal structures for the minimum number of switches and DC voltage sources to generate the maximum voltage levels are presented. Moreover, the control method for the proposed topology is described. To verify the performance of the proposed topology, simulation and experimental results of proposed topology are presented.

KEYWORDS

quasi-Z source, multilevel inverter, DC voltage sources, switches and control method.

INTRODUCTION

GENERAL

This paper proposes a three-level diode clamped active impedance source inverter (AIS-TLI) based on the quasi Z-source inverter (qZSI). Apart from having minimal components and the inherent benefits of three-level qZSIs, such as single-stage buck-boost capability,

shoot-through (ST) immunity, and continuity of input current, the proposed topology has a higher boost capability and excellent efficiency. In addition, the inverter bridge has a higher modulation index, which improves the quality of the output waveform and necessitates less inductance. The proposed topology provides common ground between input and output terminals, which effectively eliminates leakage current in PV-powered single-phase systems. This paper describes the different operating modes principle, dynamic analysis, steady state analysis, and parameter selection instructions for the proposed in- depth.

Furthermore, the suggested inverter's benefits and limitations are compared to the traditional (q)ZSIs and some other AIS-TLIs. Finally, modelling and experimental results are used to confirm the effectiveness of the suggested topology.

GENERAL

Three-level diode-clamped inverters offer several advantages versus traditional two-level voltage source inverters (VSIs), including two times lower voltage stress on semiconductors, higher power capacity, and lower switching losses that result in higher switching frequency, better output waveform quality, smaller filter size, reduced dv/dt, improved harmonic performance, and the lack of a transformer required at the level of the distribution voltage. Reference proposes a high step-up DC-DC converter based on the Cockcroft-Walton (CW) voltage multiplier.

The proposed converter does not require a step-up transformer and is well suited for DC generation systems with low input levels. Reference discusses a new three-level uninterruptible power supply (UPS), which uses a push-pull boost circuit to interface with the battery bank and the DC bus.

HISTORY OF MULTILEVEL INVERTER

Compactness The associate editor coordinating the review of this manuscript and approving it for publication was Javier Moreno-Valenzuela. in its future implementation, another topology based on the Cuk-derived buck-boost method presented in . Although present some beneficial topologies of traditional TL boost inverters, none of them can provide shoot through (ST) immunity. Hence, employing dead time between the switching control signals is inevitable, but this additional dead time distorts the output AC voltage and

degrades the inverter's output waveform quality. To cover this shortcoming, the impedance network solution is one of the creative ideas which can be added to the three-level Neutral point clamped inverter (TLNPC).

QUASI Z-SOURCE

Combining the Z-source or quasi-Z-source (q)ZSIs topo logical notion with the TL-NPC, yields a bunch of single-stage buck-boost inverters. Some of the more common topologies, depicted in Fig. 1. As an attempt to apply Zsource to the three-level inverters, combines a three-level inverter with a passive impedance source (1PIS-TLI). Using this topology, suggests a new carrier-based modulation technique that uses the effective large, medium, small, and zero vectors as opposed to the invalid vectors to produce constant common-mode voltage and leakage current suppression.

Since the traditional space vector modulation (SVM), is unable to address the problem of neutral-point potential (NP) balancing, presents an improved SVM approach based on modifying the time of the classic symmetric SVM.

Although the single LC-TLI has a minimal passive component, it has several disadvantages, including high voltage stress across switches and capacitors, significant inrush current, and restricted boost factor. To mitigate some of these drawbacks, introduces another type of ST immune, single stage impedance source topology by using a combination of a three-level inverter with two symmetrical Z-source networks (2PIS-TLI). Trying to form another topology with continuous input current characteristic, introduces a different 2PIS-TLI by combining two quasi-Z-source inverters

METHODS AND MATERIALS
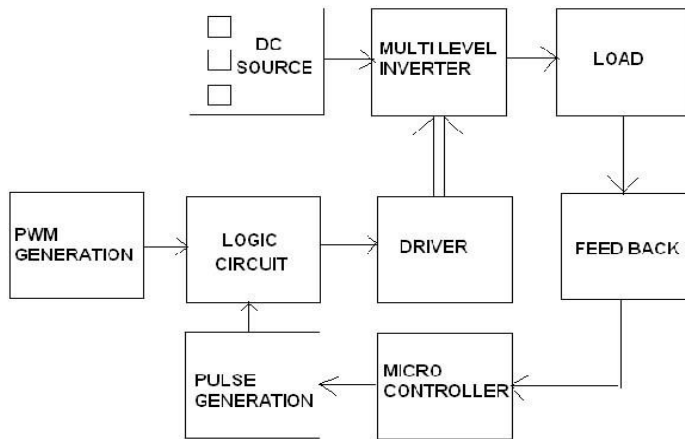
EXISTING SYSTEM

Figure 3.1 block diagram of Existing System

CIRCUIT DIAGRAM
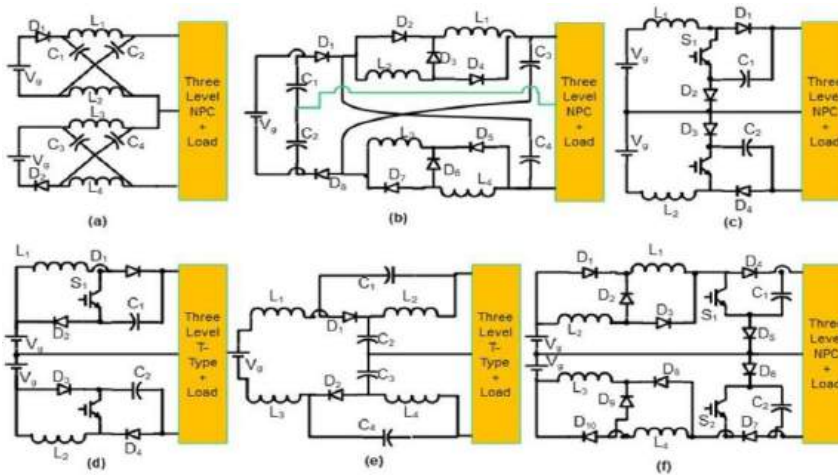
Since multilevel inverters contain more gain boost and operating safely even if the inverter's power switches are open-circuited.

Enhancing voltage gain despite lowering capacitor voltage stress, two new quasi switch boost (qSB) based inverters have been presented.

Their benefits achieved through the application of a modified PWM control approach.

By examining these topologies, it is concluded that the most shortcomings they share are the higher ST duty ratio, lower modulation index availability, and lesser boosting capabilities.

Furthermore, the majority of these topologies use two distinct impedance networks, Which means deploying single split or two independent DC voltage sources with many other components.

To address most of these shortcomings, this paper proposes two new configurations of a single-stage AIS-TLI.

The proposed topologies have a single non-split source with lower passive elements, which is based on the qZSI definition, so they called active quasi Zsource neutral point clamped (AqZS-NPC) inverter.

Compared the proposed topologies save one switch. They have higher voltage gain than traditional PIS-TLI and most of AIS-TLIs, meaning a better DC- link utilization factor. They also have a continuous input current and an adjustable midpoint, which is beneficial for using in asymmetric NPCs.Both topologies provide the same function. However, the second one saves a diode.

PROPOSED SYSTEM
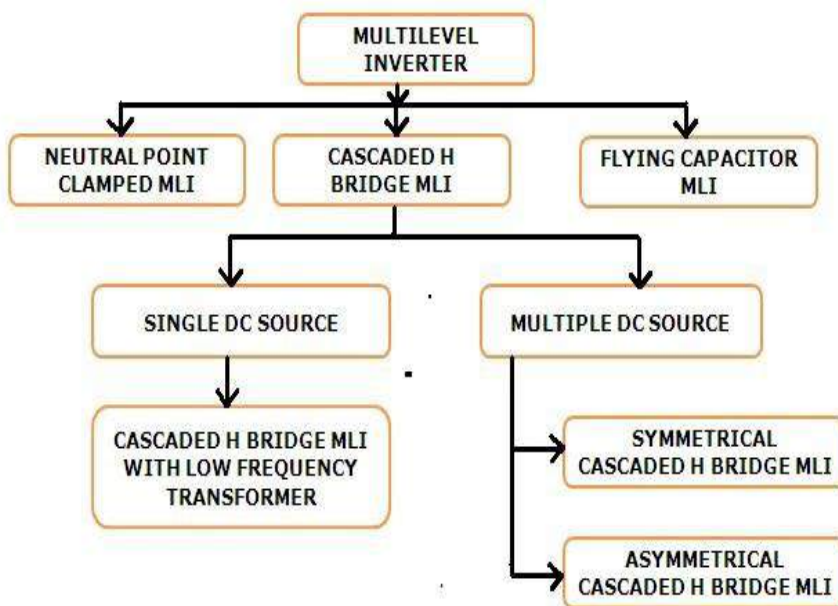
Block diagram Of the Proposed System

In this section, the operating principle of these two topologies is thoroughly outlined and discussed. For the sake of analysis simplicity, we assume that all the components of the

AqZS-NPCs are ideal and all of the passive components are time-invariant, linear, and frequency-independent.

EXPLANATION

The operation principle of this mode is similar to that of a traditional qZS impedance network. It depicts the equivalent circuit for the d1-state. In this mode, there is no short circuit in the bridges, and switch Sd is turned off. Diodes D1, D2, and D3 conducted, and Capacitor C1 is fed by Inductor L1 and the input source. In contrast, Inductor L2 discharges energy to capacitor C2. The time interval of this operating mode is d1·Ts. By applying KVL and KCL, for this state, voltage and current relations can be extracted.

The equivalent circuit of the d2-state. Throughout the active d2-state, switch Sd is turned on, and like d1-state, there is no short circuit in the bridges. In this mode, both diodes D1 and D2 are conducting while diode D3 is reversed biased. Capacitor C1 continues to charge by inductor L1 and the input source while simultaneously discharges energy to Inductor L2. The time interval of this operating mode is d2·Ts, where d2 is the time which Sd is conducting. During non- shoot-through-d2 state, it is possible to extract inductor voltages and capacitor currents.

Although the proposed topology is only made up of traditional qZS, a switch and extra one or two diodes, it has a better boost factor than other topologies use.

RESULT AND DISCUSSION
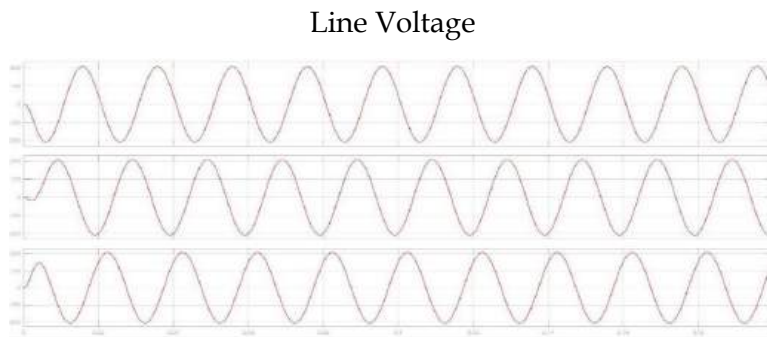
Line Voltage

Filtered Line Voltage-1
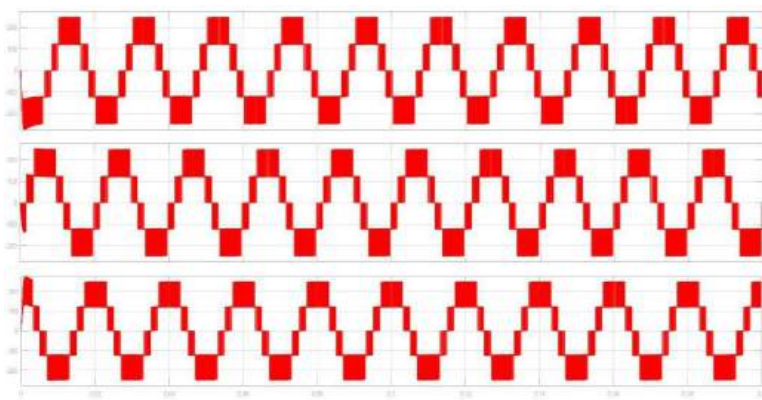
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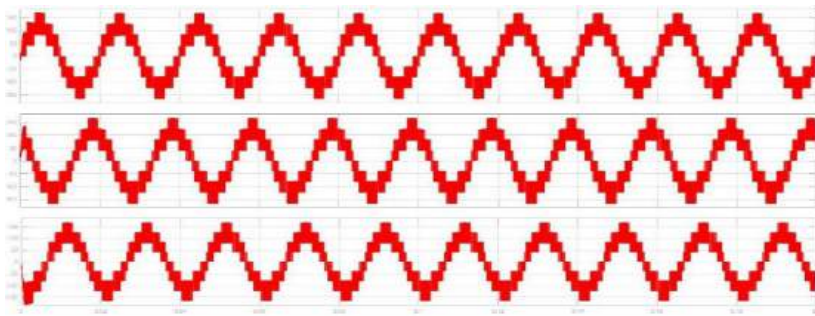
Neutral Voltage-1

HARDWARE SPECIFICATION:

SI NO	COMPONENTS	SPECIFICATION
01	AqZS	60V
02	Capacitor	1mf
03	Inductor	2mf
04	Filter Inductor	3mh\phase
05	Filter Capacitor	5μf\phase
06	Power IGBT Module	600V 20A
07	DSP	150 MHz
08	Filter	2-3A

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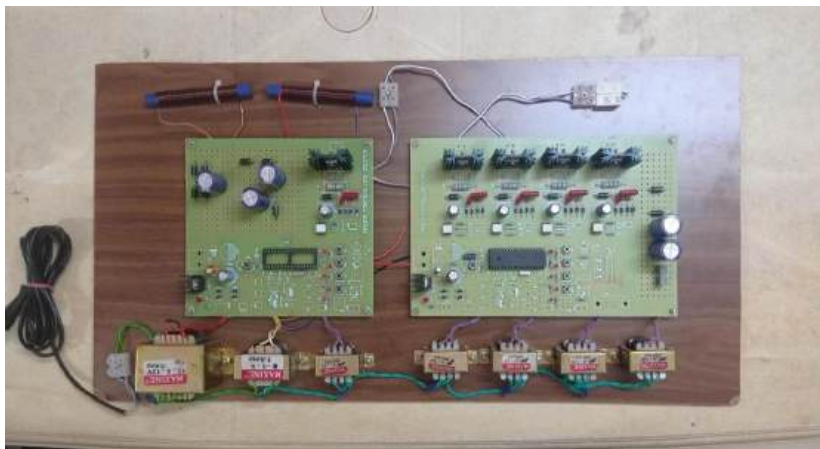
CONCLUSION

This paper introduced a new active quasi-Z-source three-level NPC inverter with a lower component count. The suggested inverter presented in two alternative configurations, all of which offer the same results. Besides having outstanding features such as power conversion in single-stage, ST immunity, continuous input current, and improved modulation index, the main contributions of proposed inverters are lower component count, enhanced voltage gain, and requires smaller inductances. The simulation and experimental prototype developed to confirm the feasibility and reliability of the proposed topology. The hardware results corroborated the simulation and analytical results.

Also this paper proposes a single-stage sliding mode control using an advanced reaching law to provide both DC link voltage and inverter control for a high- switching frequency

modified capacitor-assisted extended boost quasi-Z source multilevel inverter. An optimized topology for a multilevel three-phase inverter was selected to achieve a trade-off between switching loss and the higher number of levels. To achieve fast control, dq–gh transformation-based SVPWM was used because of its fast action, which is required at higher switching frequencies. A comparison was performed between the proposed control strategy and a PI controller on the basis of a simulation. The results of the simulation showed that the proposed controller demonstrated an extraordinary performance compared to PI-based controllers under normal and harmonic-infested grid connections. It showed strong robustness, invariance to disturbance, fast response, higher-quality current, and lower THD. Hardware-in-loop implementation was performed in Smart Grid Laboratory, and the experimental results were in agreement with the simulations, thus validating the feasibility and effectiveness of the control.

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CHAPTER 23

IOT BASED BATTERY MONITORING SYSTEM IN ELECTRIC VEHICLE

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ABSTRACT

Electric vehicles (EV) are playing a key role because of its zero-emission of harmful gases and use of efficient energy. Electric vehicles are equipped by a large number of battery cells which require an effective battery management system (BMS) while they are providing necessary power. The battery installed in electric vehicle should not only provide long lasting energy but also provide high power. Lead-acid, Lithium-ion, -metal hydride are the most commonly used traction batteries, of all these traction batteries lithium-ion is most commonly used because of its advantages and its performance. Battery management system (BMS) makes decisions based on the battery charging and cell voltage, temperature, etc. To ensure safe operation of the battery pack, the Battery Management System (BMS) has to make sure the cells remain in this safety window. Electric vehicles are becoming more common place as the technology matures and gas prices remain higher than in previous decades. While the internal combustion engine still dominates much of the world's roads, electric vehicles and hybrids (vehicles with both an internal combustion engine and some form of electric motor) are more prevalent in urban areas than previous decades. In harnessing the regenerative braking energy as an additional power storage abstraction reinforces the sustainability and performance of the EV, further optimizing energy efficiency and enhancing the driving experience. Electric vehicles do not have any on board power generation and rely solely on stored energy in batteries to power the electric motors during operation. This paper outlines a scalable method of determining the voltage across each battery in an electric vehicle charging and an eventual path for the development of a real-time battery monitoring for use in the Department Electric Vehicle.

KEYWORDS

EV, BMS, Lead-acid, SoC, SoH, Lithium-ion and Electric motors.

INTRODUCTION

The Internet of Things (IoT) is a network of goods that include electronics, software, actuators, and connectivity, allowing these devices to connect, interacts, and exchange data. The Internet of Things means extending Internet connectivity beyond standard devices such as PCs, laptops, smartphones, and tablets to a wide range of previously dumb or non-internet-enabled physical gadgets and everyday objects. These technologically implanted items can connect and interact over the Internet, and they can be remotely monitored and controlled.

The definition of the Internet of Things has changed as a result of the convergence of several technologies, including real-time analytics, machine learning, inexpensive sensors, and embedded systems. The Internet of things is made possible by embedded systems, wireless sensor networks, control systems, automation (including home and building automation), and other conventional disciplines.

Enable continuous monitoring of the battery's parameters such as voltage, current, temperature, state of charge (SoC), and state of health (SoH). Allow users to access battery data remotely through a web or mobile application, providing them with insights even when they are not physically present with the vehicle. Implement algorithms to detect early signs of battery degradation or faults, enabling proactive maintenance and preventing potential failures. Provide recommendations for optimal charging patterns based on usage patterns, grid conditions, and battery status to prolong the battery's life span.

Integrate safety features such as over-voltage, under-voltage, over- temperature, and short-circuit protections to prevent hazardous situations. Utilize historical data and machine learning algorithms to predict future battery performance, allowing for better planning and maintenance scheduling. Implement a notification system that alerts users in real-time about critical battery conditions, ensuring timely response to potential issues.

METHODS AND MATERIALS

ARDUINO IDE

The Arduino Integrated Development Environment (IDE) is a user-friendly software platform that serves as the primary interface for programming Arduino microcontroller boards. It provides a comprehensive set of tools and features to facilitate the development of embedded systems and interactive electronic projects. The IDE is designed to be accessible to both beginners and experienced programmers, making it a popular choice for hobbyists, students, and professionals alike.

. It employs a simplified version of the C and C++ programming languages, making it accessible to those with varying levels of coding experience. The IDE provides a straightforward environment for writing, editing, and managing code, with features like syntax highlighting and auto-completion to aid in the coding process. Additionally, it offers a vast library of pre-written functions and code examples, which can be easily incorporated into projects, reducing the need for extensive programming knowledge.

Another significant aspect of the Arduino IDE is its compatibility with a wide range of Arduino microcontroller boards. These boards come with various configurations, capabilities, and processing power, catering to different project requirements. The IDE automatically detects the connected board, allowing users to select the appropriate model for their project. This flexibility enables developers to choose the best-suited hardware platform for their specific application, whether it involves robotics, sensors, actuators, or other electronic components.

The Arduino IDE also simplifies the process of uploading code to the Arduino board. With just a few clicks, users can compile their code and transfer it to the microcontroller via a USB connection. This seamless integration streamlines the development cycle, allowing for rapid iteration and testing of projects. Additionally, the IDE includes a built-in serial monitor, which provides a real-time interface for sending and receiving data between the microcontroller and the connected computer, aiding in debugging and data analysis.

Arduino IDE supports a thriving community of developers and enthusiasts. This community contributes to an extensive repository of open-source libraries, shields, and modules that extend the capabilities of Arduino boards.

Users can leverage this rich ecosystem to access additional functionalities and components for their projects. Moreover, the IDE is backed by extensive documentation, forums, and tutorials, making it easy for users to seek assistance, share knowledge, and collaborate on projects.

In the Arduino IDE is a powerful and versatile software platform that empowers individuals to create a wide array of electronic projects. Its intuitive interface, compatibility with diverse Arduino boards, and robust community support make it an invaluable tool for both beginners and experienced developers. Whether used for educational purposes, prototyping, or building complex embedded systems, the Arduino IDE remains a cornerstone in the world of microcontroller programming.
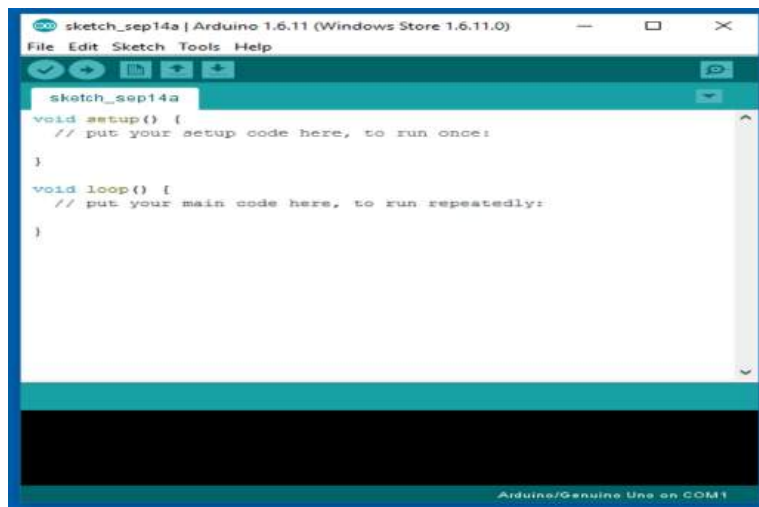
Fig 1 Arduino code

RESULTS AND DISCUSSION

In this paper, we have proposed an IoT-based battery monitoring system for electric vehicles that leverages wireless communication and cloud computing to collect and analyse battery data in real-time. Our system offers granular and accurate insights into battery health and performance, real-time monitoring and analysis capabilities, cloud-based analysis, and enhanced safety.

The regenerative braking technology presents an innovative approach to power management. Harnessing during braking and storing it in the vehicle's battery supplements the power reserves, optimizing energy efficiency and bolstering the vehicle's performance.

The paper described the design and development of an IoT-based battery monitoring system for electric vehicle to ensure the battery performance degradation. We are developing the system for battery management in electric vehicle by controlling the crucial parameters such as voltage and temperature. It is very important that the BMS should be well maintained with battery reliability and safety. This present paper focuses on the study of Battery Management System and optimizes the power performances of electric vehicles. Moreover, the target of reducing the greenhouse gases can greatly be achieved by using battery management system.
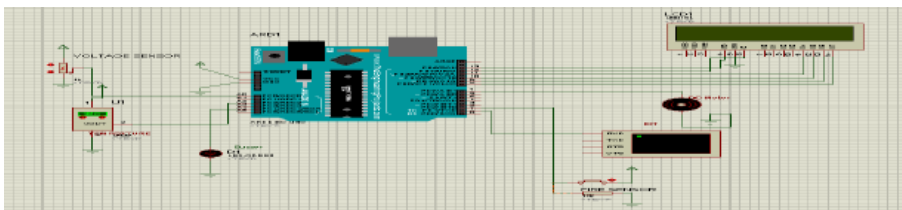
Fig 2 Simulink Diagram.

CONCLUSION

An IoT-based battery monitoring system in electric vehicles is an essential aspect of ensuring efficient operation and prolonging the battery life of electric vehicles. IoT-based battery monitoring systems can collect a significant amount of data related to battery usage and performance. By applying advanced data analytics, such as machine learning and artificial intelligence, to this data, the system can gain a deeper understanding of battery performance and predict potential issues before they occur. Integrating IoT-based battery monitoring systems with smart grids can enable better control and optimization of the energy flow between the vehicle and the grid. This can help to ensure that the battery is charged efficiently and at the optimal time. Wireless charging technology is becoming more prevalent and can be integrated with IoT-based battery monitoring systems to provide a seamless and effortless charging experience for electric vehicle users. Multi-modal battery

management is a system that can manage the performance of multiple batteries in an electric vehicle. By monitoring and balancing the performance of these batteries, the system can help to optimize battery life and improve overall vehicle performance. Block chain technology can be used to create a secure and transparent record of battery usage and performance. This can help to ensure that batteries are properly maintained and replaced when necessary, reducing the risk of battery failure and improving overall vehicle safety. The future of IoT-based battery monitoring systems in electric vehicles is exciting, with many potential enhancements that can improve battery performance, vehicle efficiency, and overall user experience. As technology continues to advance, we can expect to see more innovative solutions for battery monitoring and management in electric vehicles.

ACKNOWLEDGEMENT

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CHAPTER 24
GRID INTEGRATED PV BASED E-VEHICLE CHARGE STATION

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ABSTRACT

This paper presents a three-phase grid interfaced charging station (CS) for electrical vehicle (EV). It interacts with the grid to compensate for the reactive power. The charging station operates in various modes, 1. charging/discharging of EV battery, 2. compensation of reactive power, 3. both concurrent charging and compensation of harmonics current, 4. concurrent discharging and compensation of harmonics current. The CS while in grid connected mode, operates under distorted and unbalance grid voltages conditions. The control of charging station is designed such that reference grid currents synchronize with phase voltages at PCC (Point of Common Coupling). If grid losses synchronism, then charging station works in islanded mode and PV source charges the EV battery. The performance of charging station is tested under various dynamic conditions and grid currents distortion levels are in the limits as recommended by the standard IEEE-519.

KEYWORDS

Batteries, Reactive power, charging stations, Electric vehicle charging, Vehicle-to-grid, MPPT's.

INTRODUCTION

With the increase in the concern of the environmental safety and preservation of the resources, EVs (Electric Vehicles) are gaining popularity and their on-road demand is increasing day by day. The advantage of using EV as an alternate to fossil fuel powered vehicle is that they are environmental friendly as they don't produce pollution. This is anticipated that most of the vehicles on the road are to be electric by 2030.The EV mainly depends upon the battery used and the EV charging station availability. Therefore, a good

charging infrastructure is required to be developed for EV charging. Normally, a unidirectional on-board charger is used for the EV charging with the grid. Several unidirectional on-board charging Topologies have been demonstrated in the text. These unidirectional chargers charge the EV using the grid. However, they do not allow the active power supply from vehicle to the grid. The energy stored in EV battery could be used as an energy storage.

Moreover, EV is mostly parked in the parking and it also carries a huge amount of the energy. Thus, EV battery can be used as a storage device and when not in use it could be used for providing the power to the grid. This could be achieved when there is bidirectional flow in the system. The flow of the energy from the EV to the grid is termed as V2G (Vehicle to Grid). In V2G mode, the reactive power required by the grid has been supplied by the VSC (Voltage Source Converter). In V2G mode, while compensating for the reactive power, active power is not consumed from the EV. The reactive power compensation and active power generation in proximity to the load are favorable as if the compensation is done far away from the load, a considerable the power would waste in transmission only.

The charging of EV's using the grid is not a good idea it consumes an enormous amount of power from the grid. Therefore, an alternate source of energy is required for EV battery charging. The renewable energy sources prove to be a better alternative for EV charging instead of the grid.

As solar PV (Photo Voltaic) generation is freely available, it emerges as a potential source for EV charging. However, PV array generation is intermittent in nature. The uncertainty of the PV power generation could be overcome using EV as a storage and integrating it with grid. The reactive power compensation done by the on board chargers has the constraint of the EV movement and the power transfer capacity is also limited. However, the reactive power compensation done by the off-board chargers, is more rewarding as compared to the on board chargers as they are installed in the premises with high rating and they may provide ancillary services by having an agreement with the grid. The increasing attention towards the ancillary services provided by EV to the grid, more and more charging stations are required to be installed. A bidirectional, multifunctional on board EV charger has been discussed in. This type of charger while operating in V2G mode could charge the additional battery present in the charging station. Another bidirectional charger charging the EV as

well as compensating for the reactive power have been presented in. Some researchers have worked on the EV chargers with V2G capabilities.

HISTORY OF DC-DC CONVERTERS

The DC-DC conversion progression was established in 1920s. A easy way of representing DC-DC voltage conversion is a voltage divider or potentiometer. This approach generates an output voltage lower than the supply voltage with poor performance. Subsequently, the multi-quadrant chopper was designed for DC-DC conversion for industrial applications as reported by Rashid. Later, telecommunication technology was enhanced tremendously suddenly and it needed a low voltage DC supply that resulted in the fast growth of the DC-DC conversion process. Very high step-up voltage transfer gains are required by many modern applications such as high-intensity discharge lamp ballasts for automobile headlamps, fuel-cell energy conversion systems, solar-cell energy conversion systems and battery backup systems for uninterruptible power supply. Theoretically, the basic DC– DC converters, such as boost, buck– boost, Cuk, SEPIC can achieve a high voltage transfer gain with an extremely high duty cycle. However, in practice, the step-up voltage transfer gain is limited owing to the effect of power switches, rectifier diodes and the equivalent series resistance (ESR) of inductors and capacitors.

Moreover, the extremely high duty-cycle operation will result in a serious reverse-recovery problem. DC– DC converters may be developed by n-cell cascade connection or by adding transformers to obtain higher voltage transfer gains. However, the resulting problems, such as energy losses, multiple power switches and large switching surges in transformers, significantly increase the cost of these converters and the control complexity. Some research of the transformer less DC– DC converters include the quadratic boost type, the capacitor-diode voltage multiplier type and 2 the boost type integrated with switched-capacitor technique. However, these types are all complex and will lead to a higher cost. Voltage lift (VL) technique is an effective method that is widely applied in electronic circuit design, especially in radio engineering. It can also lead to performance and characteristics improvement of DC– DC converters.

However, it differs from current switched- capacitor techniques. Both inductors and capacitors play an important role in the VL technique, and all inner capacitors are fully

charged by the power source. Moreover, fewer power switches (usually a single switch or two synchronous switches) are included in VL structures and avoid those complex multiple-switch control schemes. Reduced-order modeling is reasonable and necessary as there are a lot of energy elements in the series of VL split- inductor-type boost converters. A general reduced-order state space model is given in this paper. It provides enough information on the circuits and convenience for the controller design. For controlling issues, since DC– DC converters are typical variable structure systems, variable structure control such as sliding mode (SM) control is one of the best choices. It is one kind of non-linear control and can get much better regulation performance especially in some situations when input voltage and output load have large variation ranges.

Therefore a SM controller will be designed for the proposed VL split-inductor-type boost converter. In order to improve the overall performance of the converter implementation of LQR plus PI, PID controllers in this work.

VSC CONTROL

The switching control for VSC in grid connected mode is depicted in Depending upon power references (P ref and Q ref), active power component (Ip) and reactive power component (I q) of grid reference currents are estimated. The per phase active currents (ipa, ipb, ipc) are calculated by multiplying active power component (Ip) and in-phase unit templates (upa, upb, upc). Likewise, per phase reactive currents (iqa, iqb, iqc) are calculated by multiplying reactive power component (Iq) and in-phase unit templates (uqauqb, uqc). The VSC control is explained in the following sections.

TOPOLOGY

VSC can be classified with respect to the converter technology types used, which have evolved over time. Two-Level VSC – earliest technology used Three Level Diode Neutral Point Clamped (NPC) or Three Level Active NPC, Two Level with Optimum Pulse-Width Modulation (OPWM), Cascaded-two Level Converter (CTL), Modular Multi-Level Converter (MMC), which is the latest and most advanced technology used for HVDC transmission. MMC differentiates further into the so-called Half Bridge type and Full Bridge type MMC. In offshore HVDC grids, MMC is becoming the preferred power electronic

converter for converting between AC and DC as it presents several benefits: (i) the ability to reverse the power flow without reversing the polarity of the DC voltages by DC current reversal; (ii) modularity and scalability features, making it advantageous compared to other VSC topologies; (iii) its inherent capability of storing energy internally in the converter. This can benefit the system in which it is connected and enables the drastic reduction of operating losses of the converter stations by avoiding the need for high frequency switching of the semi-conductor devices.
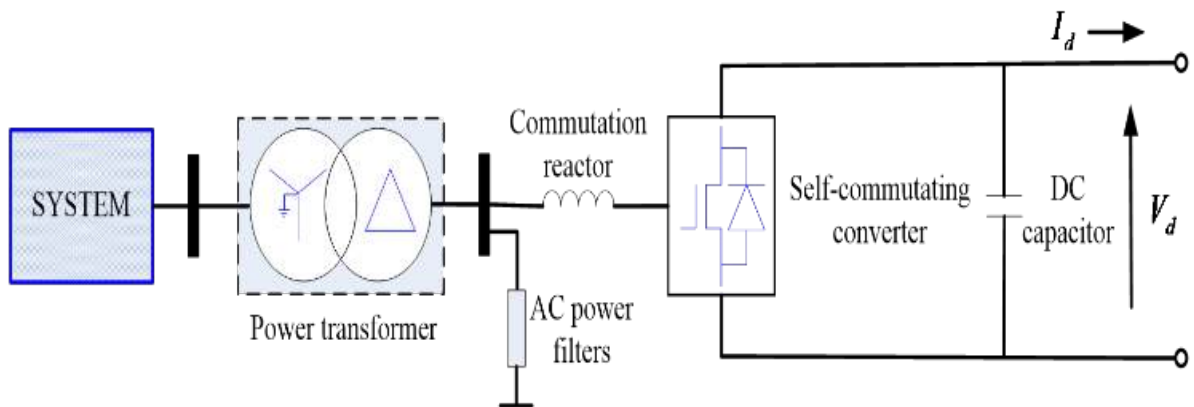
Fig 1: Voltage Source Controller

COMPONENTS

- DC/DC converter
- Transformer (Optional Tapping in series/parallel)
- DC-link capacitors
- Passive high-pass filters
- Phase reactors
- DC cables
- DC breaker (Optional)

PROPOSED SYSTEM:
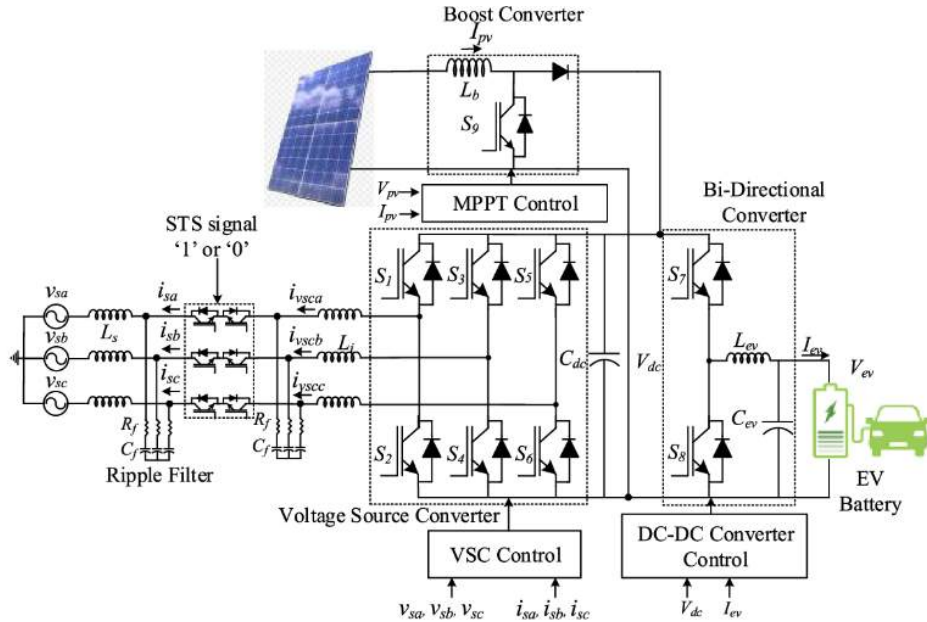
Fig 2: Circuit Diagram

MAXIMUM POWER POINT TRACKING

An INC based MPPT extracts the maximum power from the PV array during erratic PV circumstances. The duty cycle of the boost converter is calculated by,

where, is the PV array current at MPPT, Vdc is the DC-link voltage.

The duty cycle is compared with the sawtooth wave and switching pulses of the boost converter are generated as demonstrated
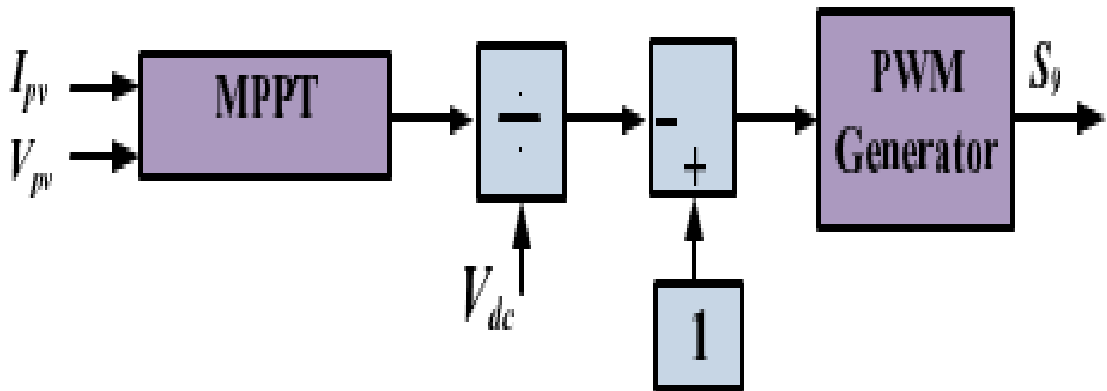
Fig 3: Maximum Power Point System

METHODS AND MATERIALS

MPPT CONTROL TECHNIC

MPPT is an algorithm used for extracting the maximum available power from PV arrays under certain conditions. The voltage at which maximum power occurs is called maximum power point voltage. Maximum power point changes with solar irradiation, temperature, etc. In this developed system Perturb and Observe (P & O) method is used for MPPT control . This method takes the PV array output voltage and current as input. It compares the difference between present power and old power, present voltage or current, and old voltage or current. Power formula can be written as given in expression. Power (PPV) = Voltage*Current = VPV*IPV Where, PPV is PV array output power, VPV is the PV array output voltage and IPV is the PV array output current. MPPT algorithm steps followed and flow chart are given. Let the difference between present power and old power = ΔP. Difference between present voltage and old voltage = ΔV.If $\Delta P > 0$, it checks whether ΔV is greater than zero or less than zero.

1. If $\Delta V > 0$ then Dref is decreased by ΔD.

2. If $\Delta V < 0$ then Dref is increased by ΔD. If $\Delta P < 0$, it again checks for ΔV whether it is greater than zero or less than zero

1. If $\Delta V > 0$ then Dref is increased by ΔD.

2. If $\Delta V < 0$ then Dref is decreased by ΔD.

PV PANNELS

With their immense potential for increasing the country's energy security, economic vitality, and quality of life, plug-in electric vehicles (PEVs) – including plug-in hybrid electric and all-electric vehicles – will play a key role in the country's transportation future. The Vehicle Technologies Office (VTO) supports a variety of work to lower the cost and increase the convenience of PEVs. VTO is collaborating with national laboratories and industry to improve batteries and electric drive systems. To maximize these technologies' effectiveness, researchers use simulation and modeling software to create virtual vehicles based on data collected from vehicles on the road and in the laboratory through the Advanced Vehicle Testing Activity (AVTA). VTO also works with national laboratories and key stakeholders

to advance the development and use of PEV charging infrastructure. Three broad principles guide VTO efforts in this area and are intended to support communities, companies, and others as they plan for future PEV charging availability. The office closely coordinates with other Federal agencies, including the U.S. Department of Transportation, state and local governments, industry partners, and other key stakeholders to serve current and future PEV drivers across America.

GRID INVERTER DC TO AC

A grid-tied electrical system, also called tied to grid or grid tie system, is a semi-autonomous electrical generation or grid energy storage system which links to the mains to feed excess capacity back to the local mains electrical grid. When insufficient electricity is available, electricity drawn from the mains grid can make up the shortfall. Conversely when excess electricity is available, it is sent to the main grid. When the Utility or network operator restricts the amount of energy that goes into the grid, it is possible to prevent any input into the grid by installing Export Limiting devices.
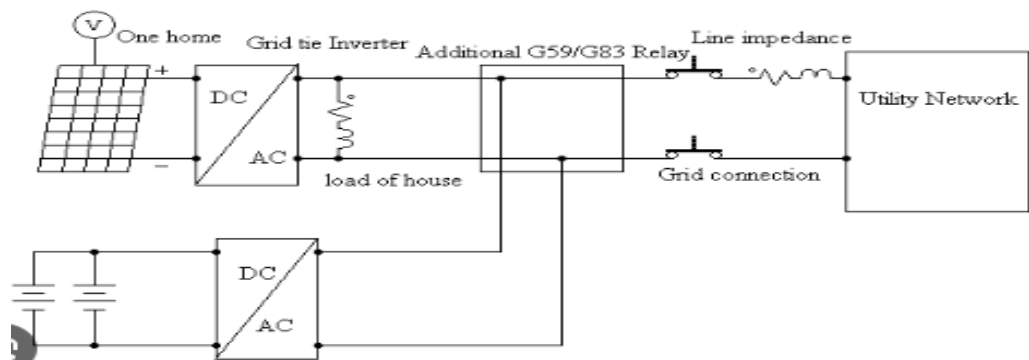
Fig 4: AC Grid Inverter

AC GRID INVERTER

An electrical grid is an interconnected network for electricity delivery from producers to consumers. Electrical grids vary in size and can cover whole countries or continents. power stations: often located near energy and away from heavily populated areas electrical substations to step voltage up or down electric power transmission to carry power long distances electric power distribution to individual customers, where voltage is stepped down again to the required service voltage(s).

GENERATION

Electricity generation is the process of generating electric power from sources of primary energy typically at power stations. Usually this is done with electro mechanical generators driven by heat engines or the kinetic energy of water or wind. Other energy sources include solar photo voltaics and geothermal power. The sum of the power outputs of generators on the grid is the production of the grid, typically measured in giga watts (GW).

TRANSMISSION

Electric power transmission is the bulk movement of electrical energy from a generating site, via a web of interconnected lines, to an electrical substation, from which is connected to the distribution system. This networked system of connections is distinct from the local wiring between high-voltage substations and customers. Because the power is often generated far from where it is consumed, the transmission system can cover great distances. For a given amount of power, transmission efficiency is greater at higher voltages and lower currents. Therefore, voltages are stepped up at the generating station, and stepped down at local substations for distribution to customers.

SUBSTATION

Substations may perform many different functions but usually transform voltage from low to high (step up) and from high to low (step down). Between the generator and the final consumer, the voltage may be transformed several times. The three main types of substations, by function, are,

1.Step-up substation: these use transformers to raise the voltage coming from the generators and power plants so that power can be transmitted long distances more efficiently, with smaller currents.

2.Step-down substation: these transformers lower the voltage coming from the transmission lines which can be used in industry or sent to a distribution substation.

3.Distribution substation: these transform the voltage lower again for the distribution to end users.

If the EV battery needs to be discharged to provide the active power to the grid, then the operation is known as V2G. In V2G mode, EV owner has an advantage of cost incentive

during peak hours. The primary aim of the EV charging station is EV charging from a PV array. However, if required, the EV provides the power to the grid. Thus, the control is developed in such a manner to integrate the EV with grid.

The control structure is depicted. Here, active reference power is deciding factor that EV battery is charged or discharged. The EV battery charging power is decided by the owner, whereas discharging of EV battery is according to power demanded by grid. The reactive power command determines quantity of reactive power exchanged.

Fig 5: Interconnected System

RESULTS AND DISCUSSION

The charging station is designed in such a way that reference active power and reference reactive power are provided from the EV owner and the grid is required for the sustained operation of the charging station. The PV array-based charging station is capable of smooth and seamless synchronization while other operations of the charging station like EV charging remains uninterrupted. The charging station is operated in both modes G2V (Grid to Vehicle) and V2G as it is designed to support the bidirectional active power flow. If the EV battery is required to be charged from the grid, then the charging station operates in G2V. Similarly, if the EV battery needs to be discharged to provide the active power to the grid, then the operation is known as V2G In V2G mode, EV owner has an advantage of cost incentive during peak hours. The primary aim of the EV charging station is EV charging from a PV array. However, if required, the EV provides the power to the grid. Thus, the control is developed in such a manner to integrate the EV with grid.

The control structure is depicted. Here, active reference power is deciding factor that EV battery is charged or discharged. The EV battery charging power is decided by the owner, whereas discharging of EV battery is according to power demanded by grid. The reactive power command determines quantity of reactive power exchanged. The controller is devised in such a manner that concurrent flow of the active power and compensation of reactive power is done. If the sign of the grid power is positive then the power is flowing from the grid to vehicle i.e., EV is charging. However, if the sign of the grid power is negative then the power flow is from the PV array/vehicle to the grid.
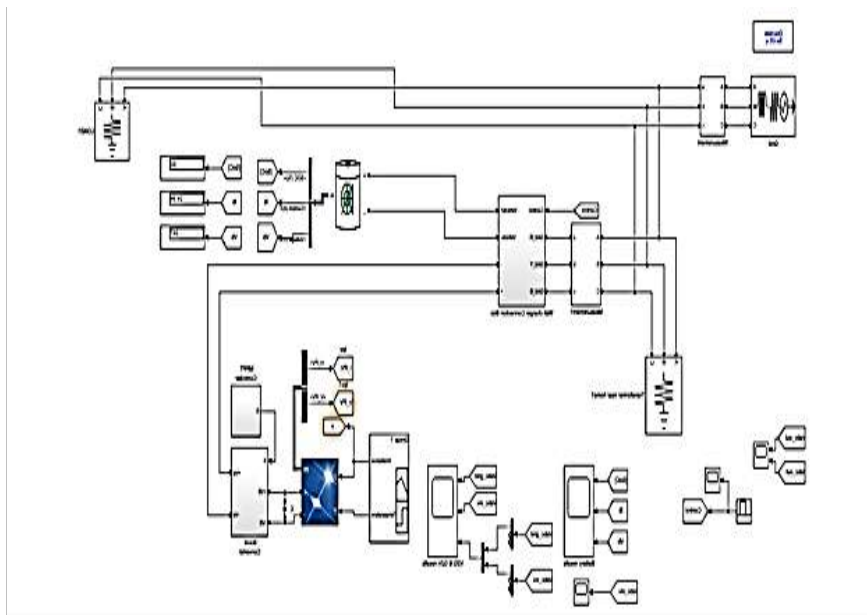
Fig 6: MATLAB SIMULATION

SPECIFICATIONS

Parameters, Components, and Equipment	Value	Unit
Nominal input voltage Vin	380	V
Nominal output voltage vinv	220	Vrms
Nominal output frequency finv	60	Hz
Nominal output active power Pinv	600	W
Switching frequency fs	20	kHz

Filter inductance L1, L2	625	µH
Filter capacitance C1	10	µF
MOSFET Q1, Q2, Q3, Q4	IPW60R037P7	
Microcontroller unit	TMS320F28335	
PV simulator	TERRASAS ETS80	
Grid simulator	CHROMA 61830	
AC load	CHROMA 63803	
Oscilloscope	WAVESURFER 3024	
Power analyzer	WT1806E	

Table 1. Parameters and components of the proposed grid-connected inverter and equipment in the experiments.
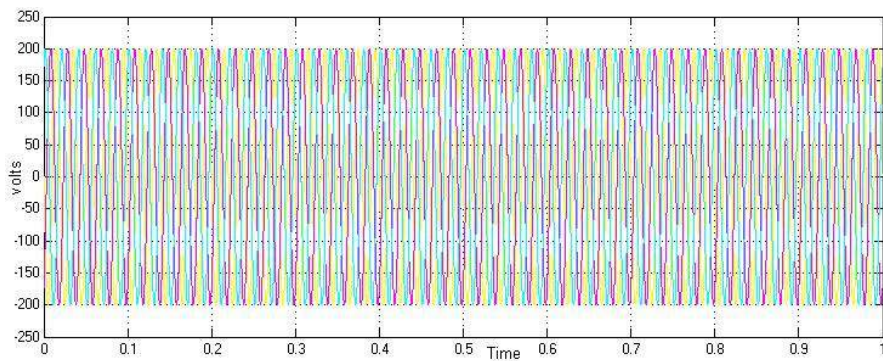
Fig 7: Source Voltage
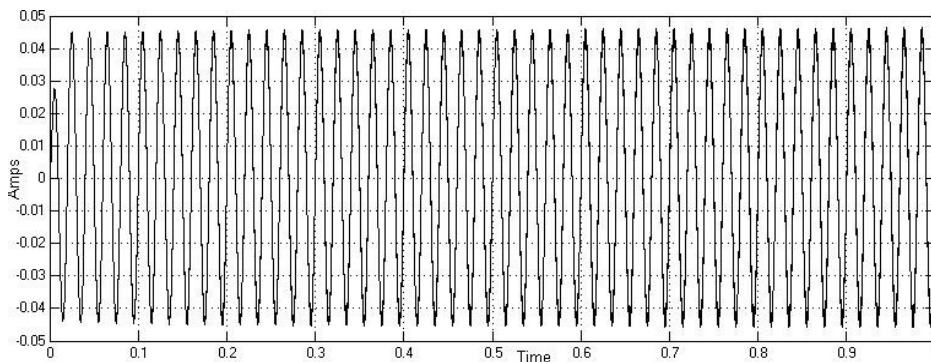
Fig 8: Source Current
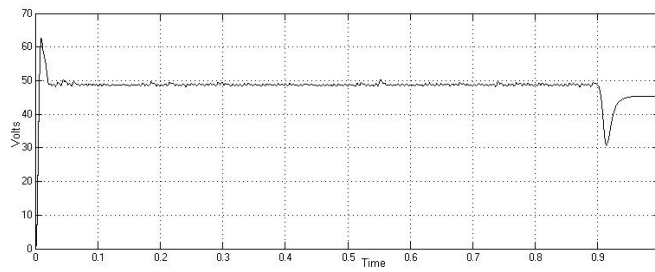
Fig 9: Capacitor Voltage
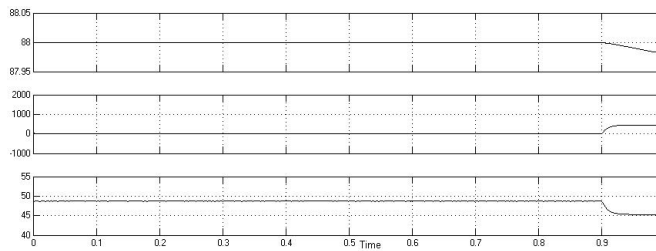
Fig 10: Battery Rating

HARDWARE IMPLEMENTATION

Fig 11: Hardware Snap shot

Fig 12: Output of Buck Mode Pulses Boost Off

Fig. 13: Output of Boost Mode Pulses Buck Off

Fig. 14: Output of Inverter Switching Pulses

CONCLUSION

A grounded, single-stage solar-powered EV charging station that is connected to the grid, feeds the power produced there to the grid, and delivers the EV's batteries to the grid to release power during peak hours is being constructed. You stand to gain. The charging station receives reactive power compensation after being wired into the electrical grid. The grid connection and freestanding modes of operation both operate satisfactorily, according to the charging station capacity evaluation. The charging station syncs with the grid, feeding more power into the grid when the grid is operating efficiently. The charging station functions admirably under dynamic circumstances like varying solar insolation, erratic grid voltage, and reactive power regulation, according to experimental data.

FUTURE SCOPE

Analysts predict that the number of charging stations will increase over the next five years due to the expected rapid growth of EVs (500,000 stations by 2030). The global market for EV charging stations is expected to reach $30.41 billion by 2023 and further increased.

ACKNOWLEDGEMENT

I would also like to express our deepest sense of respect and indebtedness to my Co-Author Mrs. P.SURIYA, M.E., Assistant Professor for her consistent support and help during this chapter work.. It is a great opportunity to express our sincere thanks to all the members who have contributed to the successful completion of our book chapter work through the support, encouragement and guidance.

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LEGENDS TO FIGURES

S.NO FIGURES

1. Voltage Source Controller
2. Circuit Diagram
3. Maximum Power Point System
4. AC Grid Inverter
5. Interconnected System
6. MATLAB SIMULATION
7. Source Voltage

8. Source Current

9. Capacitor Voltage

10. Battery Rating

11. Hardware Snap shot

12. Output Of Buck Mode Pulses Boost Off

13. Output Of Boost Mode Pulses Buck Off

14. Output Of Inverter Switching Pulses

LEGENDS TO TABLES

S.NO TABLES

1. Parameters and components of the proposed grid-connected inverter and equipment in the experiments

Non-Circuit Engineering

CHAPTER 25

ENHANCING MORTAR STRENGTH THROUGH SUSTAINABLE REPLACEMENT OF CEMENT WITH RICE HUSK ASH AND SAWDUST ASH

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ABSTRACT

This paper refers to the potential partial use of rice husk ash (RHA) and sawdust ash (SDA) as cement replacement in mortar, with a view to strengthening the mortar and ensuring environmental sustainability. Using industrial and agricultural by-products with suitable potential to replace cement may reduce the consumption of cement, and therefore, the adverse impacts resulting from the cement production process would be minimized. Different mortar mixes were prepared by varying proportions of RHA and SDA as cement replacement. Considering their mechanical properties, compressive strength, tensile strength, and durability, the specimens were tested. Marked strength improvements in the mortar are noticed due to the pozzolanic reaction and improved microstructure upon finding the optimal percentages of replacing RHA and SDA. Thus, it is confirmed that supplementary cementitious materials, RHA, and SDA, are effectively used towards sustainable construction and an environmentally friendly approach in the building industry.

KEYWORDS

Rice Husk Ash, Sawdust Ash, Cement Replacement, Mortar Strength, Sustainability, Pozzolanic Reaction, Green Construction.

INTRODUCTION

The environmental issues in disposing rice husk, a milling byproduct of paddy, are huge. The weight percentage of paddy in husk is about 22%, and 25% of the same gets converted into rice husk ash upon combustion. RHA contains 80-90% amorphous silica. The annual

production of RHA in India amounts to about 20 million tons and thus endangers this land plus the environment. RHA and sawdust ash are used as supplementary cementitious materials in construction to reduce this menace. The compressive and flexural strength is improved by replacing Portland cement with RHA and sawdust ash. RHA is a good pozzolan since silica content is in it at a high percentage. Therefore, it would be an excellent source of silica, which would be required in making high-performance concrete. Reduction in environmental pollution, lesser disposal, and the cost associated with it can be achieved when RHA is used.

METHODS AND MATERIALS:

PRODUCTION OF SAW DUST ASH &RICE HUSH ASH

The production of Rice Husk Ash (RHA) and Sawdust Ash (SDA) by controlled burning can have a satisfactory physical property similar to that previously occupies, also chemical wise mineral admix position. Addition of RHA into concrete could increase the strength and quality, but high carbon composition would reduce it due to pozzolanic activity. The only thing is that it can slightly reduce the environmental degradation caused by using RHA in AAMs production. The properties of RHA largely depend on the production process, and as such its reactivity also varies… It is observed that AAMs incorporating RHA exhibited significant improvements in mechanical, microstructural and durability properties and both are soybean-based eco- friendly low-cost cementitious materials. Hence, it is one of the most probably deployed examples in sustainable construction. In ferro cement furnaces/boilers with air ducts, the rice husks and sawdust are incinerated for 24 hours within temperature controls at 500- 800°C to lower the carbon content. Combustion fans are used to help the combustion process. Waste wood such as sawdust gave birth to sawdust stoves that produce sustained amounts of heat with a very large margin of smoke and almost no service required during the operation, which is suitable for houses and buildings that are in use on a permanent basis.

TABLE 1 PHYSICAL PROPERTIES

Physical State	Solid-non- Hazardous
Appearance	Fine powder
Particle Size	25microns
Color	Grey
Odour	Odourless

Cement

Cement used in the experimental work is ordinary Portland cement of 53 Grade of specific gravity 3.15. The chemical composition of ordinary Portland cement of 53 grade is shown

TABLE 2 CHEMICAL PROPERTIES

CHEMICAL CONTENT	%
Aluminium Oxide(Al_2O_3)	4.47
Silicon Di oxide(SiO_2)	20.34
Calcium Oxide (CaO)	62.91
Iron Oxide (Fe_2O_3)	4.58
Magnesium Oxide(MgO)	1.24
Potassium Oxide (K_2O)	0.29
Sodium Oxide (Na_2O)	0.31

METHODOLOGY

LITERATURE REVIEW
COLLECTION OF RAW MATERIALS
TESTING OF MATERIALS
PROPERTIES OF MATERIALS
MIX DESIGN
CASTING OF SPECIMEN

TESTING OF SAMPLES
DATA ANALYSIS AND EVALUATION
CONCLUSION

TESTING OF MATERIALS

CEMENT

TABLE 3 CEMENT PROPERTIES

Specific gravity of Cement	3.15
Fineness	1.8%
Initial setting	33mts
Final setting	12 hr

TABLE 4 SIEVE TEST

Sieve size	Weight retained	Cumulative wt	Cu.wt.% retained
10mm	3	3	0.6
4.75mm	8	11	2.2
2.36mm	16	27	5.4
1.18mm	79	106	21.2
600 microns	216	322	64.4
300 microns	108	430	86
150 microns	63	493	98.6
<150microns	7	500	100

WATER ABSORPTION

Water Absorption of RHA&SDA

5%	=	7.42%
10%	=	8.73%
15%	=	10.34%

Test Result of ASH TABLE 5

S.No	DESCRIPTION	VALUES OBTAINED
1	Specific Gravity	1.96
2	Water Absorption	8.83%
3	Fineness modulus	6.81%

MIX DESIGN:

TABLE 6 Stipulation for proportioning

Grade Designation	M30
Ratio	1:0.75:1.5
Type of cement	OPC53grade
Maximum nominal size of aggregate	20mm
Minimum cement content:	320kg/m3
Maximum water-cement ratio	0.45
Workability	100mm(slump)
Types of aggregate:	Crushed angular aggregate
Maximum cement (opc) content:	450kg/m3

Mix proportion

Cement	13.57kg/m3
Rice husk ash & saw dust ash	1.356kg/m3

Water-cement–ratio   5.18kg/m3

Materials used in making of cube:

TABLE 7 Cube materials

Material	Weight(Kg/m3)
Cement	12.22
RHA&SDA	1.356
Water	5.18
WaterCement-ratio	0.42

Fig 1: Mixing

Fig 2: CUBE CASTING

FIG 3: CURING OF SPECIMEN

Compression Test

To find out the compressive strength of test specimens.

Apparatus : Compression testing machine.

Specimen : Cubes of 70.6 mm x 70.6mm x 70.6mm size

Mix Ratio   :M30

Procedure:

Cube curing time can be fixed one, usually 7 or 28 days depends on the standard (e.g. ASTM), BS). Take the cubes out from curing condition if any, allow them to dry little bit. Place the cube in cantering of compression testing machine. Load uniformly the cube until it crashes and make peak load applied.

FIG 4: CUBE TESTIN

COMPRESSION TEST RESULTS TABLE 7 TEST RESULT

S.NO	ASH %	CM ST 7 DAYS	CM ST 14 DAYS	CM ST 28 DAYS
1	10%	17.5MPA	13MPA	7.5MPA
2	15%	16.45MPA	10MPA	5.8MPA
3	20%	13.52MPA	8.5MPA	4.2MPA

CONCLUSION

Experimental Study on the Compressive and Split Tensile Strength of Concrete Partially Replaced with Rice Husk Ash (RHA) and Sawdust Ash (Abhinav et al., 2018): ─ The same paper shows some reasons for improvement in concrete strength because RHA is being sifted, sawing extracted from diesel ash. Both the materials that are waste products can be used in this and thereby reducing the cost of construction to a greater extent. The optimum replacement level is found as 0-15% with M30 grade concrete.

However, while SDA and RHA doses increase in the mixtures (Table 3), this could be observed that these have shown negative effects; slump values would indicate a decrease of workability. Furthermore by including this ash, we can actually achieve a reduction in carbon/greenhouse gas emissions over the life-cycle of pyrolysis infusing concrete through some capable mechanisms that are still being researched. Therefore, the construction and rice industries are recommended to take advantage of use with RHA or SDA in making concrete because other technical/economic benefits can be gained from using them instead primarily for betterment mineral admixture addition.

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CHAPTER 26
DESIGN AND OPTIMIZATION OF SOLAR STEAM GENERATOR

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ABSTRACT

Extensive research has been conducted on solar-powered technologies due to the growing worldwide need for sustainable energy sources. Among these technologies, solar steam generation has emerged as a highly promising approach for renewable energy production. This research paper focuses on the development and enhancement of a solar steam generator with the objective of utilizing solar energy to produce steam efficiently. The concentrated solar radiation is harnessed by the solar steam generator to raise the temperature of water or a working fluid until it reaches its boiling point. This process generates steam, which can then be used for a range of applications, including electricity generation, desalination, and industrial processes. The design of the generator takes into account factors such as thermal efficiency, cost-effectiveness, and scalability. To ensure maximum energy conversion efficiency, the system carefully analyses and optimizes various components, including solar concentrators, absorbers, and heat exchange systems. Additionally, cutting-edge materials and manufacturing methods are being investigated to improve longevity and efficiency while reducing environmental harm. Computational modelling methods, such as computational fluid dynamics (CFD) simulations, are utilized to forecast and enhance the thermal efficiency of the system across various operational scenarios. The optimization procedure takes into account factors like solar concentration ratio, absorber material characteristics, and heat transfer mechanisms in order to attain peak efficiency. Furthermore, the financial viability of the solar steam generator is evaluated, taking into consideration aspects such as initial capital outlay, running costs, and potential income sources. This study makes a valuable contribution to the progress of solar steam generation technology through the introduction of a thorough design and optimization

INTRODUCTION

For centuries, mankind has been striving to tap into the immense potential of solar energy, aiming to find eco-friendly and renewable alternatives to address environmental issues and cater to the ever-increasing energy needs. A groundbreaking advancement in this endeavor is the solar steam generator, a cutting-edge technology that effectively transforms sunlight into usable thermal energy. Unlike conventional photovoltaic systems that directly convert sunlight into electricity, solar steam generators harness the sun's heat to generate steam, which can be employed for a wide range of purposes such as power generation, desalination of water, industrial operations, and beyond.

In a time when sustainable energy solutions are becoming more and more crucial, solar power emerges as a promising renewable resource with immense potential. 2 Solar steam generation, among the different ways of utilizing solar energy, is especially important because of its versatility and effectiveness. By using solar energy to create high-temperature steam, a solar steam generator provides a clean and sustainable option compared to conventional steam generation methods reliant on fossil fuels.

A solar steam generator primarily comprises solar collectors, a heat transfer system, and a steam generation unit. These elements collaborate to transform sunlight into thermal energy, which is subsequently harnessed to generate steam for a wide range of industrial, commercial, and residential purposes. This eco-friendly process produces no greenhouse gases or harmful pollutants, thereby aiding in the fight against climate change and lessening reliance on limited fossil fuel reservoirs.

WORKING PRINCIPLE

Solar steam generators are innovative devices that harness the power of sunlight to produce steam, which can be utilized for various applications such as electricity generation, water desalination, and industrial processes. This technology is gaining momentum as a sustainable alternative to conventional steam generation methods that rely on fossil fuels. In this document, we will explore the working principle of a solar steam generator and its significance in the realm of renewable energy.

Solar Energy Conversion

The fundamental principle behind a solar steam generator is the conversion of solar energy into thermal energy, which is then used to generate steam. This process.

Involves several key components

1. **Solar Collectors:** Solar collectors, often in the form of parabolic troughs or flat-plate collectors, are used to concentrate sunlight onto a receiver. These collectors are typically equipped with mirrors or reflective surfaces to maximize solar irradiance.

2. **Receiver Tube:** The receiver tube, located at the focal point of the solar collector, absorbs the concentrated sunlight and converts it into heat. This tube is usually coated with a selective absorber material to enhance thermal efficiency.

Steam Generation

Once the heat transfer fluid reaches a sufficiently high temperature, it is used to produce steam through a process known as vaporization. The steam generation system typically consists of the following components:

1. **Heat Exchanger:** The heat transfer fluid exchanges heat with water in a heat exchanger, transferring thermal energy to the water and causing it to boil. .

2. **Boiler:** The boiled water generates steam within a boiler chamber, where the pressure and temperature are carefully controlled to achieve the desired steam quality and output.

3. **Steam Turbine:** The high-pressure steam produced by the boiler is directed onto turbine blades, causing the turbine to rotate and drive an electrical generator, thereby converting the thermal energy of the steam into electrical power.

Efficiency and Optimization

The efficiency of a solar steam generator depends on various factors, including solar irradiance, collector design, thermal storage capacity, and system integration. To optimize efficiency and performance, several strategies can be employed:

1. **Tracking Systems:** Solar collectors can be equipped with tracking systems that adjust their orientation to track the movement of the sun throughout the day, maximizing solar exposure and thermal energy collection.

2. **Thermal Storage:** Incorporating thermal storage systems allows excess heat generated during periods of high solar irradiance to be stored for later use, ensuring continuous steam generation even when sunlight is limited.

3. **Advanced Materials:** The use of advanced materials, such as high-efficiency absorber coatings and heat-resistant alloys, can enhance thermal absorption and heat transfer capabilities, improving overall system efficiency.

STEAM STORAGE CONTAINER
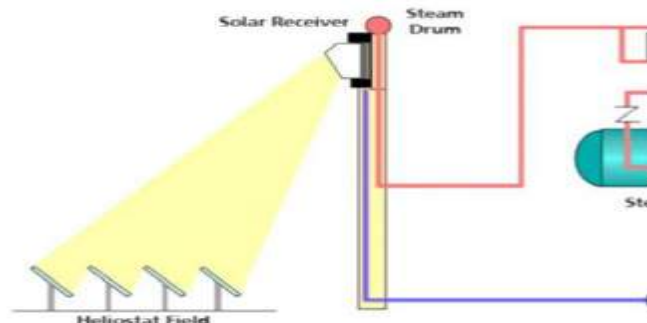
Fig no 3.6

Solar steam generators have a wide range of 4 applications across various industries and sectors:

1. **Power Generation:** Solar steam generators can be integrated into concentrated solar power (CSP) plants to produce electricity on a large scale, providing a renewable alternative to conventional fossil fuel-based power plants.

2. **Water Desalination:** The steam produced by solar steam generators can be used in desalination plants to convert seawater into fresh water, addressing water scarcity challenges in coastal regions.

Environmental Benefits

The adoption of solar steam generators offers several environmental benefits compared to traditional steam generation methods:

1. **Re duced Carbon Emissions:** By harnessing solar energy as a clean and renewable resource, solar steam generators significantly reduce greenhouse gas emissions associated with fossil fuel combustion, mitigating climate change impacts.

2. **Water Conservation:** Solar steam generation consumes minimal water compared to conventional steam generation technologies, making it a more sustainable option, particularly in water-scarce regions.

3. **Energy Independence:** Solar steam generators contribute to reducing dependence on finite fossil fuel resources, enhancing energy security and resilience against fuel price fluctuations and supply disruptions.

APPLICATION:

Electricity Generation: Steam generated by solar steam generators can be used to drive turbines connected to generators to produce electricity.

Industrial Processes: Steam is widely used in various industrial processes such as sterilization, chemical manufacturing, and food processing. Desalination: Solar steam generators can also be used in desalination plants to produce fresh water from seawater or brackish water.

Heating: Steam can be used for space heating in buildings or for district heating systems.

Solar steam generators offer a renewable and sustainable alternative to conventional steam generation methods that rely on fossil 16 fuels, contributing to reducing

CONCLUSION:

To summarize, the development and utilization of solar steam generators offer a promising solution to meet the increasing energy demands while mitigating the negative impacts of climate change. Throughout this discussion, we have explored various aspects of solar steam generators, including their principles, advancements, applications, advantages, and challenges. Solar steam generation, which utilizes solar energy to produce steam, has the potential to address the energy needs of various sectors, including electricity generation, water desalination, and industrial processes. By converting sunlight into heat and using this thermal energy to generate steam, solar steam generators provide a renewable and environmentally friendly alternative to traditional fossil fuel-based methods. This transition

not only reduces greenhouse gas emissions but also promotes energy independence and resilience in the face of fluctuating fuel prices and geopolitical uncertainties. Technological advancements in solar steam generation have played a crucial role in improving its efficiency, scalability, and cost-effectiveness. Innovations such as selective solar absorbers, concentrated solar power systems, and new materials for solar receivers have significantly enhanced the overall performance and feasibility of solar steam generators. Additionally, the integration of energy storage systems and.The utilization of solar steam generation has a wide range of applications in various sectors, each offering unique 17 opportunities to harness solar energy. Solar steam turbines and solar thermal power plants have proven to be effective in generating clean and dependable electricity, especially in regions with abundant sunlight. Additionally, solar steam generators play a crucial role in water desalination, providing a sustainable solution to freshwater scarcity by using solar heat to convert seawater obrackish water into freshwater. Furthermore, solar steam is essential in industrial processes like food processing, chemical manufacturing, and enhanced oil recovery, where high-temperature steam is necessary for production.

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CHAPTER 27

TRIBOLOGY BEHAVIOR OF AL6061 / NANO-ZRB2 METALMATRIX COMPOSITES PREPARED VIA STIR CASTING PROCESS

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ABSTRACT

This research aims to investigate the tribological Behavior of Al6061/nano-ZrB2 metal matrix composites, which were produced using stir casting. The study emphasizes the potential of these composites in industries such as automotive and aerospace due to their improved mechanical and tribological properties. By adding 3 to 7.5 wt.% of nano-ZrB2 to Al6061, twelve composites were formed, exhibiting enhanced physical, mechanical, corrosion, and tribological characteristics. The electron microscopy analysis confirmed the uniform distribution of nano-ZrB2, indicating successful manufacturing and optimized material properties. Additionally, the study explores the use of equal channel angular pressing (ECAP) to refine the grain structure of magnesium. Both experimental and numerical methods were employed for analysis. Furthermore, tribological analysis was conducted on AA7075 alloy composites with reinforcements of SiC, B4C, and waste porcelain. Among these composites, the one with 7.5 wt.% B4C demonstrated the highest mechanical strength, while the composite with 6 wt.% porcelain exhibited the lowest wear and friction. The composite with 7.5 wt.% porcelain displayed the lowest density and corrosion rate, making it suitable for specific applications. To aid in material selection, a novel AHP/CRITIC-COPRAS method was introduced, ranking the AA7075 composite with 7.5 wt.% porcelain as the most suitable for automotive use. Overall, this research provides v aluable insights into material interactions and performance, offering solutions for industries to enhance component performance in the face of technological progress.

KEYWORDS

Aluminium Metal Matrix Composite, Stir casting, Hardness, Wear resistance.

INTRODUCTION

Background

1. **Evolution of Composites:** The evolution of composite materials has been a continuous journey in materials science and engineering. From the ancient amalgamation of mud and straw to modern sophisticated composites, the quest for materials with superior properties has been relentless. The study of tribology, focusing on friction, wear, and lubrication, has become increasingly crucial as industries demand materials that can withstand dynamic and challenging environments.

2. **Significance of Tribology:** Tribology's significance is evident in applications where surfaces interact, leading to wear and friction. As technology advances, machinery, aerospace systems, and automotive components are subjected to higher loads and speeds, emphasizing the need for materials that exhibit superior tribological behavior. The Al6061/nano-ZrB2 composite, synthesized through the innovative stir casting process, represents a potential breakthrough in addressing these challenges.

Composite Material Principles

1. **Composite Structure:** The fundamental principle of composites lies in the combination of a matrix phase and a reinforcing phase. Metal matrix composites (MMCs) typically employ a metal alloy as the matrix and reinforcing elements in various forms such as fibers or particles. The Al6061/nano-ZrB2 composite adheres to this principle, utilizing aluminium alloy (Al6061) as the matrix and nanoscale Zirconium Diboride (nano-ZrB2) as the reinforcing material.

2. **Stir Casting Process:** The stir casting process is pivotal in determining the homogeneity and integrity of the composite structure. In this technique, the reinforcing particles, in this case, nano-ZrB2, are introduced into the molten Al6061 matrix and thoroughly mixed. The controlled stirring ensures a uniform distribution of the reinforcing phase, optimizing the mechanical and tribological properties of the final composite.

Al6061/nano-ZrB2 Composite

1. **Matrix Selection:** Al6061 Alloy: Aluminium alloy, specifically Al6061, serves as an exemplary matrix material due to its remarkable combination of mechanical properties. Known for its high strength, excellent machinability, and corrosion resistance, Al6061 provides a robust base for the incorporation of nano-ZrB2 particles. The ductility of the matrix is crucial for load transfer between particles, enhancing the overall toughness of the composite.

2. **Reinforcing Phase:** Nano-ZrB2, chosen as the reinforcing phase, possesses exceptional properties at the nanoscale. Its high strength, hardness, and thermal stability contribute significantly to the composite's overall performance. The nanoscale dimensions ensure a more effective load transfer between the matrix and the reinforcing particles, enhancing the composite's mechanical strength.

Importance of Tribology in Composites

Wear Resistance: Wear resistance is a critical aspect of tribology, particularly in applications where surfaces experience relative motion. The Al6061/nano-ZrB2 composite is anticipated to demonstrate superior wear resistance, a characteristic essential for extending the lifespan of components subjected to abrasive environments.

Motivation for the Study

1. **Applications of Al6061/nano-ZrB2 Composite:** The motivation for studying the tribological behavior of the Al6061/nano-ZrB2 composite extends to its potential applications in diverse industries. Aerospace, automotive, and machinery sectors could benefit significantly from a material offering enhanced wear resistance, reduced friction, and efficient lubrication characteristics.

2. **Advanced Material Solutions:** In an era where the demand for materials capable of withstanding extreme conditions is escalating, the development of advanced composites becomes imperative. The Al6061/nano-ZrB2 composite, synthesized through the stir casting process, stands out as a versatile material solution, offering a unique blend of mechanical and tribological advantages.
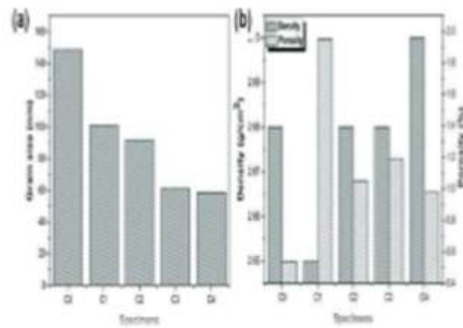
Fig.1 Comprehensive Tribological Analysis

ALUMINIUM

Aluminium alloys are a group of materials that combine aluminium with various alloying elements to enhance their mechanical, chemical, and physical properties. These alloys are widely used in industries such as aerospace, automotive, and construction due to their lightweight nature, corrosion resistance, and excellent machinability.

1. **PROPERTIES**

Here's a breakdown of the mechanical, chemical, and physical properties of aluminium alloys:

- **Mechanical Properties:** Strength Aluminium alloys exhibit varying degrees of strength depending on the alloying elements and processing techniques. They are generally less strong than steel but can be strengthened through heat treatment or cold working.

- **Hardness:** Aluminium alloys are relatively soft compared to steel but can be hardened through alloying and heat treatment.

- **Ductility:** Aluminium alloys are highly ductile, meaning they can be easily formed into various shapes without breaking.

- **Toughness:** Aluminium alloys have good toughness, allowing them to withstand impact and fatigue loads.

- **Machinability:** Aluminium alloys are known for their excellent machinability, making them suitable for a wide range of machining operations.

I.   Chemical Properties

- **Corrosion Resistance:** One of the most significant advantages of aluminium alloys is their excellent corrosion resistance. They form a protective oxide layer on the surface that prevents further corrosion.

- **Reactivity:** Aluminium alloys are highly reactive with oxygen, which is why they quickly form a protective oxide layer when exposed to air.

- **Compatibility:** Aluminium alloys are compatible with a wide range of other materials, making them suitable for use in various applications.

II.   Physical Properties

- Density: Aluminium alloys have a low density, making them lightweight compared to other metals. This property is particularly advantageous in industries where weight reduction is critical.

- Melting Point: Aluminium alloys have a relatively low melting point compared to other metals, making them easy to melt and process.

- Thermal Conductivity: Aluminium alloys have good thermal conductivity, allowing them to dissipate heat quickly. This property is beneficial in heat exchangers and other thermal management applications.

- Electrical Conductivity: Some aluminium alloys have excellent electrical conductivity, making them suitable for electrical applications.

2. CHEMICAL COMPOSITION

Aluminium 97.9–98.9%

Silicon 0.4–0.8%

Iron 0.7% max

Copper 1.0–1.8%

Manganese 0.15% max

Magnesium 1.0–1.2%

Chromium 0.04–0.35%

Zinc 0.25% max

Titanium 0.15% max

Other elements 0.05% max each, 0.15% total max

Zirconium Diboride (ZrB2) is a ceramic material. It should be emphasized that the specific composition and characteristics of the nanoscale ZrB2 particles may differ depending on the method and conditions of synthesis. Generally, ZrB2 consists of zirconium and boron, with occasional traces of carbon. These nano-sized particles are commonly utilized to improve the mechanical and tribological properties of metal matrix composites. In the production of metal matrix composites through stir casting, the procedure entails dispersing the nano-sized reinforcement particles (such as ZrB2) into the molten metal matrix (Al6061 alloy in this instance) and then stirring to achieve a uniform mixture.

WORKING METHOD

Melting the metal matrix of aluminium along with reinforcement materials like zirconium diboride (ZrB2) and graphite involves several steps. Here's a step-by step procedure for melting the metal matrix with these reinforcement materials:

1. **Preparing the Aluminium Alloy:** The aluminium alloy, such as AA6061, should be in the form of clean, dry ingots or chips. This ensures that the alloy is free from contaminants that could affect the quality of the final composite. If the alloy is not already in ingot or chip form, it may need to be melted and cast into these forms before proceeding with the composite preparation.

2. **Furnace Setup:** To melt the aluminium alloy along with zirconium diboride (ZrB2) and graphite reinforcement materials, a crucible furnace capable of reaching temperatures above 660°C, the melting point of aluminium, is used. The crucible furnace is selected based on the amount of material to be melted and is prepared by ensuring it is clean and free of any contaminants. A clean, dry crucible, typically made of heat-resistant material like ceramic or graphite, is placed inside the furnace.

3. **Loading the Furnace:** After the crucible furnace reaches the desired temperature, the next step is to place the aluminium alloy ingots or chips into the crucible. It's important to ensure that the aluminium is clean and free of any contaminants that could affect the quality of the final composite. Once the aluminium is in the crucible, the zirconium diboride (ZrB2) and graphite reinforcement materials are added to the

aluminium alloy. Care should be taken to add the reinforcement materials evenly to ensure uniform distribution throughout the alloy. Mixing the materials thoroughly is essential to achieve a homogenous composite material with consistent properties.

4. **Melting the Metal Matrix:** It important to ensure that the aluminium is clean and free of any contaminants that could affect the quality of the final composite. Once the aluminium is in the crucible, the zirconium diboride (ZrB2) and graphite reinforcement materials are added to the aluminium alloy. The proportions of these materials should be as per the desired composite composition, as this will directly impact the final properties of the composite. Mixing the materials thoroughly is essential to achieve a homogenous composite material with consistent properties.

5. **Incorporating the Reinforcement Materials:** Once the aluminium alloy is completely molten, the zirconium diboride (ZrB2) and graphite reinforcement materials are added to the crucible. These materials are added gradually while continuing to stir the molten metal to ensure that they are uniformly distributed throughout the alloy. The stirring process should be done carefully to avoid introducing air bubbles or contaminants into the molten metal. Ensuring that the reinforcement materials are evenly dispersed will help enhance the mechanical and wear characteristics of the final composite material.

6. **De-Gassing (Optional):** To remove any trapped gases and ensure the quality of the composite material, it is important to consider using a degassing agent or applying a vacuum to the molten metal. Trapped gases can negatively impact the mechanical properties and surface finish of the final composite material. Using a de-gassing agent involves adding a chemical compound to the molten metal that reacts with the gases, causing them to form bubbles that can be easily removed. Alternatively, applying a vacuum to the molten metal can help to draw out the gases. This step is particularly crucial for achieving high-quality composite materials with uniform properties and improved performance.

7. **Casting the Composite:** Once the reinforcement materials are evenly distributed throughout the molten aluminium alloy, the composite can be cast into the desired shape or Mold. This process involves carefully pouring the molten composite material into the Mold and allowing it to cool and solidify. The cooling process can

be accelerated by using a cooling chamber or other cooling methods. It is important to ensure that the Mold is properly prepared and that the composite material is poured evenly to avoid defects in the final product. Once the composite has cooled and solidified, it can be removed from the Mold and further processed or machined as needed.

8. **Post-Processing:** After the composite has solidified in the Mold, it may undergo additional heat treatment or processing steps to further enhance its properties. Heat treatment can be used to optimize the microstructure of the composite, improving its mechanical and thermal properties. For example, heat treatment can help to reduce internal stresses, increase hardness, and improve wear resistance.

9. **Testing and Quality Control:** After the composite material has been processed and shaped, it is important to perform tests to ensure that it meets the desired mechanical and physical properties. These tests may include tensile testing, hardness testing, impact testing, and wear testing, among others. These tests help to determine the strength, hardness, toughness, and other key characteristics of the composite material. Additionally, conducting quality control checks is essential to verify the uniformity and integrity of the composite.

CONCLUSION

The mechanical and wear characteristics of AA6061 aluminium hybrid matrix composites, specifically focusing on the reinforcement particles zirconium diboride (ZrB2) and molybdenum disulfide (MoS2), have been investigated to understand their potential applications and performance in various industrial settings. These composites are of particular interest due to their enhanced mechanical properties and wear resistance, which are crucial for applications such as manufacturing bearing surfaces, bushes, gears, cylinder liners, pistons, and camshafts. The addition of ZrB2 and MoS2 reinforcement particles has been found to significantly improve the mechanical properties of AA6061 aluminium alloy. The composites exhibit increased hardness, strength, and wear resistance, making them ideal for use in high-stress applications where durability and performance are critical. Additionally, the presence of these reinforcement particles enhances the thermal stability and chemical inertness of the composites, further expanding their potential applications in

harsh environments. The study also highlights the importance of optimizing the composition and processing parameters of these composites to achieve the desired mechanical and wear characteristics. Factors such as the particle size, distribution, and volume fraction of the reinforcement particles play a crucial role in determining the overall performance of the composites. Overall, the findings of this study contribute to the advancement of AA6061 aluminium hybrid matrix composites and provide valuable insights into their potential applications in various industrial sectors. Further research in this area could focus on exploring additional reinforcement materials and their effects on the mechanical and wear characteristics of these composites, as well as the development of advanced processing techniques to further enhance their performance and durability.

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CHAPTER 28

EXPERIMENTAL AND INVESTIGATION OF E-GLASS FIBRE BANANA FIBRE AND ORANGE PEEL USING BRAKE PAD

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ABSTRACT

Natural fibre composites are nowadays being used in various engineering applications to increase the strength and to optimise the weight and the cost of the product. The review of paper is to represent a general study on the alternative material for the brake pad. The results are compared for different loading conditions and a suitable composite is selected for the research of e- glass, banana fibre and orange peel with epoxy composite using brake pad. The study of mechanical properties of the composites was also investigated. The use of natural fibres in composites has been a growing research interest due to their low cost, renewable nature, and eco-friendliness. In this experiment, E-glass fibre banana fibre and orange peel were investigated as potential reinforcements for brake pads. The brake pad formulations were prepared using a thermoset resin, a hardener, and varying amounts of the three different fibres. The mixture was then moulded into brake pad shapes and cured at room temperature. The mechanical and tribological properties of the resulting brake pads were then evaluated. The results showed that the addition of banana fibres and orange peel to the brake pad formulation significantly improved the friction coefficient and wear resistance, while the E-glass fibre had a negligible effect on the performance. The brake pads reinforced with banana fibre exhibited the highest friction coefficient and wear resistance, followed by orange peel and E-glass fibre.

KEYWORDS

Natural fibre composites, Brake pad materials, E-glass fibre Banana fibre orange peel, Mechanical properties, Tribological properties

INTRODUCTION

A composite material can be defined as a combination of two or more materials that results in better properties than those of the individual components used alone. In contrast to metallic alloys, each material retains its separate chemical, physical, and mechanical properties. The two constituents are reinforcement and a matrix. The main advantages of composite materials are their high strength and stiffness, combined with low density, when compared with bulk materials, allowing for a weight reduction in the finished part.

The reinforcing phase provides the strength and stiffness. In most cases, the reinforcement is harder, stronger, and stiffer than the matrix. The reinforcement is usually a fibre or a particulate. Particulate composites have dimensions that are approximately equal in all directions. They may be spherical, platelets, or any other regular or irregular geometry. Particulate composites tend to be much weaker and less stiff than continuous fibre composites, but they are usually much less expensive. Particulate reinforced composites usually contain less reinforcement (up to 40 to 50 volume percent) due to processing difficulties and brittleness. A fibre has a length that is much greater than its diameter. The length-to-diameter (l/d) ratio is known as the aspect ratio and can vary greatly. Continuous fibres have long aspect ratios, while discontinuous fibres have short aspect ratios. Continuous-fibre composites normally have a preferred orientation, while discontinuous fibres generally have a random orientation. Examples of continuous reinforcements include unidirectional, woven cloth, and helical winding. while examples of discontinuous reinforcements are chopped fibres and random mat. Continuous-fibre composites are often made into laminates 3

by stacking single Sheets of continuous fibres in different orientations to obtain the desired strength and stiffness properties with fibre volumes as high as 60 to 70 percent. Fibres produce high-strength composites because of their small diameter; they contain far fewer defects (normally surface defects) compared to the material produced in bulk.

MATERIALS AND METHODS

Brake pads are a component of disc brakes used in automotive and other applications. Brake pads are steel backing plates with friction material bound to the surface that faces the disc brake rotor.

Brake Pad Function

Brake pads convert the kinetic energy of the car to thermal energy by friction. Two brake pads are contained in the brake calliper with their friction surfaces facing the rotor. When the brakes are hydraulically applied, the calliper clamps or squeezes the two pads together into the spinning rotor to slow/stop the vehicle. When a brake pad is heated by contact with a rotor, it transfers small amounts of friction material to the disc, turning it dull Gray. The brake pad and disc (both now with friction material), then "stick" to each other, providing the friction that stops the vehicle. In disc brake applications, there are usually two brake pads per disc rotor, held in place and actuated by a calliper affixed to a wheel hub or suspension upright. Although almost all road-going vehicles have only two brake pads per calliper, racing calliper utilize up to six pads, with varying frictional properties in a staggered pattern for optimum performance. Depending on the properties of the material, disc wear rates may vary. The brake pads must usually be replaced regularly (depending on pad material), and most are equipped with a method of alerting the driver when this needs to take place. Some are manufactured with a small central groove whose eventual disappearance through wear indicates that pad is nearing the end of its service life. Others are made with a thin strip of soft metal in a similar position that when exposed through wear causes the brakes to squeal audibly. Still others have a soft metal tab embedded in the pad material that closes an electric circuit and lights a dashboard warning light when the brake pad gets thin.

Brake pads

Selection of Material

This chapter describes the details of processing of the composites and the experimental procedures followed for their mechanical characterization. The materials used in this work are

*Orange peel fibre

*Banana fibre

*E-glass fibre

RESULTS AND DISCUSSION

Orange Peel

Orange is a citrus fruit mainly originated in Southeast Asia. It is the most commonly grown tree fruit in the world. Like all citrus fruits, the orange is acidic having pH range 2.9-4.0. Orange peel, the outer cover part of an orange, mainly consists of cellulose, essential oils, proteins and some simple carbohydrates. The orange peels were collected locally and were sun dried for 5 days. As soon as you break the skin of an orange, its sweet-tangy scent fills the air. Many, anxious to get to the juicy segments of the orange itself, consider the peel's job done and discard it in the nearest compost bin. As some have now realized, once the orange is consumed, the orange peel has many uses all on their own. The most effective orange peels to use is that of an organic orange, but other orange peels will still do the trick.

(a) Orange peels

b) Sun dried orange peels   **c) Powdered orange peels**

Sun drying was necessary to remove the moisture from the peels. The fibres were then grinded into fine powder as shown the collected powders were sieved and a particle size distribution in a sample is given in Table-3.1. Since the wt% of 212+ microns was around 74.6grams, for the present investigation we have taken this particle size for further experimentation.

Banana Fibre

Banana fibre a lingo cellulosic fibre obtained from the pseudo-stem of banana plant (Musa septennium), is a bast fibre with relatively good mechanical properties. The pseudo-stem is a clustered, cylindrical aggregation of leaf stalk bases. Banana fibre at present is a waste product of banana cultivation and either not properly utilized or partially done so. The extraction of fibre from the pseudo stem is not a common practice and much of the stem is not used for production of fibres. The buyers for banana fibres are erratic and there is no systematic way to extract the fibres regularly. Useful applications of such fibres would regularize the demand which would be reflected in a fall of the prices.

Banana fibre

Banana fibres have highly strength, light weight, smaller elongation, fire resistance quality, strong moisture absorption quality, great potentialities and biodegradability. Banana fibre has recognized for apparels and home furnishings Banana fibre has great potentialities for paper making special demand of handmade paper.

Glass Fibre

Glass Fibres are among the most versatile industrial materials known today. They are readily produced from raw materials, which are available in virtually unlimited supply. All glass fibres described in this article are derived from compositions containing silica. They exhibit useful bulk properties such as hardness, transparency, resistance to chemical attack, stability, and inertness, as well as desirable fibre properties such as strength, flexibility, and stiffness. Glass fibres are used in the manufacture of structural composites, printed circuit boards and a wide range of special-purpose products.

CONCLUSIONS

In conclusion, the experimental investigation into the utilization of E-glass fibre banana fibre and orange peel in brake pad formulations offers promising avenues for sustainable material development. The notable improvements in friction coefficient and wear resistance observed with banana fibres and orange peel underscore their potential as effective reinforcements in brake pad applications. Conversely, the minimal impact of E-glass fibre suggests a need for further optimization or exploration of alternative fibre combinations. These findings emphasize the importance of ongoing research to refine natural fibre composites, ultimately contributing to enhanced performance and environmental sustainability in the automotive industry. the experimental exploration into the integration of E-glass fibre banana fibre and orange peel in brake pad formulations offers notable implications for sustainable material applications.

The discernible enhancements in friction coefficient and wear resistance observed with banana fibres and orange peel underscore their potential as effective reinforcements. Conversely, the limited influence of E-glass fibre suggests the need for a nuanced selection of reinforcing materials in composite formulations.

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CHAPTER 29

ENHANCING DIESEL ENGINE PERFORMANCE AND EMISSIONS REDUCTION USING WASTE COOKING OIL BIODIESEL WITH ZnO NANO PARTICLES

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ABSTRACT

The need for alternative energy resources is increasing drastically due to the problems associated with fossil fuels. In this work, waste cooking oil is considered as the source for biodiesel production as it doesn't interfere the food security. The biodiesel is produced by transesterification process and 20% of biodiesel is blended with diesel fuel to form B20 as a primary fuel. The Zinc oxide nanoparticle has been introduced as fuel additive along with B20 and its performance and emission Behavior of a direct injection diesel engine has been evaluated. The ZnO nanoparticles was synthesized via solve thermal method using cow urine as a solvent and characterized by XRD, SEM and TEM. With the help of ultrasonicator, various proportions of ZnO viz. Nano materials are substances having a size of 1 to 100 nm and, as a result of their small volume and high surface area, exhibit novel features. Due to their superior features such as higher heat transfer rate, thermal conductivity, and surface reactivity, they can be used as a fuel additives to improve the performance and reduce the emission of engines. Nanoparticles are classified into inorganic, organic, polymer-based, and carbon materials and prepared through either a top-down approach or a bottom-up approach as shown in Fig.1.3. The metal oxides such as cerium oxide, aluminium oxide, zinc oxide, iron oxide, cobalt oxide, manganese oxide and carbon-based materials like CNT, MWCNT, GO and go has been widely used as the fuel additives with mineral diesel or biodiesel blend.

INTRODUCTION

Background the exponential growth of population and sophisticated human lifestyle, triggering a worldwide energy shortage. The major energy source, a fossil fuel that helps to

fulfil 80% of the world's energy demand, is limited and also emits an enormous amount of pollutants that resulting in severe environmental problems such as air pollution, climate change, global warming, and human-related issues. In order to avoid the problems associated with the use of non-renewable energy resources, the scientist are looking to utilize a renewable energy often called "clean energy", is captured from sunlight either directly or indirectly by means of photovoltaic, solar thermal, biomass, tidal, and wind energy conversion technologies in an effective way. The complete combustion of hydrocarbon fuels produces CO_2 and water as an output. The CO_2 emission is not considered as the pollutant but it contributes to the global warming as it acts as a greenhouse gas.

Diesel Engines

The internal combustion engines are machines which convert heat energy produced by the combustion of fuel into useful mechanical work and it has been classified as spark ignition engine (petrol engine) and compression ignition engine (diesel engine) . The use of internal combustion engines becomes more popular in the day-to-day activities of human beings. In applications involving transportation, agriculture, power generation, locomotives, and heavy machinery, these internal combustion engines are mostly used. Because of its superior efficiency, low 3 specific fuel use, long life, and economical operation, the diesel engine, which is also known as a compression ignition engine, is a vital selection for heavy duty applications. However, the use diesel engines have the following issues.

Alternative Fuels

Alternative fuels are derived from non-conventional sources and they have similar properties to replace conventional fuels either partially or fully. They are majorly derived from renewable sources. The significance of using alternative fuels is,

- Attaining energy sustainability by utilizing alternative fuels that are derived from renewable energy sources.
- Enhancing engine efficiency and reducing the engine emissions to protect the environment

Hydrogen

In the twenty-first century, hydrogen from renewable energy sources can replace all other primary fuels due to its higher energy to weight ratio. It is the lightest gas, and its heat of combustion is roughly 2.5 times higher than that of other hydrocarbon fuels. Hydrogen is a clean, efficient, carbon free and gaseous fuel which is highly inflammable in nature and has the potential to eliminate or significantly reduce emissions across the board, most notably carbon dioxide because it has no carbon. Hydrogen gas can be produced by the following ways,

- Photo biological process
- Photo electrochemical process
- Electrolysis
- Thermos chemical process

The properties such as density, calorific value, viscosity, flash point and fire point are characterized as per ASTM standards to find the suitability of fuel for engine. The testing instruments and ASTM standards are shown in Table 3.1. Calorific value is the amount of heat released when a one kilogram of fuel is completely burned. The suitability of a prepared fuel as a substitute for diesel engine is mainly determined by heating value of the fuel. The spray characteristics are directly related to the viscosity and density of the fuel. The higher in viscosity, then the fuel will be atomized poorly which directly affect the combustion characteristics of the fuel. The fire point and flash point are used to understand the safety storage and transportation of fuel. The fuels have the higher flash point and fire point can easily store and carried without any difficulty when compared to the fuels which have lower flash point and fire point of 80°C for 2 hrs

In this work, ZnO nanoparticles were synthesized through solve thermal method with the use of cow urine as a novel solvent as well as reducing agent. Fig.3.3 shows the steps involved in the preparation of ZnO nanoparticles. The analytical grade of zinc nitrate hexahydrate was procured from Sigma Aldrich and used for further processing without any additional treatment. Cow urine used for this study was collected from a cow in our village (Sengunam, Preambular, Tamilnadu, India - 621220). and filtered using what man filter paper to remove the impurities. In this synthesize process, initially a required amount of

zinc nitrate hexahydrate (Zn(NO3)2.6H2O)) was dissolved in 20 ml of cow urine. The mixture was continuously stirred for 1hr using magnetic stirrer.

Then, the white-colored precipitate was obtained and transferred into Teflon lined autoclave and kept in a hot air oven at a temperature of 180 °C for 12 hrs for the thermal treatment. Once the completion of thermal treatment it has allowed to cool to room temperature, and washed several times with de ionized water as well as ethanol. Then, the sample was transferred into muffle furnace for annealing at a 24 temperature of 500 °C for 2 hrs. After the annealing process the end product was collected and sealed for further investigation

RESULT AND DISCUSSIONS

- This experimental setup consists of single cylinder, four stroke, and DI diesel engine. The specifications of diesel engine are shown in Table 3.2. The diesel engine is attached to eddy current type dynamometer for loading.

- It also consists of required tools for combustion pressure and crank-angle measurements. These signals are interfaced to computer through engine indicator for Pθ−PV diagrams.

- In addition, the required provisions are also made for interfacing fuel flow, airflow, load measurements and temperatures.

- The setup has stand-alone panel box consisting of fuel tank, air box, manometer, fuel measuring unit, transmitters for fuel and air flow measurements, engine indicator and process indicator. The rotameters are provided for measuring cooling water and calorimeter water flow

- Additionally, Lab view-based software package "Engine soft" which is developed by Apex Innovations Pvt. Ltd is provided for on line performance evaluation and performance monitoring of an engine. Monitoring, reporting, entering data, and recording information are just some of the tasks that Engine Soft may do for engine testing applications.

- In order to calculate power, efficiency, fuel use, and temperature output, the programme must use a number of inputs. When operational parameters are

changed, a wide range of graphs are produced. When doing on-line testing in RUN mode, the engine's essential signals are scanned, recorded, and shown graphically.

- The information is seen in both graphical and tabular representations through a stored file. Fig.3.4 depicts the experimental setup configuration.

- Initially, An engine is kept to running by diesel around 30 minutes at no load condition with an injection pressure of 200 bar, injection timing of 230C A TDC, speed of 1500 rpm, and a compression ratio of 17.5 for the baseline correction.

- Then, the prepared test fuel is supplied into the engine and operated at different loads from 0 to 100%. The required parameters such as consumption of fuel, torque, brake power, combustion parameters, CO, HC, Co2, smoke and NOx readings are obtained for each and every test fuel blends.

CONCLUSION

In the current state of affairs, it is important to find the alternative fuels for diesel engines due to the faster depletion of fossil fuels and the environmental problems associated with the conventional fuels. Biodiesel has been considered as the suitable alternative fuel for diesel engines.

- However, the use of biodiesel in a diesel engine has some drawbacks. To avoid these negative impacts the fuel additives has played a vital role. Therefore, in this work biodiesel was produced from waste cooking oil (used sunflower oil) and considered as the alternative fuel for diesel engine.

- Based on the literature, the biodiesel blend B20 is considered as the best blending ratio for using as a fuel in diesel engine. The experimental work was carried out in three different phases using fuel additives such as acetone and ZnO along with diesel – biodiesel blend to overcome the problems associated with the use of biodiesel blend as a fuel in diesel engine.

- Based on the experimental investigations the following conclusions were made. The ZnO as a fuel additive with B20 in different proportions10 ppm, 20 ppm and

30 ppm. The addition of ZnO nano fuel additive with B20 increases the fuel properties such as density, viscosity and calorific value.

- When nitrogen reacts with oxygen in an engine and it emits as NOx which is caused by higher cylinder temperature and ignition delay. The NOx emission pattern of different test fuels with considering the engine loads are as shown in Fig.4.15. The NOx emission has a direct proportional relation to the engine load because at higher engine loads the cylinder temperature would be more.

- The test fuel B20 has achieved a higher emission of NOx at all loading condition when compared to other fuels. It is due to the more local combustion temperature caused by more oxygen content in the biodiesel. But, the addition of ZnO with B20 helps to reduce the NOx emission than B20 without ZnO.

- Nevertheless, the addition of ZnO with B20 emits more NOx than diesel irrespective of loads. The test fuels B20, B20 Zn10, B20 Zn20 and B20 Zn30 records 12.66%, 4.01%, 7.41% and 7.47% higher NOx emission than diesel at peak load condition.

TABLES

Fuel Name /Properties	Density (kg/m^3)	Kinematic Viscosity at 40^0C (CSt)	Calorific Value (kJ/kg)	Flash point (^0C)	Fire Point (^0C)
Diesel	830	1.8	42500	58	62
B20	858	2.4	40625	56	60
B20Zn10	860	2.5	40723	45	50
B20Zn20	862	2.6	41014	46	52
B20Zn30	864	2.8	41306	48	54
ASTM Standards	D1298	D445	D240	D93	D93

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CHAPTER 30
PRE-DISPATCH INSPECTION AND TIME MANAGEMENT BRAKES UNIT

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ABSTRACT

A crucial stage in the production and delivery process, pre-delivery inspection (PDI) verifies that goods fulfil quality requirements prior to being delivered to the final customer. This abstract provides a thorough investigation of the PDI inspection of brake units, an essential element of vehicle safety. The aim of this study is to emphasize the importance of PDI inspection in improving the safety and quality of brake units. A thorough analysis of the inspection protocols, procedures, and best practices used to evaluate brake systems during the PDI process is included in the study. It also explores the difficulties manufacturers and inspectors face in guaranteeing the dependability and effectiveness of brake units. The findings of this study contribute valuable insights to the automotive industry, highlighting the importance of investing in robust PDI protocols for brake unit inspection. By implementing comprehensive inspection procedures, manufacturers can mitigate risks, enhance product reliability, and uphold stringent safety standards, ultimately fostering a culture of excellence and accountability across the supply chain. Keywords: pre-delivery inspection (PDI), brake units, quality assurance, automotive safety, inspection protocols, manufacturing, customer satisfaction.

INTRODUCTION

The pre-delivery inspection (PDI) process stands as a pivotal checkpoint in the automotive industry, ensuring that vehicles meet stringent quality, safety, and performance standards before reaching the hands of consumers. Among the myriad components subject to rigorous examination, brake units occupy a particularly crucial role, given their direct impact on roadworthiness and driver safety. However, alongside the imperative for

meticulous inspection lies the challenge of managing time effectively during the PDI procedure, a balancing act that profoundly influences output, affordability, and client satisfaction. At the heart of this intricate dynamic lies the need to strike a delicate equilibrium between the thoroughness of inspection protocols and the imperative of maximizing operational efficiency and throughput.

PRE-DISPATCH INSPECTION

In the automotive industry, particularly in brake manufacturing, ensuring the safety and reliability of brake components is paramount. Brake systems play a critical role in vehicle operation and passenger safety, necessitating strict quality control measures throughout the manufacturing process. Pre-dispatch inspection is a crucial step in this process, involving a comprehensive evaluation of brake components before they are shipped to vehicle assembly plants, aftermarket distributors, or retail outlets. During pre-dispatch inspection, trained technicians meticulously examine each component for defects, dimensional accuracy, material integrity, surface finish, and functional performance. This meticulous evaluation ensures that the brake components meet stringent quality standards, performance criteria, and regulatory requirements before integration into vehicles or sale to consumers. Brake components subject to pre-dispatch inspection may include brake pads, brake discs, brake callipers, brake hoses, and other related parts. By implementing rigorous pre-dispatch inspection protocols, brake manufacturers can mitigate the risk of shipping defective or substandard components. This proactive approach helps uphold product quality standards, enhance customer satisfaction, and contribute to overall road safety. The implementation of robust pre-dispatch inspection processes not only safeguards the reputation of manufacturers but also instils confidence in consumers regarding the safety and reliability of their vehicles' braking systems.

CCA- CAREER CALLIPERS ASSEMBLY
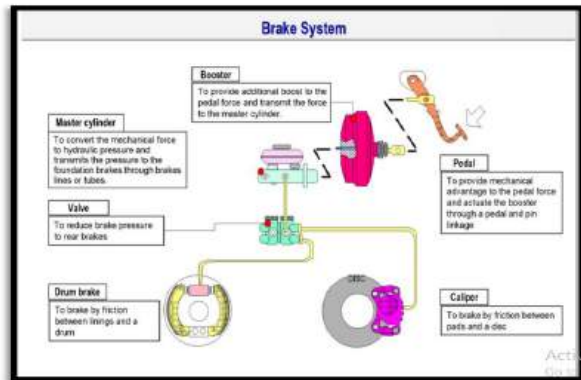
Fig.No.1

MBA-MASTER BOOSTER ASSEMBLY

Fig.No.2

The term "MBA-Master Booster Assembly" may not be widely recognized within the automotive industry as a standard component or system. However, based on the provided description, it seems to refer to a specialized type of brake booster assembly. A brake booster assembly, commonly known as a brake booster, is a critical component found in power brake systems used in vehicles. Its primary purpose is to assist the driver in applying the necessary force to operate the brakes effectively, particularly in vehicles equipped with hydraulic brake systems. Brake boosters work by utilizing vacuum pressure from the engine or an external vacuum pump to amplify the force applied by the driver to the brake pedal. This amplification of force makes it easier for the driver to engage the brakes, especially in

situations where additional force is required, such as during sudden stops or emergency braking makeovers. Overall, a brake booster assembly enhances braking performance and responsiveness, providing drivers with improved control and safety on the road. By reducing the amount of physical effort required to apply the brakes, brake boosters contribute to smoother and more efficient braking, particularly in larger or heavier vehicles.

DBA-DRAM BRAKE ASSEMBLY

Fig.No.3

Drum brake assemblies have been a staple in automotive braking systems for decades, providing a reliable means of deceleration for various vehicle types. While they have largely been replaced by disc brake systems in many applications, drum brakes still see use in certain vehicles, particularly in older models or as rear-wheel brakes in some modern vehicles. Understanding how drum brake assemblies' function is essential for appreciating their role in automotive history and their continued relevance in certain contexts. A drum brake assembly consists of several components working together to achieve effective braking. These components include the brake drum, brake shoes, wheel cylinder, springs, adjuster mechanism, and backing plate. Let's delve into each of these components and how they contribute to the overall operation of the drum brake system. Brake Drum: The brake drum is a cylindrical component mounted on the wheel hub. It rotates with the wheel and provides a surface against which the brake shoes can press to create friction and slow down or stop the vehicle. Brake Shoes: Inside the brake drum, there are two brake shoes positioned opposite each other. These brake shoes are typically curved to match the inner surface of the

brake drum. When the brakes are applied, hydraulic pressure or mechanical force causes the brake shoes to press against the inner surface of the drum, generating friction and slowing down the rotation of the wheel.

CCA- CAREER CALLIPERS ASSEMBLY
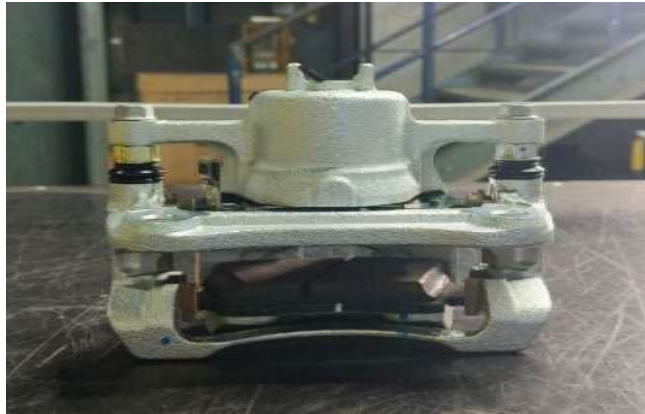
Fig.No.4

Callipers are indeed critical components in disc brake systems, responsible for applying pressure to the brake pads, which then clamp onto the rotor to slow down or stop the vehicle. Understanding how a typical calliper assembly works is essential for grasping its role in the braking system and the importance of proper maintenance and inspection.

MYTHOLOGY
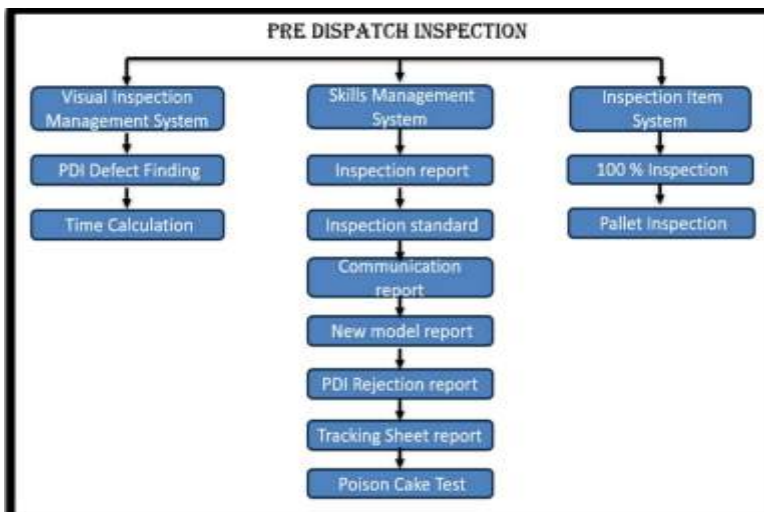
Fig.No5

VISUAL MANAGEMENT SYSTEM

The Visual management is a strategic approach utilized in lean construction to optimize operational efficiency and communication across various components of a production system, encompassing construction sites, design offices, and facilities. By harnessing visual cues and sensory communication, visual management aims to realize lean objectives at the operational level. Central to visual management is the objective of enhancing process transparency by embedding relevant information into different process elements such as physical space, equipment, tools, and personnel. This transparency ensures that all stakeholders possess a clear comprehension of workflow, tasks, and the status of ongoing activities

SKILLS MANAGEMENT SYSTEM

Skills management is a crucial process within organizations that focuses on comprehending, fostering, and utilizing the skills and competencies of employees to achieve strategic objectives and enhance performance. Effective skills management entails identifying the skills required for specific job responsibilities, evaluating the skills of individual employees, identifying skill gaps, and implementing targeted training and development programs to address these gaps. This process is typically facilitated through competency frameworks, skills matrices, or skills frameworks, which outline the desired skills, proficiency levels, and performance expectations for various roles within the organization. One of the primary objectives of skills management is the identification of skills needed for specific projects or job positions within the company. This involves a comprehensive analysis of job requirements, including fundamental skills, domain knowledge, and specialized competencies necessary for effective performance. By clearly defining the required skills, organizations can ensure that they have the right talent in place to meet their strategic objectives and drive business success. Once the necessary skills are identified, the next step in skills management involves evaluating and profiling employees' skills against predetermined skill sets. This evaluation process may include various methods such as self-assessment, peer reviews, manager evaluations, and objective assessments like exams or certifications

INSPECTIONS ITEM SYSTEM

Quality control processes are essential in manufacturing to ensure that products meet the desired standards of quality and performance. One such method is 100% inspection, where every item in a batch undergoes thorough scrutiny to ascertain its compliance with brand requirements and desired quality levels. While 100% inspection offers comprehensive assurance, it comes with inherent costs and time commitments, making it a strategic choice typically reserved for high-value products or critical situations, including those involving customer relations. At its core, 100% inspection represents a commitment to quality excellence, leaving no room for subpar products to reach the market. By scrutinizing every item in a batch, manufacturers can detect and rectify defects or deviations from quality standards promptly, thereby minimizing the risk of defective products reaching customers. This not only protects the brand reputation but also fosters customer trust and loyalty, as consumers come to associate the brand with reliability and excellence. However, the decision to implement 100% inspection must consider its associated costs and resource implications.

Fig.No.6

FOMULA & CALCULATION USED TIME CALCULATION

$NO. OF\ TROLLEY$ = TOTAL QTY / TROLLEY QTY

$TROLLEY\ TIME * NO,OF\ TROLLEY$

$= OVER\ ALL\ TIME$

(1) AH2 -CB60 (MBA)

QTY 118 118/24=4

TOTAL=4 TROLLEY

TROLLEY /24 PES

TIME / TROLLEY-46.49

4 X 46.49 = 185.96 Sec

(2) AH2 –CB50 (MBA)

QTY 72 72/24=3

TOTAL=3 TROLLEY

TROLLEY /24 PES

TIME / TROLLEY-46.49 Sec

3 X 46.49 = 139.47 Sec

(3) AI3 –DOM-HMI (DBA)

QTY 432 432/108=4

TOTAL=4 TROLLEY

TROLLEY /108 PES

TIME / TROLLEY-121.50 Sec

3 X 121.50 = 364.5 Sec

(4) QXI –DOM-KIA (CCA)

QTY 576 576/72=8

TOTAL=8 TROLLEY

TROLLEY /72 PES

TIME / TROLLEY-180.20 Sec

8 X 180.20 = 1440.6 Sec

ADVANTAGE:

- **Increased Efficiency:** By adjusting the PDI member working time, overall operational efficiency is enhanced, leading to smoother workflow and faster turnaround times.

- **Reduced Inspection Time:** The implementation of changes results in a reduction in inspection time compared to previous methods, allowing for quicker assessment and processing of goods.

- **Improved Productivity:** With shorter inspection times, PDI members can handle more tasks within a given timeframe, leading to increased productivity across the board.

- **Enhanced Accuracy:** Despite reduced inspection times, the accuracy of inspections is maintained or even improved, thanks to streamlined processes and potentially more focused attention on critical aspects.

- **Equal Online Packing Time:** Aligning online packing time with trolley time ensures consistency and fairness in workload distribution among workers, fostering a balanced and efficient work environment.

- **Optimized Resource Allocation:** With reduced inspection time, resources such as labour and equipment can be allocated more effectively, maximizing their utilization and minimizing waste.

CONCLUSION:

- The PDI-member's worktime will change in the next shift.
- The working time is different, depending on the Part and the Model.
- The part is changing from time of production to time of output in a line.
- The Manpower is separated for the team.
- We have 21 PDI members in that, and we schedule 7 members per shift.
- We need 10 to 11 people per shift, and the 2 expense-person for the shift

NEED MANE POWER PER SHIFT

DEPARTMENT	MANPOWER IN TROLLEY	MANPO WER IN 100%	MANPOW ER IN WAREHO USE
MBA	2	1	1
CCA	2	1	1
DBA	1	1	1

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CHAPTER 31

EXPERIMENTAL STUDIES ON ELECTROCHEMICAL DISCHARGE MACHINING OF BIO-CERAMIC COMPOSITE

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ABSTRACT

The Zirconia-based ceramics are widely used in Automobile and Aerospace sectors because of their High-end mechanical properties such as improved hardness, durability, and strength characteristics. Many researches show that the machining of these composites is much harder than the traditional machining processes. Even though the machining was done but ended up with an unfinished surface finish, overcut, a high rate of tool wear, less material removal rate, huge time consumption, and damages. These difficulties become a great challenge to industrialists and researchers. The study is concerned with the machining performance of the ECDM while doing the machining of Zirconia composite by determining the multi-response parameters, the optimal combination of parameter levels. As response parameters, MRR and TWR were used. Experiments were carried out in accordance with the Box Behnken Design. and response measurements were analysed. The outcomes showed that for simultaneously managing multiple response characteristics, applied voltage (V) is the most important governing input parameter, followed by Duty Cycle (%) and electrolyte concentration (wt%).

KEYWORDS

ECDM, MRR, TWR, RSM, Box Behnken Design.

INTRODUCTION

Electrochemical discharge machining is a revolutionary and extremely promising hybrid machining method that combines the concepts of electrical discharge machining (EDM) with electrochemical machining (ECM). In this method, material is removed through chemical

etching and thermal spark erosion, followed by evaporation. The work material is removed as a result of the electrical discharge's intense thermal heating and melting of the substance. The chemical activity contributes to the achievement of the higher surface quality by causing further finer material removals. The combined effects of local Joule heating brought on by thermal heating are what cause the material loss in ECDM. [2-3] Howbeit, creation of microchannel in material like glass and ceramic through conventional techniques is a tedious task due to elevated material properties like high hardness and brittleness [4] and therefore non-traditional machining methods are called for machining these glasses.

To produce micro-features in non-conductive materials such as Pyrex glass, borosilicate glass, silica glass, silicon wafers, quartz, and ceramics, the electro chemical discharge machining (ECDM) process is currently emerging as a cost-effective substitute for ultrasonic machining, laser ablation, and wet chemical etching [5]. Various process factors are explored in this study, and it is predicted that the electrolyte content reduces tool wear while boosting MRR. To obtain the highest material removal rate, the electrolyte concentration is increased to three levels in this study. [6] To optimize, they used various design of trials, such as the Taguchi design and the GA algorithm, in this work. In this study, we employed response surface methods to design experiments; [7] They employed ECDM to mill a glass workpiece using four parameters such as voltage, duty factor, electrolyte concentration, and temperature in this experiment. They employed response surface methods to construct trials, and they discovered that MRR increased with voltage and temperature. One of the critical machine configurations in this process is keeping the NaOH electrolyte stationary rather than in circulation. This experiment [8] demonstrates that a higher MRR is obtained when the electrolyte is in a stagnant position, thus we conducted the same [9] while milling.

METHODS AND MATERIALS:

Design of Experiments

To create a hole in the zirconia composite plate, the material is removed using the stainless-steel tool. Electrolytes are preserved in a stagnant state in the stationary instrument. Three distinct characteristics, such as the applied voltage, duty cycle, and electrolytic concentration, have an influence on the material removal rate.

The Process parameters

The process parameters range for the experiments are given below:

Electrode   Tungsten Carbide

Workpiece   Zirconia – Silicon Nitride Composite

Workpiece thickness   2 mm

Electrolyte   NaOH

Selection of Machining Parameters

To machine the hard to machine materials such as ceramics, the aforementioned process variables are tabulated in Table.1 and which were chosen based on trial study results.

Table:1 Parameters of machining

Name	Units	Low	High
Voltage	V	80	110
Electrolyte Concentration	% Wt	10	20
Duty Cycle	%	50	70

BoX-Bhenkan method is chosen as a Design of Experiment technique to carry the experimentation and the Table:1 show the corresponding details of it.

Material for Workpiece

Zirconia-silicon nitride composite is considered to be one of the hardest and most corrosive-resistant materials. The zirconia composite is a material with incredible features such as high resistance to indentation, high resistance to wear, excellent thermal stability, and improved chemical resistance, and it is also mentioned that this composite is strongly suggested to make wear-resistant coating. Furthermore, they discovered that MRR increases with increasing applied voltage and that overcut concerns were also highlighted [10]. The research's objective is to raise MRR while lowering TWR.

Electrochemical Discharge Machining (ECDM) Process

In their experimental study, they employed the ultrasonic machining [11] method and discovered that increased voltage contributes to tool wear [12] and the abrasive sludge

creates destruction of the surface area. In this activity, the ECDM is employed to safeguard against un even machining caused by an abrasive sludge. Figure 1 represents the experimental layout for the ECDM.
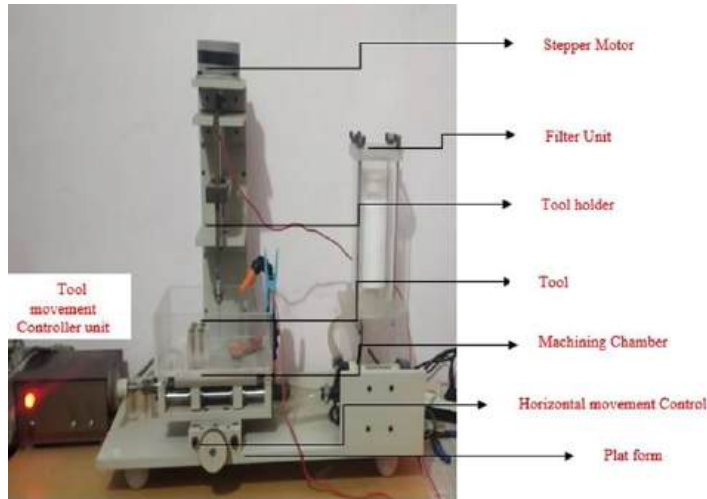
Figure 1: Machining setup

The workpiece is placed in the process chamber, which is previously filled with NaOH till it covers over the workpiece surface. A tool holder is attached to the stainless-steel tool. The work table is moved in the X and Y directions using a hand wheel to machine the material.

RESULTS AND DISCUSSION

The workpiece material is kept into the machining chamber as seen in Figure 2. The workpiece are placed just below the electrolyte level and where the spark is created. Electrification Discharge will release when the machining process starts, the electrolyte around the tool debases as a result of the reaction, creating gas bubbles. The bubbles then release the pressure energy, which leads to the material removal. Due to the spark, the electrode wears out and becomes contaminated. As a result, a brand-new electrode and brand-new electrolytic concentration solution are utilised for every experiment.

The MRR and TWR for the machining of zirconia composites are displayed in Table.2. To determine the rate of material removal and rate of tool wear, the workpiece and tool were inspected both before and after machining.
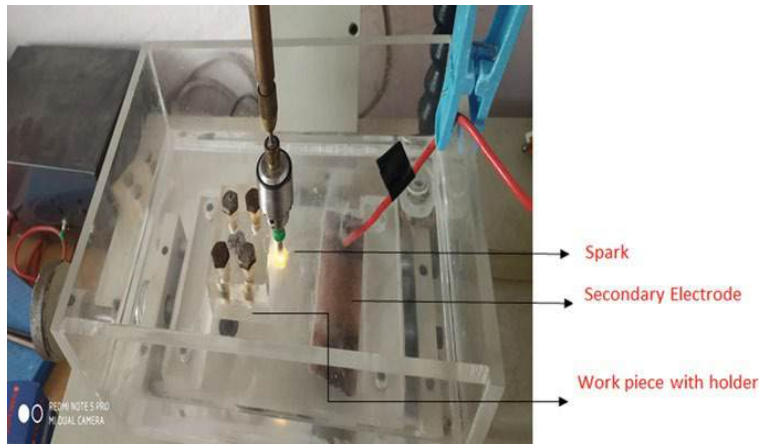
Figure 2: Machining of Workpiece

Observations During Experimentation

Time duration   30 min, (Each Cycle)

Tool   Tungsten Carbide

Tool diameter   1 mm

Regression equations obtained for the material removal rate and tool wear rate is given below in equation 1 & 2.

Table:2 Machining Performance

Run	VOLTAGE	EC	DUTY CYCLE	MRR	TWR
	V	%WT	%	µg/min	µg/min
1	90	15	60	334	571
2	100	10	60	335	286
3	90	15	60	325	474
4	80	20	60	211	529
5	90	10	70	241	319
6	100	15	70	370	592
7	90	20	50	353	551
8	90	15	60	330	476
9	80	10	60	211	283
10	90	15	60	357	495

11	90	15	60	334	441
12	80	15	70	210	569
13	90	20	70	259	547
14	100	20	60	370	617
15	80	15	50	210	579
16	100	15	50	355	603
17	90	10	50	219	293

Regression equations obtained for the MRR and TWR is given below. This equation helps to optimize the output parameters concerning input parameters.

$$\text{MRR} = +336.00 +73.50A+23.38B -7.12C+8.75AB+3.75AC-29.00BC-18.00A^2-36.25B^2 -31.75C^2 \tag{1}$$

$$\text{TWR} =+491.40+17.25A+132.88B+0.1250C+21.25AB-0.2500AC-7.50BC+47.80A^2-110.45B^2+46.55C^2 \tag{2}$$

where A is voltage, B is electrolyte concentration, and C is duty cycle. Table 2 shows the result of the MRR & TWR of zirconia composite in µg/min. These table has proven that the zirconia composite can machined by ECDM process.

CONCLUSION:

With the help of ECDM process, non-conductive materials including glass, ceramics, polymers, etc. can be machined effectively. These findings are derived from experimental research using zirconia composite machining:

1. The ECDM technology makes it feasible to efficiently machine electrically inert materials including glass, ceramic and polymer, etc.

2. The MRR and TWR of zirconia composite are greatly impacted by voltage in this followed by duty cycle study.

3. Voltage is the most influencing factor in the MRR, followed by electrolyte concentration.

4. Voltage plays a major role then followed by duty cycle in the TWR.

5. Optimized MRR and TWR are found at electrolyte concentration is 10% wt., the applied voltage is 100 V, and the duty cycle is 60%.

6. Future research may be done to determine the overcut and roughness of the machined region.

7. In future the machining characteristics can be optimized with advanced machine learning and optimization methods.

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Software Engineering

CHAPTER 32

DECENTRALIZED SOCIAL MEDIA APPLICATION USING INTERPLANETARY FILE SYSTEM

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Abstract

Amid rising concerns about privacy and data ownership, decentralized social networks offer an appealing alternative to centralized platforms. Existing projects like Mastodon and Diaspora provide federated alternatives but still depend on centralized servers for data storage. Platforms like Steemit leverage blockchain technology but face scalability and usability challenges. These existing systems suffer from issues such as vulnerability to single points of failure, lack of true data ownership, and limited integration with blockchain for secure transactions. By utilizing Bootstrap, Ethereum, IPFS (Inter Planetary File System), Infura, Solidity, and MetaMask, a decentralized social network can be constructed to overcome these limitations, ensuring true data decentralization and enhanced security. Ethereum serves as a blockchain platform for decentralized app and smart contract development, while IPFS provides a decentralized file storage system for user data and media files. Infura offers a managed service for secure and reliable access to blockchain networks, simplifying infrastructure management for developers. Solidity is a programming language for implementing smart contracts on Ethereum, and MetaMask is a browser extension enabling secure storage and management of Ethereum accounts and interaction with decentralized applications. The decentralized social network will enable users to create profiles, share updates and media files, and engage with others, with data residing on IPFS and interactions stored on the Ethereum blockchain, facilitated by MetaMask. Hands-on experience in blockchain development, decentralized applications, and front-end web development is demonstrated, showcasing the potential of decentralized social networks in granting users more control over their data and privacy, with promising results in terms of enhanced security and user autonomy.

Keywords

Decentralized Social Networks, Blockchain Technology, Data Ownership, IPFS, User Privacy, Smart Contracts.

INTRODUCTION

In recent years, there has been growing concern over the privacy and data ownership policies of centralized social media platforms. With the rise of blockchain technology, decentralized social networks have emerged as an alternative model that provides users with greater control over their data and privacy. Decentralized social networks use blockchain technology to store and manage user data, while allowing users to interact with each other in a peer-topeer network. It is aimed to build a decentralized social network using Ethereum, IPFS (Inter Planetary File System), Django, Solidity, Infura and MetaMask.

Ethereum is a blockchain platform that provides a decentralized and secure platform for the development of smart contracts and decentralized applications (dApps). Smart contracts are self-executing contracts with the terms of the agreement between buyer and seller being directly written into lines of code. Decentralized applications are applications that run on a peer-to-peer network of computers rather than on a centralized server. By leveraging the Ethereum platform, it able to build a decentralized social network that is transparent, secure, and resistant to censorship.

IPFS (Inter Planetary File System) is a decentralized file storage system that can be used to store user data and media files. IPFS uses a peer-to-peer network to store and distribute files, making it a secure and reliable option for decentralized social networks. By using IPFS user data and media files are stored in a decentralized and secure manner, while also reducing storage costs and improving performance.

Django is a high-level Python web framework renowned for its simplicity, efficiency, and scalability in building web applications. At its core, Django follows the Model-View-Template (MVT) architectural pattern, where models represent the data structure, views handle user requests and generate responses, and templates render the presentation layer.

One of Django's key strengths is its robust ORM system, which enables developers to define database models using Python classes. This ORM abstraction simplifies database

operations like querying, inserting, updating, and deleting records, reducing the need for manual SQL queries and enhancing code readability.

Django's URL dispatcher maps URLs to views, providing a clean and organized way to handle routing within the application. The built-in admin interface automates administrative tasks by generating a user-friendly interface based on defined models, facilitating easy data management.

Additionally, Django offers powerful form handling capabilities, middleware for request/response processing, and built-in security features like CSRF protection and secure password handling. Its authentication and authorization system integrates seamlessly with user management, allowing developers to implement complex access control mechanisms.

Solidity is like a special programming language built specifically for the Ethereum blockchain. Imagine a secure, digital world where apps run on a network of computers instead of a single company's servers. That's the world of blockchain. Solidity lets developers write the instructions, or "code," for these decentralized applications (dApps) that run on the Ethereum network.

These instructions control things like storing information, managing digital assets, and even facilitating secure transactions – all without relying on a central authority. It's like having a set of clear rules written in code that everyone on the network agrees on, ensuring trust and transparency in the dApp. In just a few lines of Solidity, developers can create complex features for things like decentralized marketplaces, social networks, or even games that run entirely on the blockchain. So, Solidity is the key that unlocks the potential for building secure and innovative applications on the Ethereum network.

MetaMask is a browser extension that allows users to securely store and manage their Ethereum accounts, as well as interact with decentralized applications. MetaMask provides a simple and secure way for users to manage their Ethereum accounts, making it an essential tool for any decentralized social network. By using MetaMask, can ensure that users have a secure and easy way to manage their Ethereum accounts and interact with dApp.

It is aimed to build a decentralized social network that allows users to create profiles, post updates, share media files, and interact with other users. User data and media files will be stored on IPFS, while user interactions and profile information will be stored on the Ethereum blockchain. Users will be able to securely manage their Ethereum accounts using

MetaMask, and interact with dApp using the MetaMask API. By building a decentralized social network, hope to demonstrate the potential of blockchain technology to provide users with greater control over their data and privacy.

LITERATURE SURVEY

In [1], Shah et al. (2020) proposed a system that enhances data security in decentralized cloud storage by encrypting and distributing data across multiple peers using the AES 256-bit encryption algorithm. The approach ensures confidentiality of user data while maximizing storage resource utilization by allowing peers to rent out underutilized storage for cryptocurrency rewards. Guidi et al. [2] highlighted the requirements and challenges of Decentralized Social Applications (DOSNs) and Blockchain-based Object Storage Models (BOSMs) in 2021. They emphasized the importance of data availability and discussed limitations of IPFS regarding privacy. Their proposed solutions, including private IPFS networks and content encryption, aim to enhance data persistence while preserving privacy. In [3], Kumar and Tripathi (2019) designed an IPFS-based storage model integrated with blockchain to address storage and transaction access limitations. The model efficiently stores transaction hashes and suggests extensions for handling various types of multimedia files, enhancing optimal storage utilization and scalability. Lin and Zhang [4] introduced a method for protecting private data in IPFS by integrating blockchain technology. Their approach includes user group and file directory management to enhance access control, although it may increase file upload processing time. Nagaoka et al. [5] proposed a method for encoding content-based similarity in IPFS pointer names, facilitating human-like recognition in file systems. Despite challenges with multibyte sequences in languages like Japanese, they demonstrated the potential for generating highly similar output. Hao et al. [6] evaluated the performance of consensus algorithms in private blockchain platforms, focusing on Ethereum and Hyperledger Fabric. Their findings indicate that Hyperledger's PBFT algorithm outperforms Ethereum's PoW in average throughput and latency, highlighting the trade-offs between security and performance. In [7], Tern (2021) systematically introduced smart contract technology, discussing its lifecycle, architecture, and research status. The study also developed a crowdfunding contract system to explore practical applications of smart contracts, offering insights into current research and

challenges. Dinh et al. [8] proposed BLOCKBENCH, a benchmarking framework for evaluating private blockchain systems. The framework conducts comprehensive analyses on Ethereum, Parity, and Hyperledger, identifying performance bottlenecks and design trade-offs in large-scale data processing workloads. Gervais et al. [9] introduced a quantitative framework for comparing Proof of Work (PoW) blockchains, evaluating their security based on real-world network impacts. Their study reveals insights into the differences in security provisions between Bitcoin and Ethereum. Lastly, Zhao et al. [10] addressed the integration of blockchain and Industrial Internet of Things (IIoT) from an industrial perspective. They introduced a blockchain-enabled IIoT framework and discussed fundamental techniques, while also analyzing research challenges and future trends in this emerging field.

To address the aforementioned disadvantages in decentralized cloud storage systems utilizing IPFS and blockchain technologies, several innovative solution strategies have been proposed:

Layered Architecture: Implementing a layered architecture can enhance scalability by separating concerns, allowing for independent scaling of storage, processing, and data access layers. This can help mitigate the limitations of traditional blockchain scalability.

Alternative Consensus Mechanisms: Exploring alternative consensus mechanisms, such as Proof of Stake (PoS) or Delegated Proof of Stake (D PoS), can significantly reduce energy consumption compared to PoW. These mechanisms require less computational power and can enhance the overall efficiency of the network.

Data Encryption and Segmentation: Utilizing advanced encryption techniques alongside data segmentation can enhance data privacy. Sensitive information can be encrypted and stored off-chain, while only hashes or references are recorded on the blockchain, maintaining confidentiality.

User-Friendly Smart Contract Development Tools: Developing more intuitive and user-friendly frameworks for smart contract creation can reduce complexity. Low-code or no-code platforms can empower developers and non-developers alike to create secure smart contracts without deep programming knowledge.

Interoperability Protocols: Establishing interoperability protocols and standards can facilitate seamless data exchange between different blockchain networks and decentralized storage systems. This could enhance collaboration and data sharing across platforms.

Cost-Effective Storage Solutions: Leveraging storage optimization techniques, such as deduplication and sharding, can reduce storage costs and improve efficiency. Utilizing off-chain storage for large datasets while retaining essential metadata on-chain can also enhance cost-effectiveness.

Dynamic Resource Management: Implementing dynamic resource management strategies can help mitigate network congestion. Adaptive algorithms can allocate resources based on current network conditions, improving transaction processing times during peak loads.

Regulatory Compliance Frameworks: Developing frameworks that ensure compliance with data protection regulations can alleviate governance challenges. Collaborating with legal experts to create adaptive solutions can ensure that decentralized systems meet regulatory requirements.

Continuous Security Audits: Conducting regular security audits and employing formal verification methods can enhance the security of smart contracts and reduce vulnerabilities. These measures can help in identifying potential risks before deployment.

Enhanced User Interfaces: Improving user interfaces for D Apps to make them more intuitive and user-friendly can enhance user experience. Simplifying onboarding processes and providing comprehensive tutorials can aid in mainstream adoption.

These solution strategies aim to overcome the identified disadvantages and improve the functionality and adoption of decentralized cloud storage systems. By focusing on scalability, energy efficiency, data privacy, and user experience, these innovations can significantly enhance the viability and attractiveness of decentralized technologies in the cloud storage domain.

THE PROPOSED MODEL

The decentralized Android application (Dapp) developed using Web3j and Infura revolves around a robust system architecture designed to interact seamlessly with the Ethereum blockchain. The core components of this architecture include the Web3j Java library, Infura for blockchain connectivity, and smart contract integration.
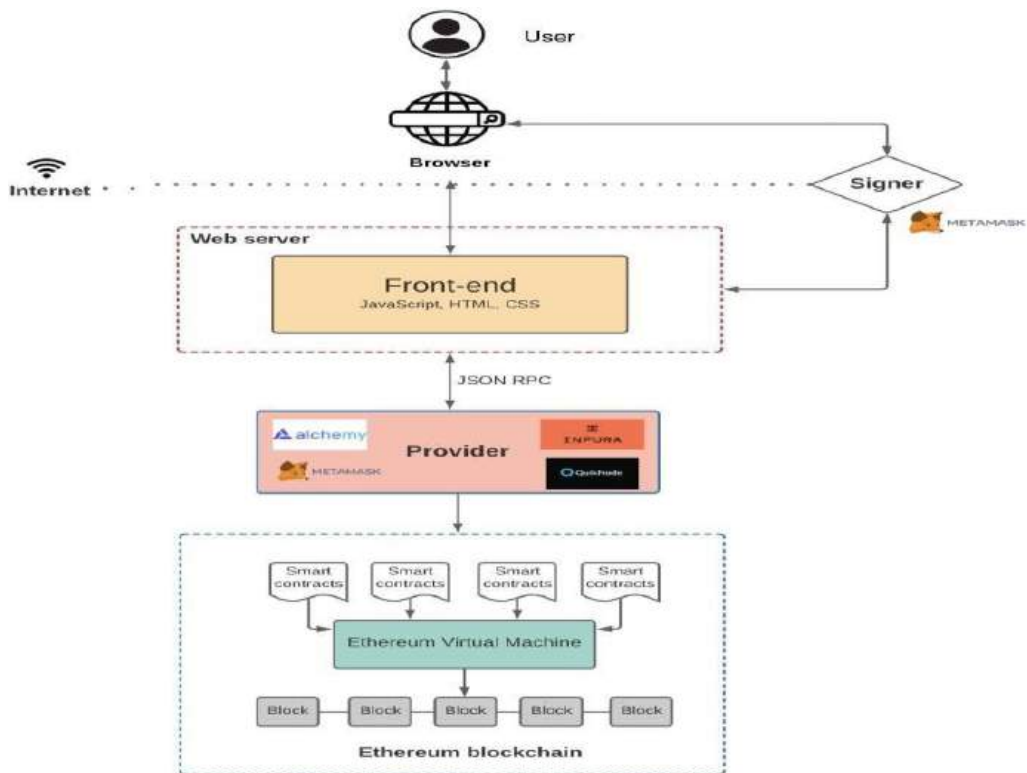
Figure 1: Proposed System Architecture

Firstly, the application incorporates the Web3j dependency by adding the necessary Maven Central repository and implementing the Web3j core library in the project's build. Gradle files. This step enables the app to interact with Ethereum smart contracts and blockchain functionalities.

Next, the application establishes connectivity with the Ethereum network via Infura. Infura provides a straightforward method to connect the D app to the Ethereum blockchain, eliminating the need to download the entire blockchain or operate as a node. By obtaining a unique API Id from Infura and integrating it into the app, seamless connectivity is achieved with Ethereum.

The architecture includes the creation of offline wallets using Web3j's Wallet Utils. Offline wallets are preferred for their enhanced security compared to online counterparts. These wallets are encrypted and stored locally on the user's device, ensuring the safety of private keys and sensitive information.

The app allows for the loading of existing offline wallets using credentials such as the wallet password and name. Credentials obtained from loaded wallets provide access to essential account information, including address and balance details.

Additionally, the application supports wallet importation from mnemonic phrases, providing users with flexibility in accessing their wallets. By leveraging Bip32ECKeyPair, the app can generate keys from mnemonics and load corresponding accounts into the Credentials object, enhancing user convenience and accessibility.

Finally, the system architecture facilitates ether transfers to specified addresses. This functionality is streamlined through the Transfer class, which handles essential transaction parameters such as nonce, gas price, gas limit, and signatures. These elements are seamlessly integrated with Web3j objects and Credentials, ensuring secure and efficient ether transfers within the D app.

Overall, the system architecture of the Android D app underscores a robust framework for Ethereum blockchain interaction, emphasizing security, connectivity, and user-friendly features essential for a decentralized application environment.

RESULT ANALYSIS

The proposed method involved the integration of blockchain technology, specifically deploying a Solidity smart contract on the Ethereum blockchain and creating a user-friendly web application using Django. This journey encompassed several key phases, from setting up the development environment to deploying the smart contract and creating a web interface for user interaction.

1. **Virtual Environment Setup:** The project began with the establishment of a virtual environment using Python's venv. This isolated environment allowed for efficient dependency management, preventing conflicts between different Python projects. The creation and activation of the virtual environment ensured that the necessary packages could be installed without affecting the global Python installation.

2. **Project Initialization:** Once the virtual environment was active, the project directory was initialized, and a requirements.txt file was created to list all the necessary Python

modules. This file was crucial for ensuring that all dependencies could be installed in one go using the pip install -r requirements.txt command.

3. **Smart Contract Deployment:** The deployment of the Solidity smart contract involved several steps:

*   Solidity Compiler Installation: The project used Solidity version 0.8.12, ensuring compatibility with the latest features and security enhancements.

*   Contract Compilation: The smart contract code was read from a .sol file, compiled using the Solidity compiler (solc), and the output was saved as a JSON file for further processing.

*   Infura Connection: The connection to the Ethereum network was established using an Infura URL, allowing for reliable interaction with the blockchain.

*   Web3.py Integration: A Web3 instance was initialized to facilitate interaction with the Ethereum network. This included deploying the compiled contract, signing transactions with the private key, and waiting for the transaction receipt to confirm the deployment.

*   Contract Address Storage: The address of the deployed contract was stored in a text file for future reference, enabling easy interaction with the contract post-deployment.

4. **Django Web Application Development:** A Django server was set up to provide a robust web interface for users to interact with the deployed smart contract:

*   Project Setup: A new Django project was initialized, and necessary directories and files were created for optimal organization.

*   Smart Contract Integration: The deployed smart contract was integrated into the Django application, allowing for seamless blockchain interaction.

*   User Interface Development: Django views and HTML templates were created to facilitate user interaction, enabling users to upload images, add descriptions, and engage with the social media application shown in figure 1.2 and 1.3

*   Static Files Management: CSS and JavaScript files were managed to enhance the frontend design and functionality of the application.

5. **User Interaction and Functionality:** The application provided an intuitive user interface where users could log in, upload images with descriptions, and interact with previously posted content through likes and comments. The process of uploading images involved connecting to the IPFS (Inter Planetary File System) for decentralized storage, ensuring data integrity and accessibility.

6. **Server Management and Cleanup:** To ensure optimal resource utilization, the Django development server was effectively managed. Upon completion of testing, the server was stopped using the CTRL+C command, and any temporary files or cached data were cleaned up to maintain a tidy development environment shown in figure 1.4.

The implementation of this proposed method showcased the potential of combining blockchain technology with web applications, resulting in a decentralized social media platform. The successful deployment of the Solidity smart contract and the development of a user-friendly Django interface highlighted the possibilities of blockchain integration in real-world applications.
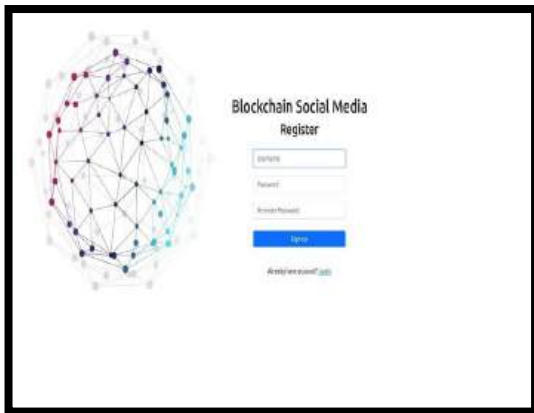
Figure 2: Registration page
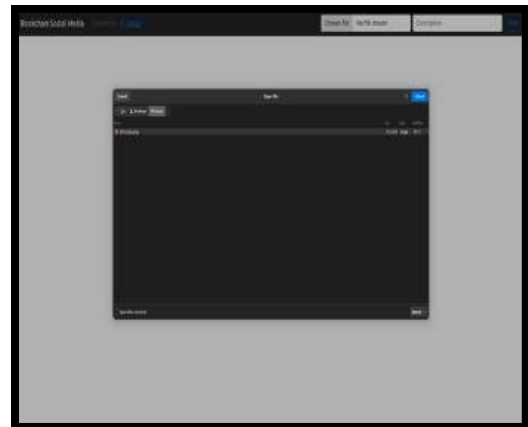
Figure 3: Selecting the Image
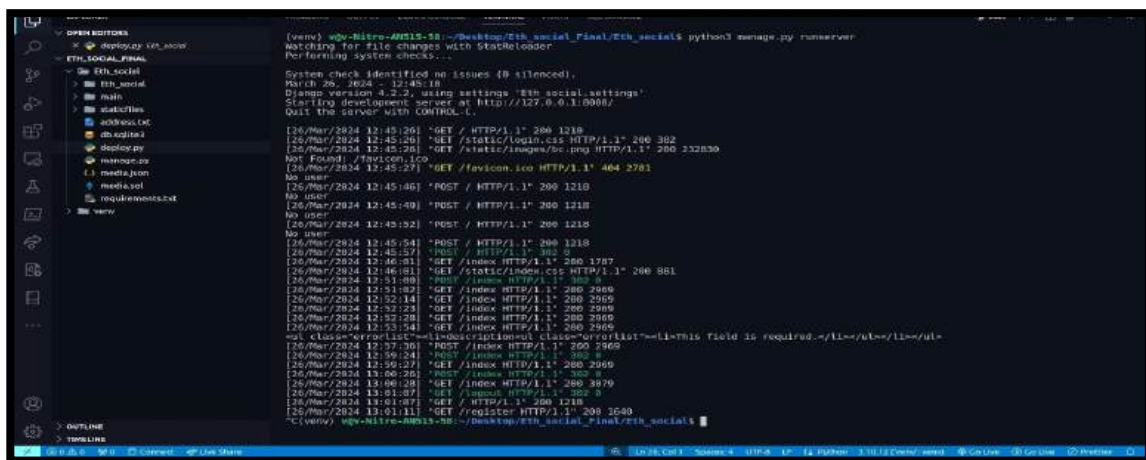
Figure 4: Server Management and Cleanup

CONCLUSION

In conclusion "Decentralized Social Media Application Using IPFS and Blockchain," significant success has been achieved in creating a secure, efficient, and user-centric platform for storing and sharing media content. By utilizing IPFS for distributed storage and Blockchain for data integrity and smart contract functionalities, key challenges in decentralized cloud storage have been addressed.

The application ensures enhanced data security through AES encryption, granular access control via smart contracts, and incentivization mechanisms for users. The user interface provides a seamless experience for uploading, sharing, and interacting with media content. Performance metrics, including upload speed and data management efficiency, have been analyzed and optimized for scalability.

Overall, the potential of Blockchain and IPFS technologies in revolutionizing data storage paradigms, offering a decentralized alternative with enhanced security, privacy, and user control were demonstrates. The successful implementation and performance of application validate its viability and relevance in modern digital ecosystems.

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CHAPTER 33
SYNTH VOICE MATE USING ARTIFICIAL INTELLIGENCE

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Abstract

In this modern era, day-to-day life has become smarter and more interlinked with technology. We're already familiar with voice assistants like Google and Siri. This project aims to create a voice assistant system that can act as a basic medical prescriber, daily schedule reminder, note writer, calculator, and search tool. The system takes voice input through a microphone (both Bluetooth and wired) and converts it into computer-understandable language. It then provides the required solutions and answers based on user queries. The voice assistant connects to the World Wide Web to retrieve relevant information. Natural Language Processing algorithms enable communication using natural human language Artificial intelligence (AI) systems that facilitate natural human-machine interaction are gaining popularity. Rather than humans learning to communicate with machines, these systems learn to communicate with humans. Virtual assistants, such as Apple's Siri, Amazon's Alexa, and Microsoft's Cortana, play a crucial role in this domain. They improve user productivity by managing routine tasks and providing information from online sources. This project aims to build a virtual assistant that leverages openly available data and information from the web. By understanding user actions, habits, and behavior, it becomes a personalized assistant capable of making intelligent decisions for routine activities.

INTRODUCTION

The journey of voice-activated technology began in 1922 with the invention of Radio Rex, a simple toy dog that responded to its name using an electromagnet. This early innovation laid the groundwork for modern voice recognition, predating contemporary computing by over two decades. Fast forward to the 21st century, we witness a transformative shift towards automation, significantly driven by performance improvements and the

development of sophisticated technologies like machine learning and neural networks. Today, human interaction with machines has evolved through the emergence of virtual assistants—software programs that facilitate everyday tasks by responding to voice commands. Popular examples include Apple's Siri, Amazon's Alexa, and Microsoft's Cortana, which have inspired many projects aimed at enhancing user experience on digital devices.

These voice-based intelligent assistants operate by listening for a specific wake word before executing commands, enabling seamless communication. They leverage advanced artificial intelligence techniques, including natural language processing and speech recognition, to understand and fulfill user requests. From checking the weather to controlling smart home devices, these AI-powered systems offer a remarkable blend of convenience and efficiency, revolutionizing how we interact with technology.

In summary, the evolution of voice assistants highlights a significant leap in our ability to communicate with machines, marking a pivotal shift in automation and human-device interaction.

LITERATURE SURVEY

This project involves developing a voice assistant system using Python, comprising nine modules that execute various API and system calls, resulting in the creation of 11 distinct voice assistants. These assistants facilitate voice command execution without keyboard interaction and can operate on hybrid platforms. However, the paper highlights limitations, particularly regarding system calls that lack sufficient support. The advantages of voice assistants include providing a natural and intuitive user experience, enhancing input speed through speech-to-text technology, and improving accessibility for individuals with disabilities. They also enable hands-free operation, making them useful in situations such as driving or cooking. On the downside, the technology is not flawless; speech recognition can still struggle with accuracy. Additionally, many voice assistants have difficulty grasping context beyond the immediate dialogue, limiting their effectiveness in complex interactions. Furthermore, reliance on cloud-based services for speech recognition can hinder functionality in offline scenarios, posing challenges for users without consistent internet

access. Overall, while voice assistants offer significant benefits, they also face notable challenges that need to be addressed for broader application and reliability.

This project presents a desktop assistant powered by Python, incorporating IoT features and artificial intelligence, along with a SQLite database for efficient data management. While it offers a robust database connection and query framework, the project notably lacks API and system call functionalities. The advantages of this desktop assistant include its ability to operate offline, which sets it apart from cloud-based alternatives. Users gain full control over the assistant's features, behavior, and integrations, allowing for a tailored experience that meets specific needs. Python's extensive libraries and packages enhance its versatility, making it well-suited for various tasks beyond simple desktop applications. Additionally, Python's reputation as a user-friendly programming language, characterized by its straightforward syntax, makes it accessible for developers at all skill levels. This combination of features allows for greater customization and innovation in creating a personalized assistant, making it a compelling choice for those interested in developing desktop-based AI solutions. Overall, while the project demonstrates significant potential, the absence of API and system calls presents opportunities for further enhancement and integration in future iterations.

The project focuses on Portable Voice Recognition with GUI Automation, utilizing Google's online speech recognition for converting speech to text via Python. This system features a graphical user interface (GUI) and a portable framework, enabling users to interact seamlessly with technology. However, the accuracy of the text-to-speech (TTS) engine is relatively low, and the project lacks IoT capabilities. The advantages of this system include the natural interaction it offers, allowing users to issue commands verbally. By combining voice recognition with a GUI, it caters to a diverse audience, enhancing usability across different contexts. The portable nature of the system facilitates multimodal interaction, allowing users to choose their preferred input method, whether voice or GUI. Additionally, voice recognition accelerates tasks such as note-taking, messaging, and searching. On the downside, the accuracy of voice recognition can be affected by factors like background noise, accents, and speaker clarity. Furthermore, the integration of voice recognition with a GUI adds complexity to the system. Privacy concerns also arise with always-listening features, as

users may fear unintentional activations or recordings of their conversations. Balancing convenience and privacy remains a critical challenge for this technology.

A Novel Python-based Voice Assistance System for Reducing the Hardware Dependency of Modern Age Physical Servers introduces an innovative solution using Python as the backend for voice assistant technology. The system aims to minimize reliance on traditional server hardware by efficiently handling system and API calls, offering a more flexible and scalable architecture. The project demonstrates strong responsiveness to API requests, yet there is room for improvement in terms of understanding user inputs and enhancing overall system reliability. The system can generate personal conversations, which makes it appealing for personalized marketing. It allows marketers to gather insights from different family members and customize campaigns more effectively. This direct communication between users and the voice assistant enables businesses to offer personalized customer experiences based on users' needs. Furthermore, the rise of smart speakers opens a new channel for engagement, potentially expanding its use in homes and businesses.

The Voice Enabled Personal Assistant for PC using Python proposes a Python-based voice assistant designed to enhance user interaction with personal computers. By integrating voice commands, the system allows users to execute tasks such as turning off or restarting the PC, accessing the latest news, and performing other actions with ease. The project features a well-supported library for converting raw JSON data into text, though it faces some delays in processing request calls. This voice-enabled assistant simplifies task management by allowing users to control their PC through speech rather than manual inputs. advantages include the ability to streamline tasks and enable multitasking without needing to switch between applications. Users can set reminders, check calendars, or perform routine tasks with simple voice commands, making the system highly efficient. Moreover, this technology proves beneficial for individuals with visual impairments or mobility challenges, offering an accessible and hands-free interface.

In-room Voice-Based AI: Digitally Transforming On-Site Hotel Services and Guests' Experiences explores the integration of voice-enabled AI in the hospitality industry, specifically in hotel rooms. The system aims to enhance guest experiences by allowing them to control services such as room settings, housekeeping requests, and food orders through voice commands. This technology proves particularly relevant in the COVID-19 era, where

minimizing human touch has become critical for health and safety. The voice assistant eliminates the need for direct human interaction, reducing physical contact while still delivering high-quality service. Key advantages include the ability for guests to request services without touching surfaces or interacting with staff, thereby addressing concerns about virus transmission. The voice system can also automate several routine tasks, such as adjusting room temperature, controlling entertainment systems, and managing lighting, enhancing both convenience and personalization for guests.

METHODOLOGY
EXISTING SYSTEM

From the above literature survey, we have inferred that all the systems existing predict only particular diseases namely lung disease, breast cancer, heart disease, diabetes by implementing various algorithms on the particular datasets. After implementing various algorithms, the most accurate one is selected and it is used for prediction of disease. Sometimes, we may get confused of what algorithm to use. Also, all the systems find only the particular disease and not the disease based on the symptoms.

PROPOSED SYSTEM

We are proposing a system in an efficient way of implementing a Personal voice assistant, Speech Recognition library has many in-built functions, that will let the assistant understand the command given by user and the response will be sent back to user in voice, with Text to Speech functions. When assistant captures the voice command given by user, the under lying algorithms will convert the voice into text. And according to the keywords present in the text (command given by user), respective action will be performed by the assistant.

This is made possible with the functions present in different libraries. Also, the assistant was able to achieve all the functionalities with help of some API's. We had used these APIs for functionalities like performing calculations, extracting news from web sources, and for telling the weather. We will be sending a request, and through the API, we're getting the respective output. API's like WOLFRAMALPHA, are very helpful in performing things like calculations, making small web searches. And for getting the data from web. In this way, we

are able to extract news from the web sources, and send them as input to a function for 15 further purposes. Also, we have libraries like Random and many other libraries, each corresponding to a different technology. We used the library OS to implement Operating System related functionalities like Shutting down a system, or restarting a system.

OBJECTIVE

Main objective of building personal assistant software (a virtual assistant) is using semantic data sources available on the web, user generated content and providing knowledge from knowledge databases. The main purpose of an intelligent virtual assistant is to answer questions that users may have. This may be done in a business environment, for example, on the business website, with a chat interface. On the mobile platform, the intelligent virtual assistant is available as a call-button operated service where a voice asks the user "What can I do for you?" and then responds to verbal input. Virtual assistants can tremendously save you time. We spend hours in online research and then making the report in our terms of understanding. Provide a topic for research and continue with your tasks while the assistant does the research. Another difficult task is to remember test dates, birthdates or anniversaries. It comes with a surprise when you enter the class and realize it is class test today. Just tell assistant in advance about your tests and she reminds you well in advance so you can prepare for the test. One of the main advantages of voice searches is their rapidity. In fact, voice is reputed to be four times faster than a written search: whereas we can write about 40 words per minute, we are capable of speaking around 150 during the same period of time. In this respect, the ability of personal assistants to accurately recognize spoken words is a prerequisite for them to be adopted by consumers.

WORKING

As discussed about the mandatory features to be listed in voice assistant are implemented in this work, brief explanation is given below.

API CALLS

We have used API keys for getting news information from news api and weather forecast from open weather map which can accurately fetch information and give results to the user.

SYSTEM CALLS

In this feature, we have used OS & Web Browser Module to access the desktop, calculator, task manager, command prompt & user folder. This can also restart the pc and open The chrome application.

PROGRAMMING LANGUAGES

PYTHON

Python is an OOPS (Object Oriented Programming) based, high level, interpreted programming language. It is a robust, highly useful language focused on rapid application development (RAD). Python helps in easy writing and execution of codes. Python can implement the same logic with as much as 1/5th code as compared to other OOPs languages. Python provides a huge list of benefits to all. The usage of Python is such that it cannot be limited to only one activity. Its growing popularity has allowed it to enter into some of the most popular and complex processes like Artificial Intelligence (AI), Machine Learning (ML), natural language processing, data science etc. Python has a lot of libraries for every need of this project. For this project, libraries used are speech recognition to recognize voice, Pyttsx for text to speech, selenium for web automation etc.

OMAIN

The internet of things, or loT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to- computer interaction. A thing in the internet of things can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built- in sensors to alert the driver when tire pressure is low or any other natural or man-made object that can be assigned an Internet Protocol (IP) address and is able to transfer data over a network.

ALGORITHMS

SPEECH RECOGNITION MODULE

- The class which we are using is called Recognizer.
- It converts the audio files into text and module is used to give the output in speech.
- Energy threshold function represents the energy level threshold for sounds. Values below this threshold are considered silence, and values above this threshold are considered speech.
- Recognizer instance. Adjust for ambient noise(source, duration = 1), adjusts the energy threshold dynamically using audio from source (an Audio Source instance) to account for ambient noise.

SPEECH TO TEXT & TEXT TO SPEECH CONVERSION

- Pyttsx3 is a text-to-speech conversion library in Python. And can change the Voice, Rate and Volume by specific commands.
- Python provides an API called Speech Recognition to allow us to convert audio into text for further processing converting large or long audio files into text using the Speech Recognition API in python.
- We have Included sapi5 and espeak TTS Engines which can process the same.

PROCESS & EXECUTES THE REQUIRED COMMAND

- The said command is converted into text via speech recognition module and further stored in a temp.
- Then, Analyze the user's text via temp and decide what the user needs based on input provided and runs the while loop.
- Then, Commands are executed.

System Architect
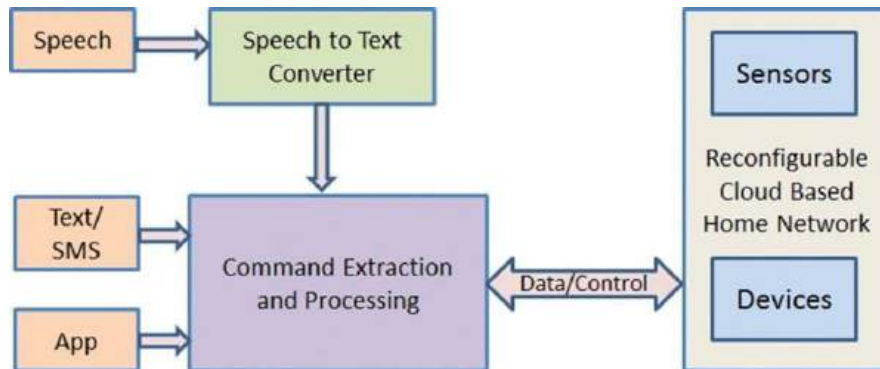
TYPES OF OPERATION

News of the day

- Keyword: news
- If we ask for the news, it reads out the Indian news of the day on which it is asked.

Temperature and Weather:

- Keyword: temperature
- If the user asks the temperature, it gives the current temperature.

Restart the system:

- Keyword: Restart the system or Reboot the system
- The assistant restarts the system if the user asks the assistant to restart the system.

Date and Time:

- Keyword: date or time or date and time
- If the user asks for the date or time, the assistant tells it.

Turn on the light:

- Keyword: light on
- This is an IOT feature where the assistant turns on the light if the user asks it to turn on the light.
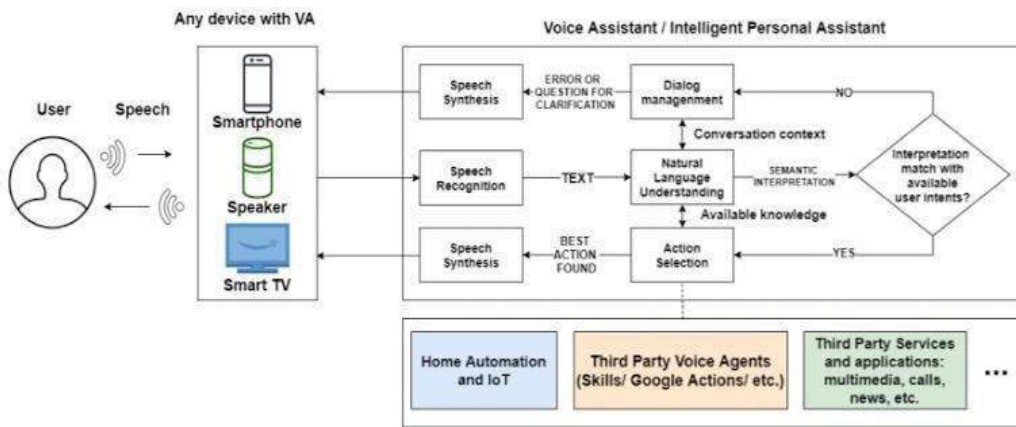
Main Diagram of Voice Assistant

CONCLUSION

As stated before, "voice assistant is one of the biggest problem solvers" and you can see that in the proposals with the examples that it is in fact one of the biggest problem solvers of the current world. We can see that voice assistant is one of the major evolving artificial intelligences in the current world once again on seeing the proposal examples because at the past, the best feature which a voice assistant had was telling the date and searching the web and giving the results but now look at the functions that it can do so with this, we can say that it is a evolving software in the current world. The main idea is to develop the assistant even more advanced than it is. now and make it the best ai in the world which will save an ample of time for its users. I would like to conclude with the statement that we will try our best and give one of the best voice assistants which we are able to.

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CHAPTER 34

SURVEILLANCE IN REAL TIME USING CYBER SECURITY FOR CRIMINAL FACE RECOGNITION

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Abstract

To address the growing problems caused by electronic crimes (eCrimes) in today's digital world, the Face-Based eCrime Identification and Online FIR Reporting initiative is a trailblazing example of how cutting-edge technologies can be integrated successfully. Through the study of video material, this project allows for the quick and precise identification of criminals by utilizing powerful facial recognition skills powered by the Inception V3 algorithm. Rapid and precise identification of people with a known criminal history is made possible by the system's inceptionV3 algorithms, which identify and match face traits. Law enforcement authorities can track criminals in busy areas by continuously monitoring live feeds or archival footage. Once a criminal image is published on the mail in a police station, the investigations can begin. The process of filing a FIR has been streamlined, and victims and witnesses can now report crimes online.

INTRODUCTION

Criminal identification has undergone a revolutionary change as a result of law enforcement's incorporation of cutting-edge technologies, especially the combination of real-time video surveillance and facial recognition. The convergence of these technologies enables the prompt identification of offenders captured in photographs or video recordings taken in public settings, in response to the requirement of improving public safety. With an emphasis on the InceptionV3 algorithm, this revolutionary method makes use of advanced image processing techniques to recognize and match people's faces in real time. This technology, which is essential to criminal investigations, allows law enforcement to quickly

and easily identify individuals who are listed as suspects in First Information Reports (FIRs) that are filed at police stations.

Beyond static photographs, the tool enables dynamic monitoring of public areas where criminal activity may occur. Using the InceptionV3 algorithm guarantees a high level of facial recognition accuracy, which is a major advancement in the integration of AI, image processing, and law enforcement for the preemptive detection of criminals in public spaces. To achieve the best possible balance between enhancing security and protecting individual rights, these technologies must be implemented with ethical considerations and privacy precautions, just like any other technical breakthrough.

To achieve the best possible balance between enhancing security and protecting individual rights, privacy protection and ethical considerations must be fundamental to the implementation of such systems, just as they are with blockchain technology. Also, the incorporation of blockchain technology guarantees the confidentiality and integrity of critical information, indicating a more effective and safe strategy for thwarting criminal activity in the digital era.

PROBLEM STATEMENT

Electronic crimes, or eCrimes, are on the rise in today's digital landscape, posing serious problems for both individuals and law enforcement organizations. The complexity and speed of current criminal activity frequently make traditional methods of crime detection and reporting ineffective. As a result, there is an urgent need for creative solutions that may both enable victims' and witnesses' easy reporting processes and quickly and reliably identify offenders. Furthermore, maintaining sensitive data security and integrity in the face of changing cyberthreats continues to be of utmost importance. Therefore, in order to effectively combat eCrimes and improve overall cybersecurity measures, the current challenge requires the creation of complete systems that include cutting-edge facial recognition technology, a streamlined FIR reporting process, and secure blockchain data management.

MOTIVATION

In today's digital world, the rise of electronic crimes, or eCrimes, poses a serious challenge that calls for creative solutions to effectively counteract. The intricacy of contemporary criminal activity frequently outpaces the detection and reporting capabilities of traditional techniques of crime. Therefore, the goal of the Face-Based eCrime Identification and Online FIR Reporting program is to improve the efficiency and security of identifying and reporting criminal activity by utilizing cutting-edge technologies like blockchain and advanced face recognition. This program is to empower law enforcement agencies and individuals in the battle against cybercrime by streamlining procedures and removing conventional hurdles, ultimately leading to a better and more secure digital environment for everyone.

OBJECTIVES

- Support crime prevention, investigations, and public safety by helping law enforcement agencies identify and follow offenders or suspects in real-time.
- Efficient operations can be achieved by optimizing procedures that demand identity confirmation or identification, including those in retail, banking, or attendance systems.
- Propel continuous technological progress in image processing, machine learning, and artificial intelligence to consistently enhance precision, speed, and resilience in person identification.
- Address privacy issues, put data protection measures in place, and reduce the biases present in facial recognition technology in an effort to uphold ethical norms.
- The mail shred with the probable image.

LITERATURE SURVEY

Facial recognition system using LBPH face recognition for anti-theft and surveillance application based on drone technology, Li Wang and Ali Akbar Siddique. Providing security to the citizens is one of the most important and complex tasks for the governments around the world which they have to deal with. Street crimes and theft are the biggest threats for the citizens and their belonging. In order to provide security, there is an urgent need of a

system that is capable of identifying the criminal in the crowded area. This paper proposes a facial recognition system using Local Binary Patterns Histogram Face recognizer mounted on drone technology. The facial recognition capability is a key feature for a drone to have in order to find or identify the person within the crowd. With the inception of drone technology in the proposed system, we can use it as a surveillance drone as well through which it can cover more area as compared to the stationary system. As soon as the system identifies the desired person, it tags him and transmits the image along with the co-ordinates of the location to the concerned authorities using mounted global positioning system. Proposed system is capable of identifying the person with the accuracy of approximately 89.1%.

A Noval Low Processing Time System for Criminal Activities Detection Applied to Command-and-Control Citizen Security Centers, Julio Suarez-Paez, Mayra Salcedo-Ganzalez, Alfonso Climente. This paper shows a Novel Low Processing Time System focused on criminal activities detection based on real-time video analysis applied to Command-and-Control Citizen Security Centers. This system was applied to the detection and classification of criminal events in a real-time video surveillance subsystem in the Command-and-Control Citizen Security Center of the Colombian National Police. It was developed using a novel application of Deep Learning, specifically a Faster Region-Based Convolutional Network (R-CNN) for the detection of criminal activities treated as "objects" to be detected in real-time video. In order to maximize the system efficiency and reduce the processing time of each video frame, the pretrained CNN (Convolutional Neural Network) model AlexNet was used and the fine training was carried out with a dataset built for this project, formed by objects commonly used in criminal activities such as short firearms and bladed weapons. In addition, the system was trained for street theft detection. The system can generate alarms when detecting street theft, short firearms and bladed weapons, improving situational awareness and facilitating strategic decision making in the Command-and-Control Citizen Security Center of the Colombian National Police.

Privacy-Preserving Surveillance as an Edge Service Based on Lightweight Video Protection Schemes Using Face De-Identification and Window Masking, Alem Fitwi, Yu Chen, Sencun Zhu. With a myriad of edge cameras deployed in urban and suburban areas, many people are seriously concerned about the constant invasion of their privacy. There is a mounting pressure from the public to make the cameras privacy-conscious. This paper

proposes a Privacy-preserving Surveillance as an Edge service (PriSE) method with a hybrid architecture comprising a lightweight fore ground object scanner and a video protection scheme that operates on edge cameras and fog/cloud-based models to detect privacy attributes like windows, faces, and perpetrators. The Reversible Chaotic Masking (ReCAM) scheme is designed to ensure an end-to-end privacy while the simplified foreground-object detector helps reduce resource consumption by discarding frames containing only background-objects. A robust window-object detector was developed to prevent peeping via windows; whereas human faces are detected by using a multi-tasked cascaded convolutional neural network (MTCNN) to ensure de-identification. The extensive experimental studies and comparative analysis show that the PriSE scheme (i) can efficiently detect foreground objects, and scramble those frames that contain foreground objects at the edge cameras, and (ii) detect and denature window and face objects, and identify perpetrators at a fog/cloud server to prevent unauthorized viewing via windows, to ensure anonymity of individuals, and to deter criminal activities, respectively.

Smart Monitoring Cameras Driven Intelligent Processing to Big Surveillance Video Data, Zhenfeng Shao, Jiajun Cai, Zhongyvan Wang. Video surveillance system has become a critical part in the security and protection system of modem cities, since smart monitoring cameras equipped with intelligent video analytics techniques can monitor and pre-alarm abnormal behaviours or events. However, with the expansion of the surveillance network, massive surveillance video data poses huge challenges to the analytics, storage and retrieval in the Big Data era. This paper presents a novel intelligent processing and utilization solution to big surveillance video data based on the event detection and alarming messages from front-end smart cameras. The method includes three parts: the intelligent pre-alarming for abnormal events, smart storage for surveillance video and rapid retrieval for evidence videos, which fully explores the temporal-spatial association analysis with respect to the abnormal events in different monitoring sites. Experimental results reveal that our proposed approach can reliably pre-alarm security risk events, substantially reduce storage space of recorded video and significantly speed up the evidence video retrieval associated with specific suspects.

Rectified DenseNet 169-based automated criminal recognition system for the prediction of crime prone areas using face recognition, Shahina Anwarul and Susheela Dahiya. With

the increase in the crime rate, it becomes difficult for police officials to catch criminals. Face recognition is a technique that helps police officials to catch suspects easily with the help of CCTV footage. The constant checking of surveillance video is a tiresome approach that involves substantial visual consideration and is not mentally captivating, making it increasingly inclined to errors. Therefore, the authors proposed an automated criminal recognition system in the present paper. The present paper comprised three phases; the initial phase investigated the performance of various existing face detection algorithms. The second phase proposed a rectified fine-tuned DenseNet169 model for face recognition. In the third phase, the authors proposed an automated criminal recognition system in which the identification of crime-prone areas is made, based on the data collected where most of the criminals are identified. The proposed rectified model outperformed 1.02% to Deep ID, 1% to deep convolutional neural network (CNN), and 1.05% to self-learning CNN on the LFW dataset, 1.09% to VGGFace2, 1.13% to Sphere Face, and 1.03% to lightweight CNN on the CPLFW dataset, and achieved 88.7% recognition accuracy on a self-created dataset by meticulously selecting the hyperparameters and customizing the layers of the model.

Accessorize to a Crime: Real and Stealthy Attacks on State-of-the Art Face Recognition., Mahmood Sharif, Lujo Bauer and Sruti Bhagavatula. Machine learning is enabling a myriad innovation, including new algorithms for cancer diagnosis and self-driving cars. The broad use of machine learning makes it important to understand the extent to which machine-learning algorithms are subject to attack, particularly when used in applications where physical security or safety is at risk. In this paper, we focus on facial biometric systems, which are widely used in surveillance and access control. investigate a novel class of attacks: attacks that are physically realizable and inconspicuous, and allow an at tacker to evade recognition or impersonate another individual. We develop a systematic method to automatically generate such attacks, which are realized through printing a pair of eyeglass frames. When worn by the attacker whose image is supplied to a state-of-the-art face-recognition algorithm, the eyeglasses allow her to evade being recognized or to impersonate another individual. Our investigation focuses on white-box face-recognition systems, but we also demonstrate how similar techniques can be used in black-box scenarios, as well as to avoid face detection.

METHODS:

Image or Video Capture

create one android application for users. Users can register them in an android application. Then the user can add bank details with them profile. Users can select from and to location using that android application when users are going to local, or government bus and user can generate amount according to that bus. The Image or Video Capture module is a crucial component of the real-time surveillance system, responsible for acquiring visual data from various sources such as surveillance cameras, webcams, or video feeds.

It serves as the initial step in the process of monitoring and analyzing the environment for potential security threats or criminal activities. Through this module, the system continuously captures images or video footage, ensuring a constant stream of data for subsequent analysis and processing. To ensure the effectiveness of the surveillance system, the Image or Video Capture module may incorporate advanced features such as motion detection, which automatically triggers image or video recording when movement is detected within the monitored area. Additionally, the module might include functionalities for adjusting camera settings, optimizing image quality, and controlling frame rates to adapt to different lighting conditions and environmental factors. This plays a pivotal role in providing the necessary visual input for real-time monitoring and analysis, facilitating timely responses to security incidents and ensuring the safety of the monitored premises.

Face detection and recognition

A user must select from and to location and it will generate fare details based on that location. Then we entered the count of passengers, and we get total amount. After that, we must use a QR scanner for mobile payment. The Face Detection and Recognition module is designed to identify and recognize human faces within the captured images or video frames obtained from the surveillance system. This module employs sophisticated algorithms and techniques to analyze the visual data and locate faces accurately, irrespective of variations in lighting conditions, facial expressions, or occlusions.

Initially, the face detection component of this module scans the input images or video frames to detect potential regions containing human faces. It utilizes techniques such as Haar cascades, convolutional neural networks (CNNs), or deep learning-based models to identify

facial features and distinguish them from other objects or background elements. Once faces are detected, the recognition component of the module compares the detected faces against a database of known individuals to determine if they match any pre-registered profiles. To enhance the accuracy and reliability of face recognition, the module may employ advanced features such as facial landmark detection, which identifies key points on the face to improve alignment and matching. Additionally, techniques like feature extraction and template matching may be utilized to analyze unique facial characteristics and facilitate precise recognition. Overall, the Face Detection and Recognition module plays a crucial role in identifying individuals of interest and enabling proactive security measures in real-time surveillance applications.

Inception V3 algorithm

Web service is like connecting android application and server. Server should run 24 hours and it must give all the details to database which data's we are getting from users. Then using SOAP protocol, we can connect android application to server. If we are using SOAP protocol, it will collect all the details from android application and it will send to server. The Inception V3 algorithm is a convolutional neural network (CNN) architecture designed for image classification tasks, developed by Google's research team. It is an extension of the original Inception architecture, aimed at achieving better accuracy and efficiency in deep learning-based image recognition tasks.

Inception V3 utilizes a deep network composed of multiple layers of convolutional and pooling operations, followed by fully connected layers for classification. One of its key features is the use of Inception modules, which consist of parallel convolutional layers with different filter sizes and operations. These modules enable the network to capture both local and global features within the input image effectively. Moreover, Inception V3 incorporates techniques such as batch normalization and factorized convolutions to improve training stability and reduce computational complexity. It also includes auxiliary classifiers at intermediate layers during training, aiding in gradient propagation and regularization.

Inception V3 has been widely used in various applications, including image classification, object detection, and feature extraction. Its versatility and effectiveness make it a popular

choice for tasks requiring robust and accurate image analysis, including face detection and recognition in real-time surveillance systems.

Suspect Identification

Admin can see all the details of users like where they are riding local bus. Then admin has to analyze that detail like user's name, from location, to location, amount for bus fare and admin id. Then it is responsible for analyzing the results of face detection and recognition to identify potential suspects or persons of interest within the surveillance footage. This module utilizes the information obtained from the "Face Detection and Recognition" module, which detects and recognizes human faces within the captured images or video frames.

Once a face is detected and recognized, the Suspect Identification module compares the identified individuals against a database of known suspects or persons of interest. This database may include profiles containing biographical information, photographs, and other relevant data. The module employs matching algorithms and similarity metrics to determine the likelihood of a detected face belonging to a known suspect. It may also incorporate machine learning techniques to refine the identification process and improve accuracy over time. Upon identifying a potential suspect, the module may trigger alerts or notifications to security personnel, enabling them to take appropriate action.

This could include further investigation, tracking the individual's movements within the surveillance system, or alerting law enforcement authorities. This module plays a critical role in enhancing the effectiveness of real-time surveillance systems by enabling proactive identification and response to security threats or criminal activities.

FIR Reporting

We have classified each and every 3 hours using SVM algorithm. Because whenever reaching bus from one place to another place, it must collect all the details from users who are all using QR scanner in bus. Then we have analyzed the data like when and where we can give another or extra bus for according to that place. This module facilitates the generation and management of First Information Reports (FIRs) in the context of law enforcement and security operations. When a security incident or criminal activity is

detected and confirmed through the surveillance system, this module automates the process of creating an FIR, which serves as an official record of the incident.

Upon identification of a security breach or criminal behavior, the module collects relevant information from the surveillance system, including captured images or video footage, timestamps, and any associated metadata. It then compiles this information into a comprehensive report format that complies with legal standards and requirements. Additionally, the FIR Reporting module may integrate with external databases or information systems to retrieve additional data relevant to the incident, such as criminal records, suspect profiles, or incident history.

Once the FIR report is generated, the module provides tools for managing and distributing the report to relevant stakeholders, including law enforcement agencies, security personnel, and legal authorities. This may involve sending automated notifications, archiving reports for future reference, or generating printed copies for official documentation. Overall, the FIR Reporting module streamlines the process of documenting and reporting security incidents, ensuring accurate and timely record-keeping while facilitating collaboration and communication among involved parties in law enforcement and security operations.

Data Management

That serves as the backbone for securely storing, organizing, and managing sensitive information. It can be maintaining a comprehensive database of FIR reports, criminal records, and other relevant data. It ensures data integrity, confidentiality, and accessibility for authorized users. This is responsible for the efficient storage, organization, and retrieval of data collected by the surveillance system. This includes not only the raw images or video footage captured by cameras but also metadata, logs, reports, and any other relevant information generated during system operation.

This module employs database management systems (DBMS) or storage solutions to store and organize the collected data in a structured manner, ensuring easy access and retrieval when needed. It may utilize relational databases, NoSQL databases, or cloud-based storage services, depending on the scale and requirements of the surveillance system.

CONCLUSIONS

Our proposal for criminal identification through face recognition represents a groundbreaking solution that harnesses the power of advanced technologies to enhance law enforcement capabilities. By seamlessly integrating modules for image or video capture, face detection, facial recognition, suspect identification, legal considerations, and data management, the system offers a comprehensive approach to addressing the challenges of identifying and apprehending criminals. Through the utilization of cutting-edge algorithms and secure data management practices, the system enables law enforcement agencies to effectively combat crime while upholding legal standards and protecting individual rights. Moving forward, continued advancements in technology and ongoing collaboration between technology developers, law enforcement agencies, and legal experts will be essential to further refine and optimize the system, ensuring its continued effectiveness in safeguarding communities and promoting public safety in the digital age.

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CHAPTER 35

A HYBRID LANE DETECTION MODEL FOR WILD ROAD CONDITIONS USING DEEP LEARNING

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Abstract

This Project describes a real-time lane detecting method in complicated, unstructured situations. By combining an encoder-decoder network with a set of dilated convolution networks, we developed a unique hybrid convolutional neural network architecture and phrased lane detection as a binary segmentation problem. In order to counteract the imbalance between lane and nonlane pixels, we generated a new loss function for binary semantic segmentation and generated a weighted average of these branches' outputs for lane recognition. With TuSimple, the suggested model's accuracy was 95.19%. Using 6149 annotated images from the India Driving dataset (IDD), we created an Indian lane dataset to assess the system in unstructured road scenarios. Compared to other cutting-edge lanes, we noticed an intersection over union of 0.31 on IDD.

INTRODUCTION

Studies on autonomous vehicles have become more significant in recent years. Ego lane maintenance is one of the most crucial tasks performed by autonomous cars. Successful identification of the lane markers is necessary for maintaining the lanes. Despite the large number of vision-based methods for lane recognition in the literature, the problem remains unresolved when challenging circumstances and the relatively limited processing power of embedded processing units found in cars are taken into account. There are numerous factors that might degrade the structures of lane markings, including weather, reflections on the roads, and time-related marking deterioration.

Any ADS has the potential to benefit from lane detection, which depends on how well-defined and consistent the lane markers are. When identifying lanes using longitudinal road

markings, cameras are typically used, either in monocular or stereo vision. Lane detection systems must overcome a number of barriers, such as determining which lane a car is in on a multilane road, accurately detecting worn markings even in difficult lighting and weather conditions, and distinguishing road markings from other longitudinal lines like guardrails and cracks in the asphalt surface. With careful planning and administration that capitalizes on the advantages of driver support systems, this data may help create five safer roadways. It is an invaluable source of information for road asset management systems. This study sought to ascertain whether traditional methods.

LITERATURE SURVEY

For lane keeping assistance and lane departure alert systems to operate safely, accurate and dependable lane detection is essential. However, as is typically done in current research, it is challenging to achieve sufficient performance in reliably detecting the lanes from a single image under some demanding conditions. Since lane markers are continuous lines, it may be possible to more precisely infer lanes that are difficult to discern in the current single image by incorporating information from earlier frames. A novel hybrid spatial-temporal (ST) sequence-to-one deep learning architecture is proposed in this work. In order to recognize the lane markings in the final frame, this architecture fully utilizes the ST information in several continuous picture frames. In particular, the hybrid model incorporates the subsequent elements.

Both autonomous driving systems and people can receive positional information from pavement markings. The use of automated driving is growing in order to improve safety, thus it's critical to comprehend how well sensor systems interpret these marks. In this endeavor, data from a movable retro reflector deployed externally and an in-vehicle lane departure warning system were compared. The retro reflectometer could forecast whether the car's lane departure systems would identify markings in 92% to 98% of situations, depending on the conditions. The test was conducted over 200 km of driving on three distinct routes in varying lighting conditions and road classes. The experiment showed that automated driving systems may be utilized to keep an eye on pavement markings' condition and offer.

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For sophisticated driver assistance systems and driverless cars, lane detection in driving scenarios is a crucial module. Numerous advanced lane identification techniques have been put forth in recent years. Nevertheless, the majority of techniques concentrate on lane detection from a single image, which frequently results in subpar handling of certain really problematic scenarios like intense shadow, severe mark degradation, significant vehicle occlusion, and so forth. Actually, on a road, lanes are just continuous line formations. As a result, by using information from earlier frames, the lane that cannot be reliably identified in a single frame may be inferred out. In order to do this, we use several frames of a continuous driving scene to examine lane detection and propose a hybrid deep architecture that combines the convolutional neural network.

One of the main issues in the fields of intelligent vehicles and driving safety is lane-marking detection. This work proposes HSILMD, a novel lane-marking detection technique based on the HSI color model. To detect the road surface on the host car, HSILMD converts full color photos into HSI color representation. Then, it records the difference in intensity distribution of a row of pixels within the ROI and uses the fuzzy c-Means technique to cluster those pixels. Saturation and intensity thresholds are chosen appropriately. Lane markers on a variety of road scene photos are recognized using straightforward thresholds and operations. The outcomes are contrasted using an alternative scheme and the same scheme with an RGB color model. It is noted that this system with lower compute use is robust.

METHODS

Convolution Neural Networks:

The non-linear layer in most CNN architectures comes after the convolutional layer and uses an activation function of some sort to modify the output of the previous layer. Lastly, the pooling layer is yet another crucial operational element of a CNN network. Its primary contribution is to lessen the complexity of the CNN architecture by maintaining high-value features during feature map down sampling. Furthermore, one or more fully connected layers and their corresponding activation functions produce an output based on the CNN's current task (e.g., regression, classification).

Transformer Networks:

Typically, transformer networks have an encoder/decoder architecture with a few fully linked layers and multiple stacked attention layers. An embedding vector and a positional embedding that indicates each embedding's location in the original sequence are fed into the Transformer's encoder as inputs. Likewise, the network's decoder is entrusted with using the features discovered by the encoder to produce an output embedding.

Modules for performance enhancement:

A thorough synopsis of these recently suggested modules is given in this section. A compelling substitute for conventional convolutional layers in CNN architectures was suggested. Based on dilated convolution and channel attention, the suggested module aims to locate and utilize significant feature information dispersed among various channels (Woo et al., 2018). By applying a decreased kernel to the input in dilated convolution, the receptive field is increased without the need for further parameters. The authors use PINet as the backbone network and substitute their suggested channel attention and hybrid dilated convolution (CA-HDC) module for all convolutional layers except the initial ones. The common convolution branch, the residual portion, and the CA-HDC layer are divided into three sections.

Dataset and pre-processing:

The 6408 photos in the entire collection are broken up into roughly 320 one-second segments, each with 20 frames. Every frame image in the clip has an original resolution of 1280 x 720 pixels. Only the twentieth frame of each tape has lane markings for non-standard numbers of lanes (2 to 5 lanes) noted on it. The dataset's producers claim that the clips were captured in a variety of daytime and traffic situations, with either excellent or middling weather. Additionally, the developers have already divided the dataset into training and test sets. Of the 6408 clips in total, 3626 are provided for the train and validation split, while 2782 are offered for testing.

CNN Backbone Network

Following the TUSimple dataset pre-processing methods, we integrate the SegNet backbone network. Usually, the encoder block down-samples the input data while progressively and repeatedly transforming it from the preceding layer into a higher-dimensional representation. The highest-dimensional representation that the encoder produced after processing the input data is transferred to the decoder, which carried out the opposite operation. The encoder's output, which is much smaller than the original input, is then successively and repeatedly downsized to lower dimensions and then up sampled to the original input size by the decoder block. The input image is processed by the encoder to extract high-level features, which are then utilized by the decoder to create a pixel-wise segmentation map.

VIT Module and Feature Transformation

A Vision Transformer (ViT) is the next module in our pipeline, which comes after extracting the corresponding 64 channel feature maps and transmitting the input images from our backbone SegNet model. ViT models are frequently employed for image classification, and their efficacy in this task often depends on huge data sets. Nonetheless, newer research indicates that a ViT model can be trained or optimized for segmentation tasks by making a few architectural design adjustments. We also proceeded with the CNN feature extraction backbone selection in order to lessen the unique training requirements of a ViT for big training batch sizes, times, and data volumes.

Target Classification Strategy

E step: Assuming that the current cluster parameters are accurate, computes the conditional expectation of the entire log-likelihood and evaluates the posterior probabilities that link each cluster to each data point in the conditional probability.

M step: Recompute wn, c using the updated weights, means, and covariances after determining the cluster parameters that, under the assumption that the present data distribution Is accurate, maximize the likelihood of the data. The first feature extraction technique that has been suggested is based on using 2D DCT on certain regions of the 2D map created from Doppler radar data. To convert 2D images from the spatial domain to the frequency domain, 2D DCT is typically utilized. The visuals' abrupt alterations or gradual variations correlate to DCT's high and low frequencies.

Convolutional Variational Autoencoder (CVAE):

CVAEs are generative models that are frequently employed in the fields of reinforcement learning, data augmentation, and dimensionality reduction. CVAEs have been utilized to generate synthetic data while taking Doppler radar data into account. The two primary modules of CVAEs are the decoder, also known as a generative model, and the encoder, often known as an inference or recognition model. The encoder's job is to convert the observed input space (x), which has a rather complex distribution, into a much simpler distribution in a much lower latent representation (z), from its original high-dimensional space (6400 dimensions in this case). The decoder's input is then the recognition model Z's output. Rebuilding the original input x from the reduced input is the decoder's goal.

Feature Extraction:

In order to provide values that are near across similar data samples, the Euclidean distances are transformed into probabilities that describe normal distributions. Conversely, different points have different similarity values. Each data point pair Dij has its similarity scores determined, and a similarity matrix based on probabilities pij is obtained.

The low dimensional space rst receives random projections of the data samples. This leads to an initial discrepancy with the cluster patterns of data in the original domain.

Repositioning the data samples in the new low-dimensional space with the goal of maintaining the same grouping patterns as the high-dimensional space is the goal of t-SNE.

Classification:

The collected features are fed into an appropriate classifier as the last stage of the suggested method, and the classification procedure is carried out. SVM is the classifier of choice. SVM can classify two classes on the test data set with high accuracy and low computational cost by learning the support vectors from the training data set. Three gaits need to be categorized in this paper. Our approach to the multi-class classification problem is to use the one-versus-one Support Vector Machine technique. First, we construct three SVMs with two classes each, called SVM1, SVM2, and SVM3. Using the training set of gait A and gait B, SVM1 is produced. Similarly, gait B and gait C training data are used to obtain SVM2, while gait D training data are used to obtain SMV3.

Auxiliary Classifier Generative Adversarial Networks:

Using a collection of training samples, implicit generative models called GANs seek to understand the data distribution. Unlike CVAE, generative models do not require intractable density functions because of their implicit structure. The fundamental concept of GANs comes from a game-theoretic method in which there are two players: a generator and a discriminator, who are both neural networks. During training, there is a constant conflict between these two entities. The generator (G) aims to produce samples that should be drawn from the training data's similar distribution. Random noise from a 31 Gaussian distribution can be used as the generator's input. The generator transfers G(z) to the picture space after obtaining samples z from the chosen distribution.

Lane detection pipeline:

Each module of our lane detecting pipeline was covered in detail in the parts before this one. This portion includes the training schedule and configurations we used to pre-train the backbone model, as well as a quick overview of the pipeline as a whole. Our pipeline's SegNet CNN backbone is trained independently of the other pipeline components to achieve

optimal performance. Our use of hyper-parameters is mainly motivated by implementations of similar designs found in the literature.

CONCLUSIONS

In this proposal, we investigate the effectiveness of combining the feature extraction capabilities of a convolutional neural network (SegNet) with the deep contextual understanding provided by a transformer network (ViT) through its attention mechanism. The quantitative evaluation results from our model do not provide us with sufficient indications that the ViT architecture can be used effectively for lane detection, either when combined with a CNN or on its own.

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CHAPTER 36
CRIME AGAINST WOMEN ANALYSIS AND PREDICTION USING MACHINE LEARNING

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Abstract

This work uses machine learning for analysis and prediction in order to solve the important problem of crimes against women. By analyzing past data, we find trends and important variables to create crime hotspot prediction models. Our research reveals particular locations and periods of increased danger, which are impacted by factors including economic status, law enforcement presence, and population density. Precise forecasting models can assist policymakers in efficiently allocating resources and carrying out focused interventions, hence augmenting public safety. This study highlights the potential of machine learning for proactive crime prevention and offers insightful information for community and policy makers.

Keywords

Crimes Against Women, Machine Learning, Predictive Modeling, Public Safety.

INTRODUCTION

The steady increase in crimes committed against women is a serious threat to public safety and necessitates quick and efficient responses. Because these types of crimes are so complicated and multidimensional, traditional methods of crime analysis frequently fall short in proactively addressing this issue. A more calculated approach to prevention is made possible by the potential tools that recent machine learning developments offer for comprehending and forecasting criminal behavior.

The goal of this project is to use machine learning to anticipate and analyze crimes against women. Through the analysis of copious amounts of historical data, we aim to identify

trends and significant variables that underlie these crimes. Our objective is to create prediction algorithms that precisely project future crime rates and pinpoint high-risk locations and periods.

Our methodology entails gathering and preparing a variety of datasets, such as socioeconomic indicators, police reports, and demographic data. We find important patterns and relationships using exploratory data analysis (EDA), which offers more in-depth understanding of the dynamics of crimes against women. Next, we use a variety of machine learning algorithms to construct and assess our prediction models, including logistic regression, decision trees, random forests, and neural networks. The potential for this research to improve public safety by focused actions and well-informed decision making makes it significant. Law enforcement organizations can optimize resource allocation and conduct successful preventive initiatives with the aid of accurate predictions of crime hotspots. Furthermore, the knowledge gathered from our analysis can help with public awareness campaigns and policy-making, which will help to lower the overall number of crimes against women.

In conclusion, this study shows how machine learning can be used to solve challenging social problems. We hope to make significant strides in the direction of establishing a more secure atmosphere for women by utilizing data analysis and predictive modeling. In order to further increase predicted accuracy and responsiveness, future research directions include the incorporation of real-time data and the investigation of additional variables.

LITERATURE SURVEY

A Deep Learning Approach for Missing Data Imputation of Rating Scales Assessing Attention-Deficit Hyperactivity Disorder by Chung-Yuan Cheng

A variety of tools and methods have been used to measure behavioural symptoms of attention-deficit/hyperactivity disorder (ADHD). Missing data is a major concern in ADHD behavioural studies. This study used a deep learning method to impute missing data in ADHD rating scales and evaluated the ability of the imputed dataset (i.e., the imputed data replacing the original missing values) to distinguish youths with ADHD from youths without ADHD. The data were collected from 1220 youths, 799 of whom had an ADHD diagnosis, and 421 were typically developing (TD) youths without ADHD, recruited in

Northern Taiwan. Participants were assessed using the Conners' Continuous Performance Test, the Chinese versions of the Conners' rating scale revised: short form for parent and teacher reports, and the Swanson, Nolan, and Pelham, version IV scale for parent and teacher reports. We used deep learning, with information from the original complete dataset (referred to as the reference dataset), to perform missing data imputation and generate an imputation order according to the imputed accuracy of each question. We evaluated the effectiveness of imputation using support vector machine to classify the ADHD and TD groups in the imputed dataset. The imputed dataset can classify ADHD vs. TD up to 89% accuracy, which did not differ from the classification accuracy (89%) using the reference dataset. Most of the behaviors related to oppositional behaviors rated by teachers and hyperactivity/impulsivity rated by both parents and teachers showed high discriminatory accuracy to distinguish ADHD from non-ADHD. Our findings support a deep learning solution for missing data imputation without introducing bias to the data.

Value imputation using unsupervised machine learning techniques by P.S. Raja, Dr. Thangavel Kuttiyannan

To impute missing values using unsupervised machine learning, begin by cleaning the dataset to remove any irrelevant records. Conduct exploratory data analysis (EDA) to understand the statistical properties and relationships between variables. Various techniques can be employed for imputation. K-Nearest Neighbors (KNN) fills in missing values based on the mean or median of 'k' nearest neighbors. Matrix factorization methods like Singular Value Decomposition (SVD) and Non-Negative Matrix Factorization (NMF) decompose the data matrix and reconstruct missing values. Autoencoders, a type of neural network, can learn data representations and fill in gaps. Clustering based imputation groups data into clusters, imputing values based on cluster centroids or distributions. Multivariate Imputation by Chained Equations (MICE) iteratively models each variable to impute missing values. Evaluate the imputation quality using cross validation and statistical measures like RMSE and MAE. Implement the process in Python for reproducibility and consistency in future datasets.

The Feature Selection Effect on Missing Value Imputation of Medical Datasets by Chia-Hui Liu

To assess the feature selection effect on missing value imputation in medical datasets, start by cleaning the dataset to remove irrelevant records and conduct exploratory data analysis (EDA) to understand the data structure. Apply feature selection techniques such as recursive feature elimination, LASSO, or mutual information to identify the most relevant features. Create subsets of the dataset based on these selected features. For each subset, use imputation methods like K-Nearest Neighbors (KNN), matrix factorization, autoencoders, clustering based imputation, or Multivariate Imputation by Chained Equations (MICE). Evaluate the imputation quality using cross-validation and statistical measures like Root Mean Square Error (RMSE) and Mean Absolute Error (MAE). Compare the imputation results across different feature subsets to determine the impact of feature selection. Implement the entire process in Python to ensure reproducibility and facilitate future analysis.

Imputation for Repeated Bounded Outcome Data: Statistical and Machine Learning Approaches by Urko Aguirre

To impute repeated bounded outcome data, begin by understanding the dataset's structure and the nature of the bounded outcomes. Perform data cleaning and exploratory data analysis (EDA) to identify missing patterns. For statistical approaches, consider methods like Multiple Imputation by Chained Equations (MICE), which iteratively models each variable, and Bayesian methods that incorporate prior distributions. Ensure bounds are respected during imputation by applying techniques like truncated regression or beta regression for outcomes within [0,1]. For machine learning approaches, utilize algorithms such as K-Nearest Neighbours (KNN), which can respect bounds through custom distance metrics, and Random Forests, which can handle complex interactions in repeated measures. Autoencoders can be adapted to maintain bounds by using appropriate activation functions. Evaluate imputation quality using metrics such as Root Mean Square Error (RMSE) and ensure bounds are respected in all imputations. Implement the process in Python, ensuring reproducibility and consistency across different datasets.

EXISTING SYSTEM

The official police portal is the source of the crime data. Included are details about the offense, including the type of crime, date, time, latitude, and longitude of the scene. To achieve a high level of accuracy, preprocessing will be carried out prior to training the model, and then feature selection and scaling will be carried out. The decision tree and random forest algorithms, as well as the logistic regression classification, will be examined for predicting crimes; the algorithm with the highest accuracy will be trained. The dataset will be visually represented through a number of scenarios, such as when criminal activity is most prevalent—that is, when crime rates are highest or when month is most prevalent. Giving a fair explanation is the project's main goal.
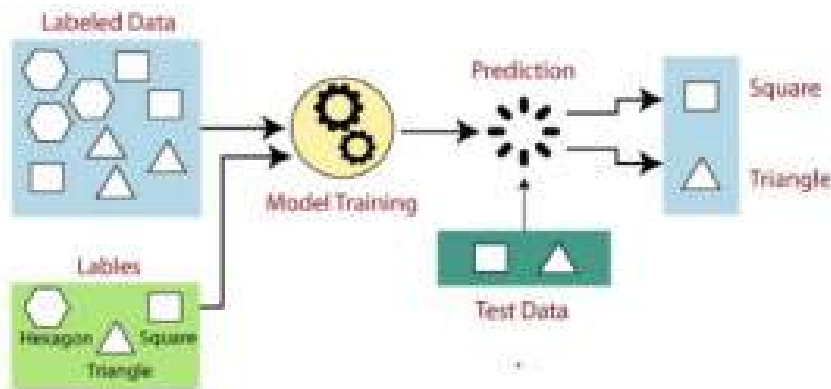
Figure 1 – Block diagram

PROPOSED SYSTEM

By combining data collection, preprocessing, feature extraction, and linear regression analysis, crimes against women in India are examined. The initial phase is gathering extensive datasets from multiple sources across different Indian states that include demographic data, crime statistics, and socioeconomic indicators. To ensure the quality and dependability of the data for further research, these datasets will go through a thorough preparation step that will clean and normalize the data. Feature extraction techniques will be used by the system to find pertinent factors and characteristics that could affect the likelihood of crimes against women. In order to identify the underlying patterns and trends, this procedure entails choosing and modifying the most illuminating characteristics from the gathered data, such as population density, literacy rates, income levels, and historical

crime rates. using linear regression techniques to simulate the correlation between the chosen characteristics and the frequency of crimes against women. The system will learn to forecast the frequency and severity of various sorts of crimes against women in different states of India by training the regression model on historical crime data. Furthermore, by using predictive modeling techniques, the system will be able to predict future trends and patterns, giving stakeholders important information for proactive intervention and policy formulation. The suggested system would also have interactive visualization and analysis capabilities, allowing stakeholders to easily examine and comprehend the predictive insights. Policymakers, law enforcement organizations, and advocacy groups will be equipped to adopt focused initiatives meant to reduce gender-based violence and make data-driven decisions thanks to user-friendly interfaces and visualization tools. The suggested method uses predictive modeling and powerful data analytics to tackle the complicated problem of crimes against women in India in a comprehensive manner. Through the application of statistical analysis and machine learning, the system seeks to deliver practical insights for building a more secure and just society for women.
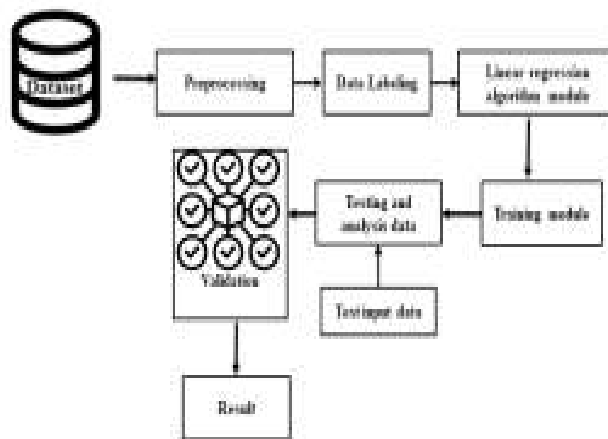
Figure 2 – System Architecture

SYSTEM IMPLEMENTATION

To implement a system for crime against women analysis and prediction using machine learning, begin by collecting datasets from sources like police reports and public crime databases. Clean and preprocess the data to handle duplicates, missing values, and ensure consistency. Conduct exploratory data analysis (EDA) to understand the data and identify

key patterns. Next, perform feature engineering by creating relevant features such as location, time of day, type of crime, and socio-economic factors. Encode categorical variables and normalize numerical ones. Split the data into training, validation, and test sets to ensure robust evaluation. Select suitable machine learning models, such as logistic regression, decision trees, random forests, gradient boosting, or neural networks, and train them on the training dataset. Optimize model performance through hyperparameter tuning using grid search or random search. Evaluate the models on the validation set using metrics like accuracy, precision, recall, and ROC-AUC. Choose the best-performing model for final deployment. Use the selected model to make predictions on the test set and new data, analysing patterns to identify high-risk areas and times. Develop visualization dashboards with tools like Tableau, Power BI, or matplotlib to present analysis results. Deploy the model using a cloud service or on-premises infrastructure, with frameworks like Flask or Django for a web interface. Continuously monitor system performance, update the model with new data, and implement mechanisms for user feedback and system updates.
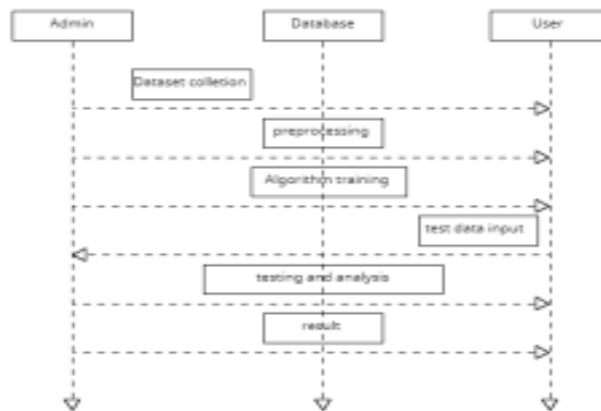
Figure 3 – Module Implementation

CONCLUSION AND OUTPUT

In conclusion, this paper presents a comprehensive analysis of crimes against women in various states of India, utilizing machine learning algorithms to predict and understand the underlying trends. Through meticulous data collection, pre-processing, and feature extraction, we have uncovered valuable insights into the prevalence and patterns of gender-based violence. By training a linear regression model, we have successfully forecasted future

occurrences of these crimes, providing stakeholders with actionable information for proactive intervention and policy formulation. The proposed system offers a powerful tool for addressing the persistent issue of gender-based violence, enabling informed decision-making and resource allocation to create a safer and more equitable society for women in India. As we strive towards a future free from violence and discrimination, the insights gleaned from this analysis serve as a foundation for fostering meaningful change and advocating for the rights and well-being of women across the nation.

OUTPUT

Figure 4 - Web Page Index

Figure 5 – Prediction Specification
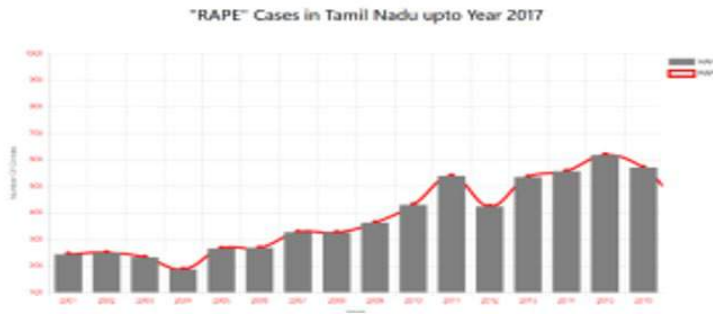
Figure 6 – Prediction View
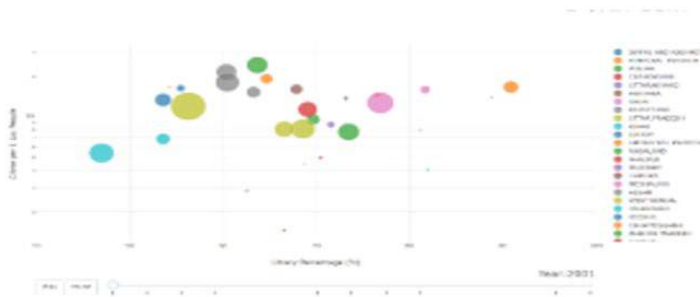
Figure 7 - Visualization
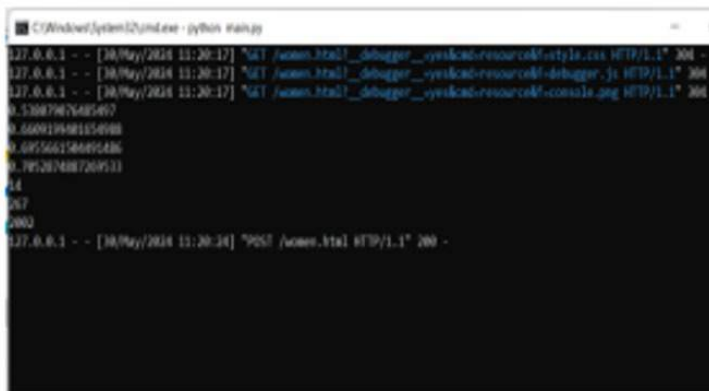
Figure 8 – Running Status

DEMAND OF THE MODULE

The alarming increase in crimes against women necessitates urgent and effective interventions to ensure safety and justice. Traditional crime analysis methods are often inadequate due to the complexity and multifaceted nature of these crimes. This project leverages machine learning to analyze and predict crimes against women, addressing this critical societal issue with advanced technological solutions. By utilizing large datasets from

police reports, demographic data, and socioeconomic indicators, the project aims to uncover patterns and influential factors contributing to these crimes. Predictive models can forecast high risk areas and times, enabling law enforcement agencies to allocate resources more efficiently and implement targeted interventions. This proactive approach not only enhances public safety but also informs policy-making and raises public awareness. The demand for such a project is driven by the need for innovative and data-driven solutions to combat the rising tide of violence against women, ultimately striving for a safer and more just society.

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CHAPTER 37

Next-Gen Security for Health Records Through Blockchain Integration

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Abstract

The traditional health record sharing system faces challenges in security, privacy, and efficient sharing. "Sec-Health" protocol, a blockchain-based solution, addresses these issues by integrating advanced cryptographic techniques. Its structured workflow includes setup, storage, sharing, and emergency access phases, ensuring controlled access and data integrity. Through blockchain and IPFS networks, users register securely in the setup phase. Health records are encrypted and stored in the blockchain network during storage. Access in the sharing phase is controlled by cryptographic material, allowing only authorized users. The emergency access phase ensures immediate and legitimate access during critical situations. Patients have dynamic control over their records through access revocation. Overall, Sec-Health offers a dynamic solution that enhances security, privacy, and collaboration in healthcare data management. The "Sec-Health" protocol, it incorporates smart contract technology, ensuring automated compliance with access rules and policies. Each access request is logged immutably on the blockchain, offering transparency and traceability for auditing purposes. Additionally, the protocol supports multi-level encryption and role-based access control, which ensures that healthcare providers, insurers, and patients have different levels of data visibility based on their roles.

Keywords

Blockchain, Healthcare, Records, Security

OVERVIEW

The healthcare sector faces significant challenges in securing patient health records, leaving sensitive information vulnerable to breaches and tampering. In response, the Sec-Health project integrates blockchain and advanced encryption to establish a secure, patient-centric data management protocol. This initiative prioritizes patient privacy, enables dynamic access control, ensures rapid emergency responses, and fosters secure collaboration for research. By leveraging consortium blockchain, governed by a national authority, Sec-Health aims to redefine healthcare data security standards. Blockchain's decentralized and tamper-proof nature offers unprecedented transparency and integrity in storing transaction records. Through its innovative approach, Sec- Health emerges as a transformative initiative poised to address critical gaps in healthcare data management and safeguard patient information in the digital age. In addition to addressing security and privacy concerns, the integration of blockchain technology in healthcare data management offers several other benefits. Blockchain enables secure and efficient interoperability among disparate healthcare systems and stakeholders, facilitating seamless exchange of patient information while maintaining data integrity. By providing a tamper-proof audit trail of transactions, blockchain enhances accountability and transparency in healthcare operations, reducing the risk of fraud and errors.

Moreover, blockchain-based solutions empower patients with greater control over their health data, enabling them to securely share information with healthcare providers, researchers, and other authorized entities. This patient- centric approach not only improves care coordination and decision-making but also enhances patient engagement and satisfaction.

RELATED WORKS

The proposed security framework for Electronic Health Record (EHR) systems addresses the critical aspects of integrity, availability, and confidentiality of health records. By leveraging tools such as STRIDE modeling and DREAD risk assessment, the framework identifies and mitigates threats posed to the EHR system. Various attacks and vulnerabilities are analyzed, and appropriate countermeasures are discussed to protect health information stored in the cloud-based EHR database. This framework provides structured security

processes for healthcare application developers, enabling them to evaluate security threats and implement suitable countermeasures. It incorporates security rules encompassing administrative, physical, and technical safeguards to ensure the confidentiality, integrity, and security of the EHR system. Recognizing the significance of real-time patient data and population health management, the framework facilitates seamless connectivity across all levels of the public health system, regardless of geographical boundaries. However, it acknowledges that the client component of the EHR system is particularly vulnerable to attacks due to its role in viewing, entering, and modifying health information. Similarly, compromising the server grants attackers complete control over the system, leading to potential exposure, alteration, or destruction of health information. Network compromises pose additional risks such as eavesdropping and data alteration during transit.

The proposed scheme for cloud-based E-healthcare services offers a robust and lightweight solution to address potential threats and ensure secure access for stakeholders. By leveraging a key derivation function (KDF), the scheme generates multiple keys for end-to-end encryption, enhancing data security and preventing unauthorized access. Access to cloud services is granted based on stakeholder identity and association, ensuring privacy and confidentiality of medical records. In the hospital environment, where staff face challenges in handling and storing patient records, the proposed scheme alleviates manual tasks by storing medical records in the cloud. The scheme distinguishes between user devices, gateways, and cloud entities. All entities execute identical cryptography functions, ensuring consistency and security throughout the system. Key Derivation Function (KDF) plays a crucial role in deriving secret keys from the master key, enhancing encryption strength and protecting sensitive information.

The state-of-the-art cloud- centric IoMT-enabled smart healthcare system with public verifiability leverages an escrow-free identity-based aggregate signcryption (EF-IDASC) scheme to ensure secure and efficient data transmission. This novel system fetches medical data from various sensors implanted on the patient's body, sign crypted , and aggregates them using the EF-IDASC scheme. Subsequently, the data is outsourced to a medical cloud server via a smartphone, safeguarding the patient's identity and medical information. In this system, data is sign crypted by the Body Monitoring System (BMS) using its private key, which can only be decrypted using the private key of the Smart Device (SD) and BMS's

identity. Unauthorized interception of the original data is prevented as it requires the private key of SD/BMS, which is derived from the Network Manager's (NM) master key and Key Production System's (KPSs) secret keys. Registration in this system involves authentication and registration by NM, followed by the issuance of a private key to each entity. Communication between entities is only permitted if they were previously registered with NM.

A blockchain security framework (BSF) to effectively and securely store and keep EHRs. It presents a safe and proficient means of acquiring medical information for doctors, patients and insurance agents while protecting the patient's data. Electronic health records (EHR) are regulated by health centers instead of patients, making it difficult to obtain medical advice from various health centers. Thus, patients need to concentrate on restoring the management of their health details and their medical information. The quick evolution of blockchain technology encourages population healthcare, including access to patient information and medical data. In the BSF-EHR system, the miner node is the EHR system server and both the doctor and patient are full nodes. The insurance agent plays the role of the light nodes. In the BSF-EHR system, a large number of doctors and patients and also insurance agents are available. Therefore, access control is necessary. Our BSF-EHR system provides access control.

Zhuang et.al,...[5] Developed a blockchain model to protect data security and patients' privacy, ensure data provenance, and provide patients full control of their health records. By personalizing data segmentation and an "allowed list" for clinicians to access their data, this design achieves patient-centric HIE. To utilize the unique technological capabilities of blockchain for patient centric HIE, we have implemented a private Ethereum blockchain system with multiple smart-contract. A system administrator from each healthcare facility will create a touchpoint for each patient's visit after the EHR is ready and input the related primary information into a smart contract for future indexing. Clinicians can select records through the touchpoints after being granted access to the patient's records without identifying the hospitals storing those records. The subsequent exchange of data among the involved remote healthcare facilities will include data encryption and use of the blockchain system to send and retrieve decryption keys.

BLOCKCHAIN

Blockchain serves as an ultra-modern digital ledger which can be tweaked to not only record monetary transactions but virtually, anything of value. The digital data that is put away on a Blockchain exists as a mutually shared— and a perpetually database. This decentralized system and its utilization has valuable benefits for virtually every industry where it is applied.

Records to be stored on a Blockchain are appended to the chain only once their integrity is verified. These records are decentralized having no central storage location for a hacker to exploit. The data at any particular instance of time is hosted on millions of computers across the globe, each having the same copy that is visible to everyone present on that network.

Decentralized Storage: Blockchain serves as a decentralized ledger where health records are stored securely across a network of nodes.

Immutable Record-keeping: Once recorded on the blockchain, health records are immutable, meaning they cannot be altered or deleted. Each transaction, such as the creation or modification of a health record, cryptographically sealed into a block and added to the chain in chronological order.

Enhanced Security: Blockchain employs advanced cryptographic techniques to secure health records, providing robust protection against unauthorized access and breaches.

Smart Contracts for Automated Processes: Smart contracts, self-executing agreements with predefined rules, automate various processes within the Sec-Health protocol.

Interoperability and Collaboration: Blockchain facilitates interoperability by enabling seamless sharing of health records among different healthcare providers and systems. This interoperability promotes collaboration and information exchange, leading to improved patient care and outcomes.

BLOCKCHAIN ARCHITECTURE

The architecture for blockchain technology in the context of the Sec-Health project involves several key components and layers designed to ensure secure and efficient healthcare data management. Here's a high-level overview of the architecture:

A. Network Layer:

Nodes: The network consists of multiple nodes, which can be distributed across various geographical locations. Nodes are individual computers or servers that participate in the blockchain network.

Peer-to-Peer Communication: Nodes communicate with each other using a peer-to-peer (P2P) network protocol. This enables the exchange of data, transactions, and blocks among network participants.

B. Blockchain Layer:

Blocks: Blocks are containers that store a batch of valid transactions. Each block contains a cryptographic hash of the previous block, creating a chain of blocks (hence the term "blockchain").

Transactions: Transactions represent the exchange of data or assets between network participants. In the context of Sec-Health, transactions include the creation, access, and sharing of healthcare records.

By integrating these components and layers, the blockchain architecture for the Sec-Health project establishes a secure, transparent, and interoperable platform for healthcare data management, ensuring the privacy, security, and integrity of patient health records.
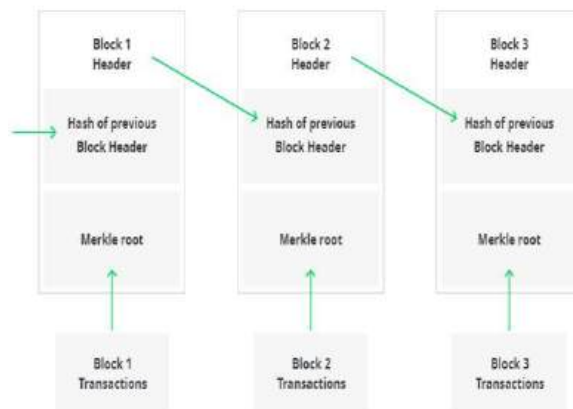
Figure 1: Sequence of Blocks in a Blockchain
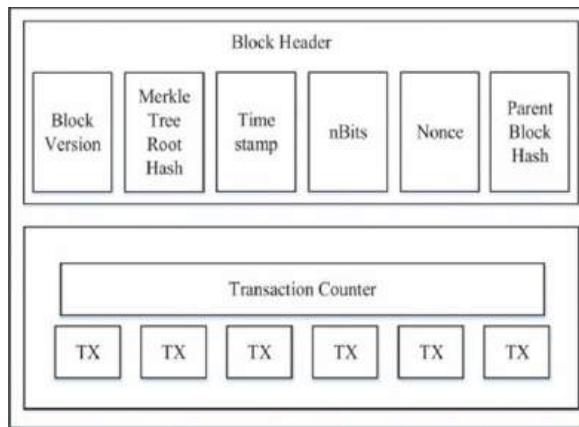
Figure 2: Structure of a single block

Each block consists of the block header and the block body as shown in Figure 2. A block header contains following information:

The block body is composed of a transaction counter and transactions. Maximum number of transactions that a block can contain depends on the block size and the size of each transaction

- Block version: specifies block validation rules to be followed.

- Merkle tree root hash: the hash value of all the transactions in the block.[15]

- Timestamp: current time as seconds.

- n Bits: target threshold of a valid block hash.

- Nonce: a 4-byte field, which usually starts with 0 and increases for every hash calculation [15]

- Parent block hash: a 256-bit hash value that points to the previous block.

- Blockchain uses an asymmetric cryptography mechanism to validate the authentication of transactions

BLOCKCHAIN SECURITY

Blockchain technology offers several inherent security advantages, which make it an attractive solution for various applications, including healthcare data management like the Sec-Health project.

A. Decentralization:

Blockchain operates on a decentralized network of nodes, eliminating the need for a central authority. This decentralization makes it inherently resistant to single points of failure and reduces the risk of data manipulation or tampering.

B. Immutable Ledger:

Once data is recorded on the blockchain, it cannot be altered or deleted. Each block contains a cryptographic hash of the previous block, creating a chain of blocks that is virtually tamper-proof. This immutability ensures the integrity and transparency of transaction.

C. Encryption:

Blockchain employs advanced cryptographic techniques to secure data and transactions. Transactions are encrypted using public-key cryptography, ensuring that only authorized parties can access and decrypt sensitive information.

D. Reduced Cybersecurity Risks:

By decentralizing data storage and distribution, blockchain reduces the risk of cyber-attacks such as DDoS (Distributed Denial of Service) attacks, data breaches, and unauthorized access. The distributed nature of blockchain networks makes them less susceptible to hacking and cyber threats compared to centralized systems.

PROPOSED METHODOLOGY

In proposed system, implement a blockchain-based protocol called Sec-Health, which enhances the schemes employed in the previous protocol to fulfill the security properties of confidentiality, access control, and integrity. Sec-Health includes novel schemes to address additional properties, i.e., emergency access, access revocation, anonymity, and interoperability. An authority is responsible for managing user's registration and attesting that cryptographic material is valid, while a blockchain and an IPFS network store data related to health records. Several participants are considered the system users, as follows. A collaborator (e.g., physician, nurse) generates health records for patients and accesses, under

patient consent, records generated by other collaborators. Research entities access anonymized health records to conduct researches. Attendants are call center professionals who handle initial steps of emergency sessions according to required information received from a phone caller. Finally, emergency servers are participants that assist collaborators to legitimately gain access to health records in emergency sessions. Every health record is encrypted with a AES with access policy elaborated by the patient. Therefore, an attacker attempting to maliciously access a record in our scheme would need to corrupt the majority of the servers in order to obtain a sufficient number of decryption parts. The set of four phases is composed of setup, storage, sharing, and emergency access. They include mechanisms that satisfy four health records properties, namely confidentiality, access control, integrity, and emergency access.

The protocol begins with the setup phase, in which blockchain and IPFS networks are created, and users are registered in the system. The authority attests all the public data (e.g., participants' public key) necessary to run the system, which are stored in the blockchain. In the storage phase, a collaborator generates a health record for a patient, who stores it in the IPFS network and its metadata in the blockchain in a secure fashion such that another collaborator can later access the record. After this, the designated collaborator can access the health record, in the sharing phase, if they own the required cryptographic material for this purpose. The emergency access phase occurs when a patient needs emergency medical care and has no physical conditions (e.g., may be unconscious) to give available collaborators access permission to her health record. This phase runs in a collaborative way (between the emergency servers, collaborators and call center attendant) such that the patient can later verify who participated in the emergency session and had access to her health record. After granting access to a health record for a collaborator, the patient can revoke this access right whenever she wants by means of the access revocation mechanism in an interaction with the blockchain network. With the anonymity mechanism, a collaborator can provide a health record for research studies under patient consent.

SYSTEM ARCHITECTURE
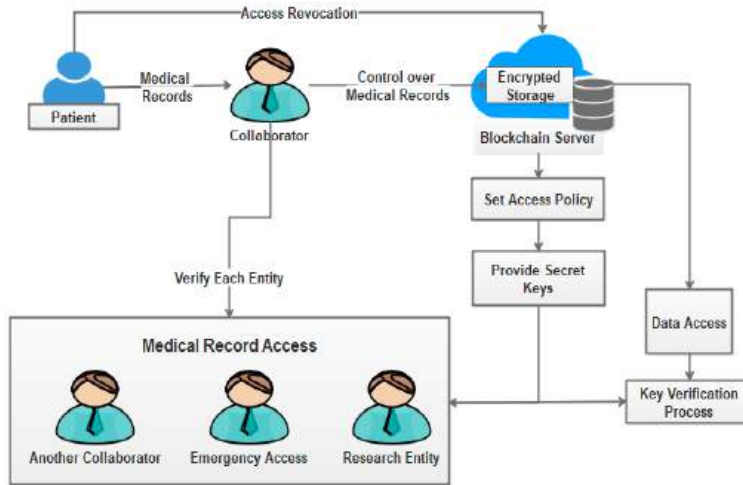
Figure 3: System Architecture

RESULT & DISCUSSION

The implementation of the "Sec-Health" protocol has demonstrated a significant improvement in the security, privacy, and efficiency of health record sharing systems compared to traditional methods. The integration of blockchain technology, combined with the use of IPFS and advanced cryptographic techniques, ensures that patients' health records are securely stored and shared without compromising privacy. The structured workflow of the protocol—setup, storage, sharing, and emergency access—provides a streamlined process for both patients and healthcare providers.

The encryption of health records before storage and the use of cryptographic material to control access in the sharing phase ensure that only authorized individuals can access sensitive information. The decentralized nature of blockchain removes the need for a central authority, mitigating risks such as hacking or data manipulation. The immutability of blockchain also prevents unauthorized changes to patient records, ensuring the integrity of the data over time.

The incorporation of smart contract technology automates the enforcement of access rules, ensuring that healthcare providers and other stakeholders can only access data based on predefined conditions. This reduces the reliance on manual processes and decreases the chances of human error or intentional policy violations. The logging of every access request

on the blockchain also adds a layer of transparency, making it easier to audit who accessed what information and when. This not only enhances security but also builds trust among patients and healthcare providers.

The emergency access phase is designed to provide immediate access to health records during critical situations, while still maintaining a high level of security and legitimacy. This feature is particularly valuable in scenarios where a patient's life may depend on quick access to their medical history. The system allows for predefined emergency protocols to trigger access without compromising overall security.

CONCLUSIONS

The Sec-Health protocol presents a comprehensive and innovative solution to the multifaceted challenges inherent in healthcare data management. By leveraging blockchain technology, advanced encryption, and decentralized storage, Sec-Health ensures the utmost security, privacy, and interoperability of health records. The modular design encompasses key functionalities, including secure framework creation, encrypted health record storage, patient-controlled access privileges, robust blockchain infrastructure, collaborator access mechanisms, emergency access procedures, research entity interactions, and dynamic access revocation. Patient-controlled access privileges empower individuals to define who can access their health records, adding a layer of dynamic control and transparency. Collaborators benefit from secure access mechanisms, while emergency situations are addressed with a swift and legitimate emergency access module. Research entities can conduct studies using anonymized health records, fostering collaboration between healthcare practitioners and researchers. The access revocation module gives patients the dynamic control to revoke access rights, emphasizing patient-centric data management.

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CHAPTER 38

PROTECTION OF INFORMATION IN TELECOMMUNICATION USING BLOCKCHAIN TECHNOLOGY

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Abstract

Global communications networks are developing with the help of satellite communications. As a way to get around the inadequate coverage and stability of terrestrial networks, satellite networking has drawn a lot of attention recently. Its many drawbacks include low data security, little computing power, and little storage capacity. Illegal entry is now a concern. There is little computational power behind the data, hostile users can alter or access the data, and regional power availability and physical satellite restrictions limit storage capacity and data security. Concerns regarding satellite communication security are intensifying in tandem with the growing significance of satellite communication in the evolution of international communication networks. This proposal suggests use block chain technology to create a satellite communication network.

INTRODUCTION

The fundamental ideas and uses of satellite communications are covered in this talk. There is discussion of key players, significant contributions, and historical advances in broadcasting, meteorological observation, communications, and remote sensing. The satellite services industry was born out of advances in satellite technology and offers a wide range of services to broadcasters, Internet service providers (ISPs), governments, the military, and other industries. When terrestrial communications capabilities are interrupted due to emergencies or natural catastrophes, satellite communications technology is frequently utilized. Mobile satellite equipment can be used in disaster zones to provide emergency communication services.

The digital revolution is led by block chain technology, which is revolutionizing information exchange in terms of trust, security, and openness. In essence, block chain is a distributed ledger that keeps track of transactions over a computer network, offering immutability

"Quantum Key Distribution (QKD) stands at the cutting edge of quantum cryptography, offering groundbreaking methods for secure communications. This discussion centers on the enduring challenge of ensuring safety in communication channels during the quantum computing revolution. As conventional encryption techniques are increasingly at risk from quantum algorithms capable of breaching them, QKD emerges as a guiding light in the realm of quantum-resistant cybersecurity. This overview highlights the innovative features of the QKD protocol and delves into the quantum mechanical principles that underpin its effectiveness. By utilizing the distinctive characteristics of quantum particles, such as superposition and entanglement, QKD establishes a fundamentally secure approach for the exchange of cryptographic keys between parties."

LITERATURE SURVEY

Cloud security that integrates dynamic AES encryption along with block chain-oriented key management. As companies increasingly depend on cloud platforms for safeguarding and handling sensitive information, maintaining confidentiality and data integrity has become essential. This initiative offers dynamic AES encryption, where encryption keys are generated and refreshed in real-time based on factors like time, user permissions, or the sensitivity of the data. Physical Unclonable Functions (PUF) act as a hardware security feature, leveraging internal variations in an electronic component's physical characteristics to provide unique identification.

The purpose of this project is to enable data recovery through multidimensional CRPS protection (cryptographically secure PUF-based shielding). CRPS enhances security by utilizing encryption techniques to safeguard data transmitted among verified entities. Although sharing information among various users or organizations is common, ensuring the confidentiality and integrity of this shared data poses challenges. This system serves as a proxy public monitoring and reverse encryption solution to address these issues. Proxy re-encryption enables a trusted intermediary, referred to as a proxy, to shift cipher text

encrypted with one individual's public key into cipher text decryptable with another individual's private key.

EXISTING SYSTEM

In a world where satellite communications are pivotal, safeguarding their networks is non-negotiable. Introducing our cutting-edge solution: Multidimensional CRPS (Cryptographically Robust PUF-based Protection). While traditional methods like DES, AES, ECC, and Blowfish have forged the path, our CRPS technology elevates security to unprecedented heights. Leveraging the uniqueness of PUF (Physically Unclonable Function), we create an impregnable fortress for your data. Dynamically generated encryption keys, based on parameters such as time and user access, ensure your sensitive information remains shielded from any threat. With multidimensional CRPS, experience the pinnacle of secure satellite communications, where every transmission is meticulously protected and uniquely encrypted. Elevate your security strategy and unlock unparalleled peace of mind.

DRAWBACKS

In an era where the computational capabilities of cyber attacker's soar, the robustness of conventional encryption methods is dwindling. Many systems are tethered to static authentication, a method that merely validates the user or device at the session's inception. This antiquated approach leaves gaping vulnerabilities, such as susceptibility to man-in-the-middle attacks and collision threats.

Furthermore, it falls short in offering reverse or forward secrecy, presenting a golden opportunity for adversaries to compromise device IDs and subsequently intercept communication to decipher both past and future keys. To compound these issues, the initialization and computation demands of these traditional systems are exorbitantly high. Surmount these pitfalls with our cutting-edge security solution, designed to outpace the evolving prowess of hackers while ensuring seamless, low-cost operations.

PROPOSED SYSTEM

Elevate your satellite communication security with the revolutionary Sat Chain—an unparalleled fusion of blockchain and quantum encryption. Introducing a cutting-edge solution that outshines conventional security systems, Sat Chain utilizes a consortium blockchain to create the epitome of secure spatial transactions, authenticated seamlessly with digital tokens (SDT). Experience the future of satellite communication where every interaction between satellites and data centers is protected with invincible quantum cryptography. Sat Chain not only guards your sensitive information but also ensures real-time tracking to detect and prevent spatial collisions. Make the switch to Sat Chain and transform your satellite network into a fortress of impenetrable security, unmatched by any competitor.

Data Processing Centre

Introducing our cutting-edge Satellite Network System Architecture Model – a revolutionary framework meticulously engineered to elevate the efficiency and reliability of satellite communications. This sophisticated model is composed of critical components, including advanced satellites, robust ground stations, state-of-the-art data centers, and highly responsive satellite controllers. Experience seamless wireless network connections that streamline data sharing and communication like never before.

A pivotal aspect of our model is the meticulous registration and initialization phase, ensuring an unparalleled secure and dependable communication channel between your user terminal and the expansive satellite network. Elevate your satellite communication experience with a system that promises unparalleled performance and reliability.

The Data Processing Centre has four sub modules,

- Registration And Initialization Steps
- Certification And Approval
- Composition Negotiation
- Secure Key Exchange
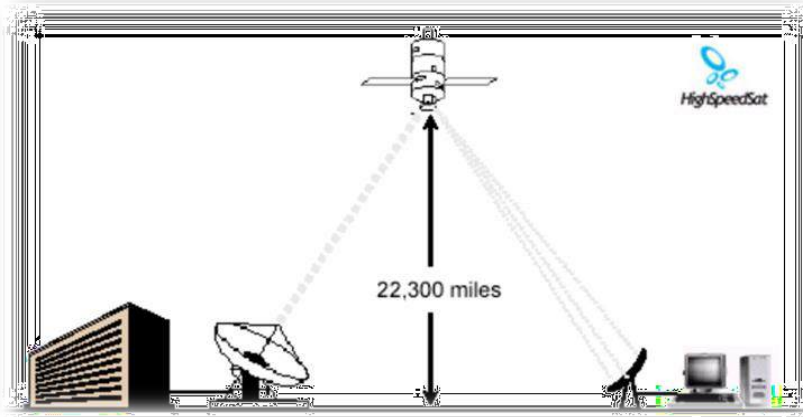
Data Processing Centre

Quantum Key Generation and Distribution

Quantum Key Distribution (QKD) is at the forefront of modern cryptography and uses the principles of quantum mechanics to provide unprecedented security. The essence of QKD is to use quantum communication to establish a shared encryption key between two trusted parties, while providing immunity to eavesdropping attempts by untrusted attackers. QKD uses its expertise to change the paradigm of cryptographic protocols, providing reliable protection against increasingly sophisticated cyber threats.
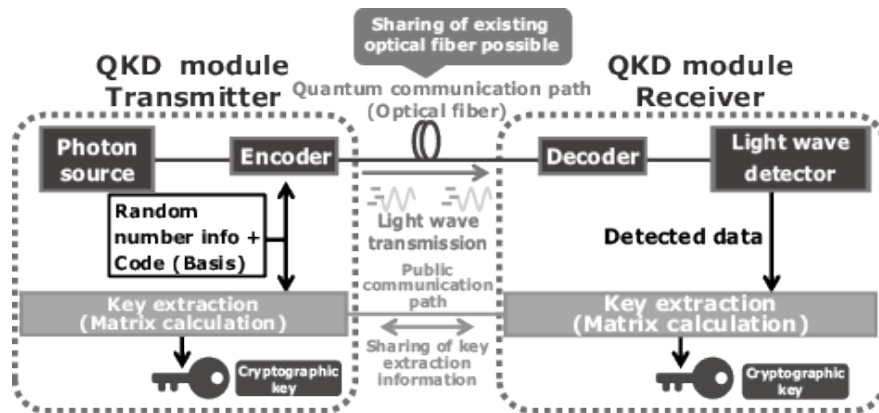
Through the process of quantum entanglement, End User and Device Registration

End user registration serves as the foundational step in granting individuals access to a network while upholding security and authentication standards. This process entails the collection of pertinent information from users, including personal details such as their name, address, contact information, and credentials. The primary objective of gathering this

data is twofold: first, to verify the user's identity and second, to ascertain them authorization status for accessing the network.

By obtaining comprehensive information, network administrators can establish reliable systems for identifying and authenticating users, reducing the risks associated with unauthorized access or fraudulent activity. When you submit your registration information, the information you provide goes through a rigorous verification process to ensure its accuracy and reliability. This verification process involves cross-referencing the data you provide with existing records or databases to verify your identity and verify your authorization status. You can also implement additional measures such as email verification, phone verification, or multi-factor authentication to increase security and prevent unauthorized access.

Particles can be correlated in such a way that a modification or measurement of one particle immediately affects the entangled counterpart, detecting eavesdropping attempts. This phenomenon is at the core of the QKD protocol.

Quantum Key Generation and Distribution

Successful implementation of QKD relies on special techniques suited to exploit the unique properties of quantum systems. Quantum key distribution systems typically involve the use of quantum cryptography devices, quantum key generators, and quantum relays, each designed to manipulate and transmit quantum states accurately and reliably.

Sat Chain

The consortium's blockchain represents a significant advance in information sharing and collaboration between joint satellite constellations. The introduction of this innovative approach opens a new era in space technology, enabling seamless communication and data exchange within satellite networks. At the heart of this initiative is an innovative concept known as Sat Chain. Sat Chains provides a new framework for tokenizing spatial transactions, turning them into digital tokens that can be processed securely using blockchain protocols. Using blockchain technology, Sat Chains provides a reliable authentication and verification mechanism for space transactions, ensuring transparency, immutability, and integrity throughout the entire process.

Sat Chains transforms the way space transactions are conducted and recorded by enabling the creation and distribution of space-based digital tokens (SDTs) within satellite constellations.

End User and Device Registration

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This verification process involves cross-referencing the data you provide with existing records or databases to verify your identity and verify your authorization status. You can also implement additional measures such as email verification, phone verification, or multi-factor authentication to increase security and prevent unauthorized access.

ADVANTAGES

- Provides improved stability
- Integration of blockchain and quantum key distribution (QKD)
- Reliable security.
- Vulnerability to unauthorized access in terrestrial networks. QKD provides an additional layer of security through authentication and privacy. Registration, authentication, and revocation mechanisms enhance the overall security of the network.

SYSTEM ARCHITECTURE
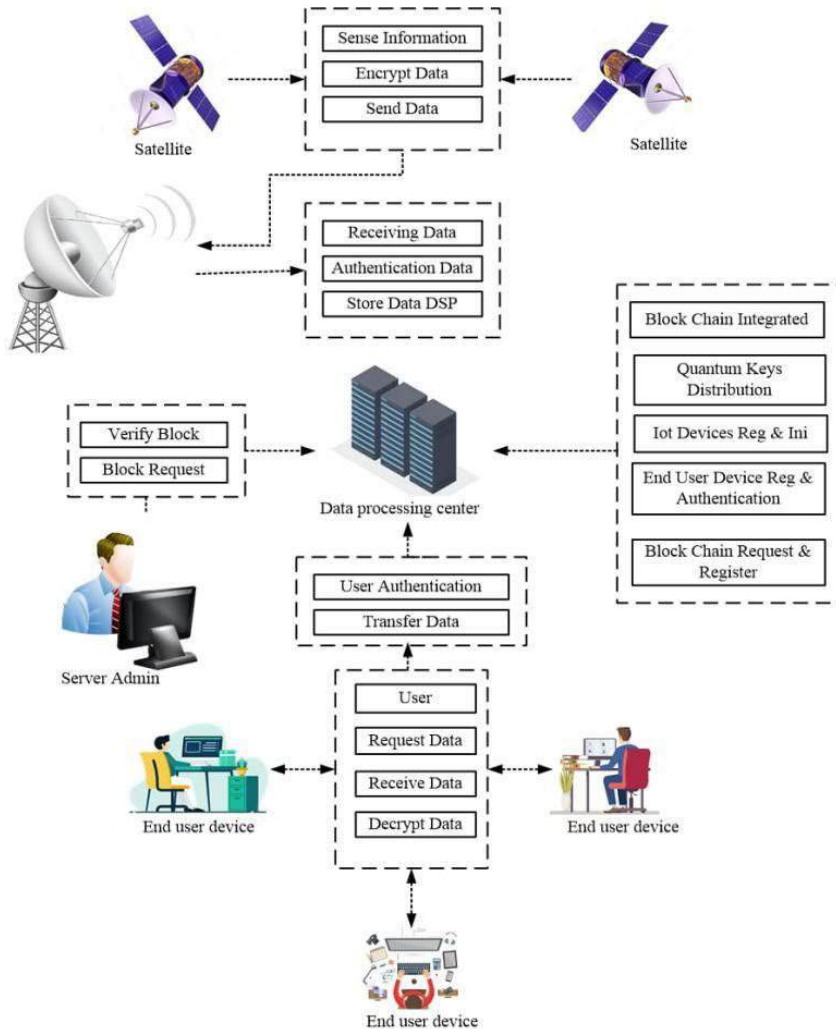
CONCLUSION

A privacy-preserving authentication method based on data storage in blockchain can effectively provide a security protection mechanism for satellite communications. Initially, the registration and authentication process of all satellite sensor nodes is performed at the base station to ensure the reliability of sensor nodes. Once the authentication process is complete, all key parameter information is stored in the Universal Key Mechanism (UKM) in the data center.

GBS transmits key boundary data to satellite sensor centers, which use inter-satellite blockchain technology to record key parameters at the point, improving the immutability

and transparency of the received data. The simulation results show that the proposed method significantly improves the safety and secure communication.

FUTURE ENHANCEMENT

The concept of a satellite blockchain system involves using satellites in orbit to support blockchain technology to ensure secure transmission and storage of data in space. The system is expected to develop further by relying on cloud constellations, networks of interconnected satellites that act as data centers in orbit. These cloud constellations allow companies to upload and manage data directly from space, bypassing terrestrial networks.

Governments and businesses can use cloud constellations to access vast amounts of data from a variety of sources and from space orbit. This approach offers a variety of advantages over traditional terrestrial networks, including increased data security, reduced latency, and improved reliability. Additionally, satellite blockchain systems can provide greater resilience to ground-based disruptions and cyber threats by decentralizing data storage and processing capabilities in space.

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CHAPTER 39

ENHANCING POWER SYSTEM SECURITY THROUGH RESILIENT FREQUENCY REGULATION IN THE FACE OF HYBRID CYBER-ATTACKS

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Abstract

The increasing dependence of power systems on contemporary communication technologies for Frequency Regulation (FR) creates susceptibilities to cyber-attacks, so presenting noteworthy risks to the stability and dependability of the system. The integrity of FR analysis may be jeopardized by these attacks because they may interfere with the coordination of several parts, including actuators, control centers, and sensors. This paper offers a robust remedy in the shape of an attack detection and mitigation system that is built on deep learning in response. Through the use of cutting-edge AI algorithms, this system seeks to strengthen FR operations' security inside the cyber-physical framework by quickly detecting and eliminating cyberthreats. Ultimately, by reducing the risks associated with hybrid cyberattacks and protecting vital infrastructure, this strategy guarantees the uninterrupted and dependable operation of power systems.

Keywords

Attack detection and mitigation (ADM) system, Frequency Regulation (FR), hybrid power system, Renewable Energy Sources (RESs), resiliency.

INTRODUCTION

The management of frequency regulation (FR) in today's power networks has undergone a radical transformation thanks to the incorporation of cutting-edge communication technology. But this advancement also brings with it an innate susceptibility to cyber-attacks. These dangers, which vary from deliberate signal modification to well-planned

cyber-attacks, present a serious risk to the coordinated operation of the components that make up the hybrid power system. These kinds of disturbances jeopardize not just the stability of the electrical grid but also the dependability of vital services that depend on a steady supply of electricity. This paper suggests a novel approach—a deep learning-based Attack Detection and Mitigation (ADM) system—to tackle these pressing issues. Through the direct integration of resilient capabilities into the FR analysis of the cyber-physical model, this novel technique seeks to strengthen power system security against dynamic cyber threats. By employing cutting-edge artificial intelligence methods, such as the potent XGBOOST algorithm, the ADM system is prepared to identify and eliminate cyberthreats instantly, guaranteeing the ongoing and dependable operation of power systems in the face of dynamic and complex cyber risks.

PROPOSED METHODOLOGY

The system under consideration is a noteworthy progression in the field of power system security. Its primary objective is to enhance the robustness of Frequency Regulation (FR) by means of the amalgamation of Attack Detection and Mitigation (ADM) mechanisms and the deep learning-based XG boost algorithm. This technology attempts to proactively detect and neutralize cyber threats that could jeopardize FR operations by focusing on the communication infrastructure connecting sensors, control centers, and actuators inside the hybrid power system.
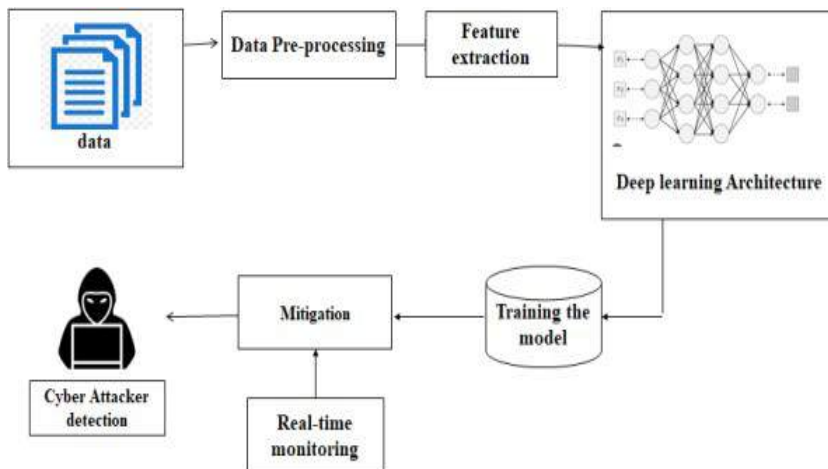
Figure 1: System Architecture

The ADM system continuously analyzes communication signals by using sophisticated deep-learning algorithms, quickly spotting any anomalies suggestive of potential cyber-attacks, such as signal alterations, delays, or jamming. By maintaining the integrity of FR analysis and enabling the system to implement prompt mitigation methods, this proactive monitoring helps the power system remain stable and reliable even in the face of hybrid cyber attacks. Essentially, the technology under consideration functions as a strong defense against the constantly changing array of cyber-attacks that target power systems. Through the utilization of cutting-edge deep-learning techniques and the capabilities of the XG boost algorithm, it provides a comprehensive method for strengthening the security posture of power systems. The solution reduces the possible effect of unwanted interference on FR operations by quickly identifying and mitigating cyber risks inside the communication infrastructure.

Data Collection Module:

The process of collecting data include obtaining pertinent information from a variety of power system sources, including communication networks and control centers. Communication signal measurements are commonly included in collected data. Gathering precise and thorough data is essential to spotting irregularities and possible cyber threats in the power system.

Preprocessing Module:

The process of cleaning, formatting, and transforming obtained data in order to make it ready for analysis is known as preprocessing. Pre-processing tasks can include data format standardization, missing value management, and noise removal. Preprocessing makes ensuring the data is consistent and of the highest quality, which increases the potency of the analysis methods that come after.

Deep Learning Model Training:

The goal of the deep learning model training module is to create models that can identify patterns and abnormalities that point to potential cyber threats within the power system by utilizing cutting-edge machine learning techniques like deep learning with XG Boost. Preprocessed data is used to train deep learning models using XG boost to identify trends and abnormalities that might be signs of cyber-attacks. By analyzing past data, these models are able to recognize typical system behavior and spot departures from it. Deep learning

models must be trained in order for developing accurate and reliable methods for identifying cyber threats in real-time.

Real-Time Monitoring Module:

In real-time monitoring, incoming data streams are analyzed and the power system's operation is continuously observed. Real-time monitoring is done to identify anomalies or questionable activity as it happens. By enabling quick action in the event of a potential cyber-attack, real-time monitoring helps to reduce the disruption to system operations.

Anomaly Detection:

The data is subjected to anomaly detection tools in order to spot any deviations from expected behavior. Anomalies that are discovered could point to system flaws or cyberattacks. In order to quickly address possible risks, anomaly detection aids in the prioritization of reaction activities and the initiation of mitigation techniques.

CONCLUSION

To sum up, the strategy put forth in this work provides a thorough way to improve the security and resistance of frequency regulation (FR) in power systems to cyber attacks. Through the application of deep learning models—more especially, the XG Boost algorithm—in combination with real-time monitoring and anomaly detection techniques, the suggested system facilitates the early identification and mitigation of potential cyber-attacks directed towards the power system's communication infrastructure. This research presents a systematic approach that offers a strong framework for protecting the integrity of FR activities, starting from data collection and preprocessing and ending with deep learning model training and real-time monitoring. By accurately detecting irregularities and swiftly reacting to possible hazards, the suggested system guarantees the ongoing stability and dependability of the electrical grid, even in the landscape.

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CHAPTER 40
OCULAR DISEASE DETECTION IN THE DEEP LEARNING ALGORITHM

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Abstract

Early enough identification of eye illnesses using fundus imaging has always been a challenge for clinicians. Diagnosing ocular diseases by hand is costly, error-prone, and challenging. Using fundus images, an automated computer system for ocular disease detection is required to distinguish between various eye conditions. This study suggests a concentrated ocular detection method based on deep learning. Deep learning algorithms that have improved picture categorization capabilities have made such a system trouble-free. Using the VGG-19 and ResNet50 image classification methods, we were able to classify the 6000 pictures of eight different fundus classes that make up the ODIR dataset. These classifications serve as characteristics for various ocular issues. The dataset for these classifications is a little inconsistent, though. To overcome this hurdle, this research suggested dividing the multiclass classification task into a binary classification challenge, with the same number of photographs for each category. The most recent vision transformer approach is also used in this work. After applying LBP (local binary pattern) to an image, the models are trained using both real data and images.

Keywords

LBP, VGG-19 and ResNet50

Introduction

Nearly 2.2 billion people around the world experience vision problems. The World Health Organization (WHO) estimates that there may have been a reduction in at least 1 billion of these incidents. Over time, there has been an increase in eye illnesses, with changes being

one of the causes of a change in human behavior caused by technology and the creation of technological apparatus. That impact caused ocular diseases have had a significant impact on modern human life. Common eye diseases include glaucoma, diabetes, and hypertension. Blindness is brought on by cataracts, pathological myopia, etc. could occur. Even though eye diseases' effects can be blindingly severe and result in early detection of the disorders can lessen the impact of the disease. Growing older and contact with certain substances, UV radiation, and genetic issues. With the prediction being digitized the model could be utilized for the analysis of the ocular disease. The disease should be accurately identified at all times. and effectiveness. One of the most important human organs is the eye. primarily vision aids in the recognition and detection of 3D objects. loss of one eyesight or both eyesight may cause a person to live an unsettling way of life because people make decisions based on what they observe in their daily lives. The effect of vision unsettling health can have an economic and personal impact. These symptoms are linked to a variety of eye illnesses. These include excruciating eye pain, an abrupt loss of vision in one or both eyes, fuzzy vision, red eyes, and droopy eyelids. Given the serious effects of eye problems on people, to find eye diseases, this research was done on lifestyle with greater precision when using the fundus image. This study is primarily concerned with accurate recognition taking into account the Local Binary Pattern features (LBP) of ocular disease. It sights to create a variety of extracting features techniques and Neural Networks to distinguish typical visual disorders involving fundus photographs. We discovered that eye illness identification using deep learning focuses on just one aberration in comparison to the prior methods. For various challenges, several designs were utilised in this paper, and the outcomes are fairly good. Thus, with accuracy more than 90% for each activity, illnesses including glaucoma, diabetic retinopathy, and cataract are adequately managed.

Dataset

We made use of the kaggle data collection for our research. In the dataset, we can find Diabetes, Glaucoma, Cataract, Related Macular Degeneration, Myopia, Hypertensive Retinopathy, and others. The lens of your eye, which is typically straightforward, becomes clouded by a cataract. Most cataracts grow slowly and don't initially impair your vision. However, cataracts will eventually obstruct your vision over time. Because of the white film

it produces, it is one of the simplest abnormalities to spot. Figure 1 shows how a realistic depiction of a cataract appears in fundus images.
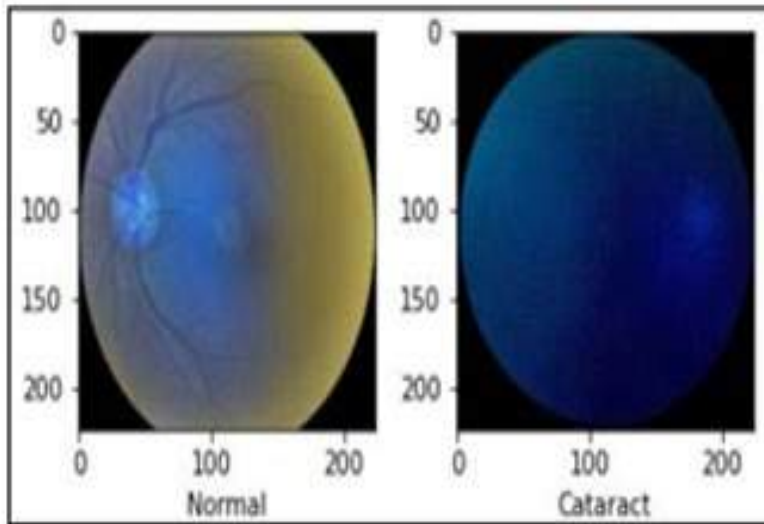
Figure 1: Normal Eye vs Cataract Eye

Image Preprocessing

The quality of the image determines how well the entire model works, so it is essential to focus on the cornea's fundus. The classification model's accuracy is adversely impacted by the noise in the photos, though. When the image is turned into a grayscale, the fundus color also closely resembles the backdrop color. Because some of the photographs have white backgrounds, this impact leads the classifier astray. Therefore, in order to make it simpler to identify the interest points, the backgrounds of all photographs were manually eliminated as the first phase of pre-processing.

Feature Extraction

The texture elements of the image are extracted using a technique called the local binary pattern. Each pixel in the picture has a value which the LBP receives, and the form of the LBP histogram distribution is used to determine the regularity of the image texture. The LBP is more efficient in computer vision operations due to its strong discriminative strength and computational simplicity. The field of medical image processing makes extensive use of LBP.
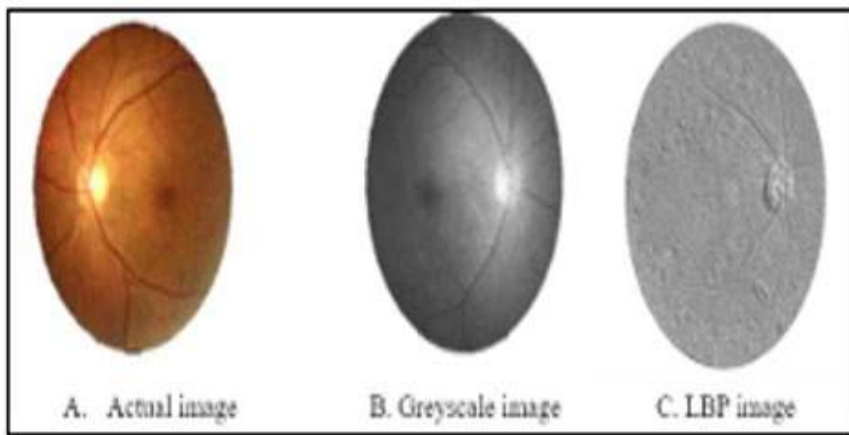
Figure 2: Actual image vs Greyscale image vs LBP image

Proposed Architecture

ResNet-50

Instead of attempting to learn specific characteristics, Res Net or Residual Network makes use of residual learning. Residual may be easily regarded as the feature learned from that layer's input subtracted. More than ResSNet50, there are other Res Net variations. Creating a shortcut connection that omits one or more levels is the fundamental concept behind Res Net. Glaucoma is another serious eye condition that can lead to blindness if not diagnosed and managed. ResNet-50 can be used for optic disc and cup segmentation in fundus images, which is crucial for glaucoma diagnosis. It can also be trained to classify images based on features indicative of glaucomatous damage.

Vision Transformer

The Vision Transformer, often known as ViT, is a classification system that employs a Transformer-like design in some portions of the image. By partitioning an image into fixed-size patches, linearly embedding each one, including location embeddings, and assembling the vectors, one may produce a series of vectors that can be fed into a standard Transformer encoder. The conventional way to conduct classification entails adding an extra "classification token" that may be learned to the sequence.
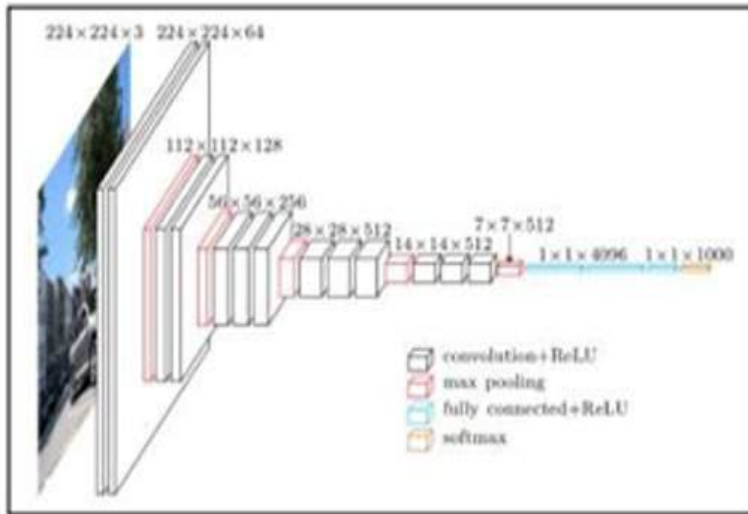
Figure 3: Architecture of VGG19

VGG-19

Advanced CNN-VGG19 has layers that have previously undergone training and has a solid understanding of the shape, colour, and structural aspects of a picture. For difficult classification tasks, the very deep VGG19 has been trained on an enormous variety of images.

Result

- **Without LBP**
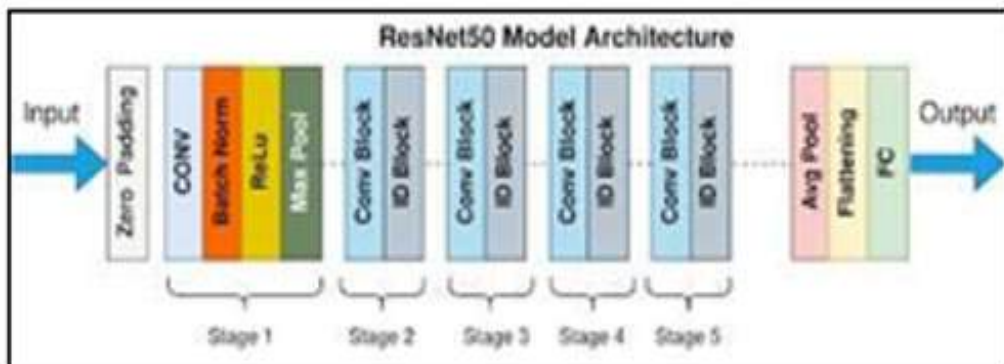
Figure 4: Architecture of RestNet50
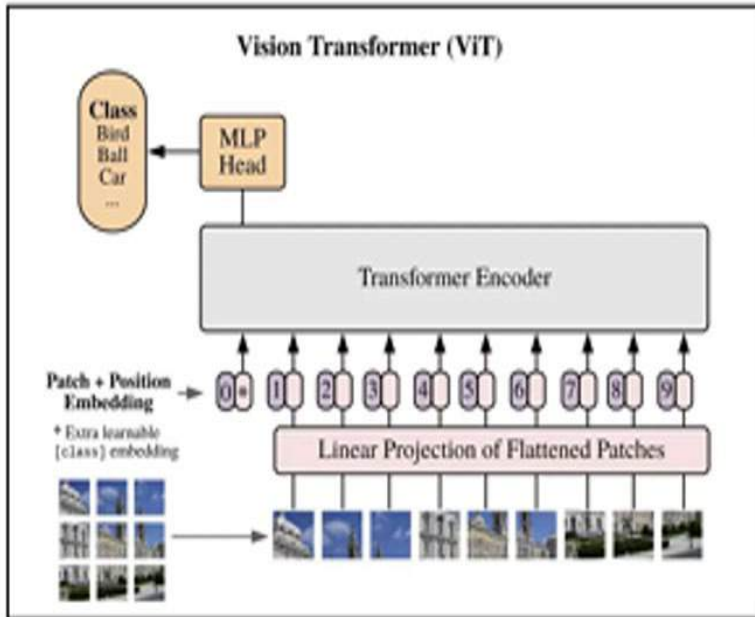
Figure 5: Architecture of Vision Transformer
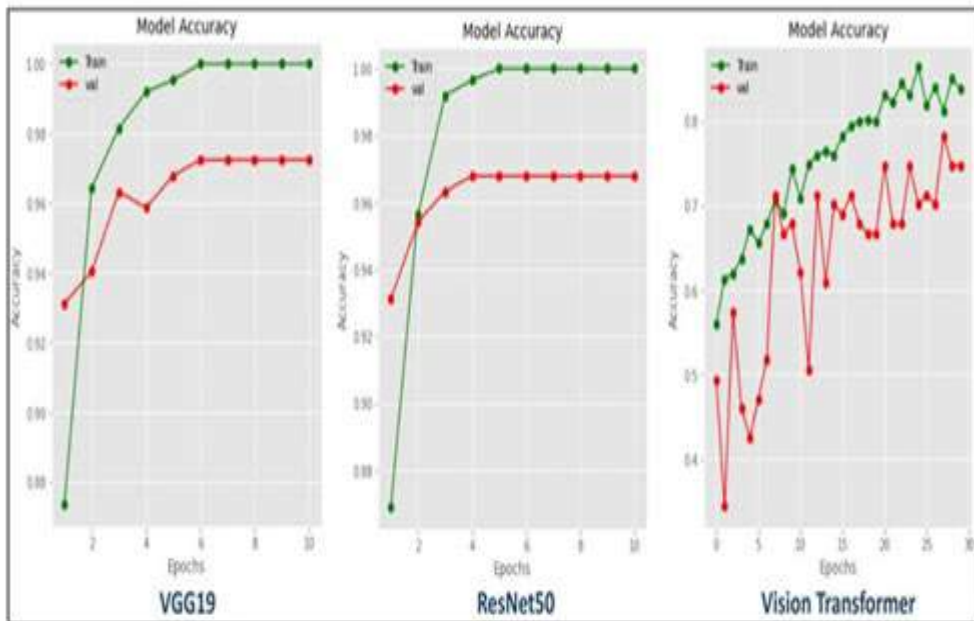
Figure 6: Model Accuracy vs Loss Curve
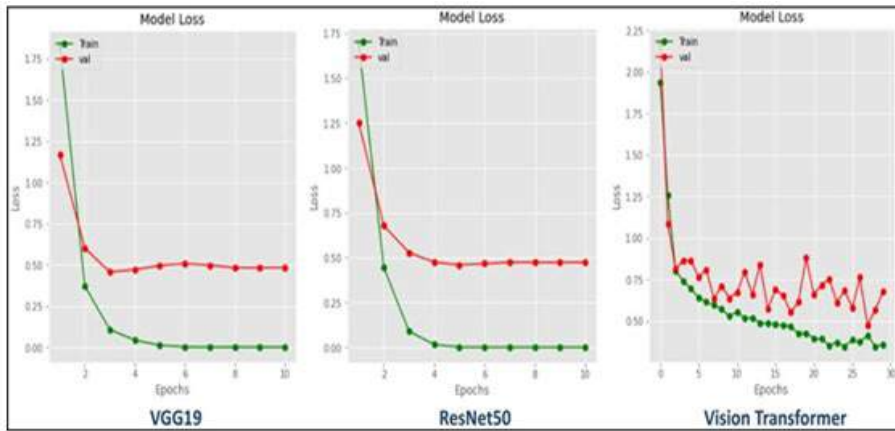
Figure 7: Model Loss vs Epoch Curve

Comparison table

The table shows that VGG19 performs very well with a validation accuracy of 99.08% and very less 0.08 validation loss. The vision transformer model performs very poorly compared to VGG19 and ResNet50.

	Model	Training_Accuracy	Training_Loss	Validation_Accuracy	Validation_Loss
1.	VGG19	0.996552	0.014352	0.990826	0.084891
2.	ResNet50	1.000000	0.000006	0.977064	0.131539
3.	Vision Transformer	0.863346	0.344338	0.781609	0.476366

Figure 8: Result Comparison of all modes before using LBP

- **With LBP**
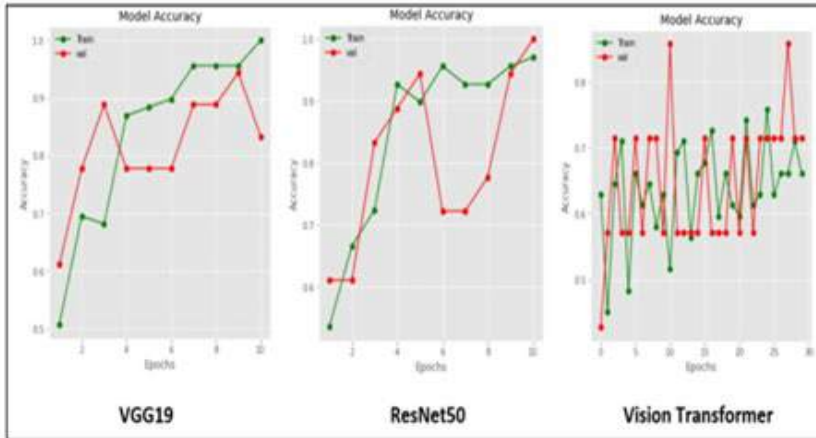
Figure 9: Model Accuracy vs Loss Curve
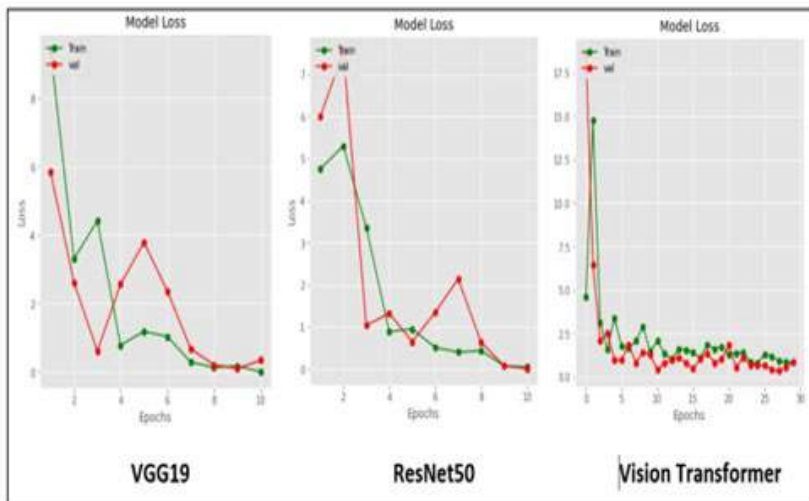
Figure 10: Model Loss vs Epoch Curve

Comparison table

Here VGG19 training accuracy is very good but validation accuracy is quite bad. ResNet50 model provided a validation accuracy of 100% and a validation loss of 0.008. The vision transformer here also performs very badly.

	Model	Training_Accuracy	Training_Loss	Validation_Accuracy	Validation_Loss
0	VGG19	1.000000	0.004897	0.944444	0.099631
1	ResNet50	0.971014	0.046032	1.000000	0.008169
2	Vision Transformer	0.758065	0.746540	0.857143	0.345332

Figure 11: Result Comparison of all models after using LBP

When we compare the model with the dataset after applying LBP and without LBP, then in both cases we cannot see any significant changes. One thing that we can notice is that the minimum validation loss in ResNet50 with LBP is very less as compared to models trained with the LBP image dataset.

Conclusion

The models VGG-19, ResNet50, and Vision Transformers were utilised in this work to categorise the different kinds of ocular disorders. These models are capable of predicting if a fundus is healthy or whether an eye has a disease. We found that models with the LBP dataset are performing very well giving high accuracy with minimum loss. To address the imbalance issue, we can employ generative adversarial networks (GANs) to generate comparable images of eye illness. A technology like this will also revolutionise the field of diagnosing eye diseases and be of great assistance to medical professionals. However, we believe that it can still be a useful model and that there are chances for improvement with additional research and investigation in the near future.

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CHAPTER 41
MONITORING SYSTEM FOR COAL MINE WORKERS USING IoT

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Abstract

There are several occupational dangers in the coal mining sector, and worker safety is of utmost importance. This study suggests an IOT-based Coal Mine Worker Monitoring System (CMWMS) to improve the security and welfare of coal miners as a solution to this problem.

The system continuously monitors the ambient conditions, the position of mine workers, and their vital signs in real time by integrating wearable sensors, wireless connectivity, and data analytics. The CMWMS offers extensive monitoring capabilities through the deployment of wearable devices with sensors for measuring physiological parameters like heart rate, body temperature, and respiratory rate, as well as environmental sensors for detecting gas levels and ambient temperature. Wireless transmission of the data gathered from these sensors is made to a central monitoring station, where advanced algorithms examine the data. Through the deployment of wearable devices equipped with sensors for measuring physiological parameters such as heart rate, body temperature, and respiratory rate, along with environmental sensors for detecting gas levels and ambient temperature, the CMWMS provides comprehensive monitoring capabilities. Data collected from these sensors are transmitted wirelessly to a central monitoring station where sophisticated algorithms analyze the information for early detection of potential health risks or hazardous conditions. Additionally, the system incorporates geo-location technology to track the movements of miners within the mine, enabling rapid response in case of emergencies such as accidents or cave-ins.

Keywords

Internet of Things, Temperature Sensor, Smoke Sensor, Humidity Sensor, Arduino Microcontroller.

INTRODUCTION

The difficult working conditions and inherent risks of subterranean labor are what define the coal mining industry. Coal mine workers' safety and wellbeing continue to be the primary concerns of mining corporations, authorities, and the general public. Nonetheless, maintaining continuous supervision over employees' health and safety amid the intricacies of subterranean operations poses formidable obstacles. This research suggests a novel approach, the IOT-Based Coal Mine Worker Monitoring System (CMWMS), to address these issues. This system provides a complete method for managing coal mine worker safety in real time by utilizing the revolutionary potential of the Internet of Things. This introduction establishes the scene by emphasizing how vital worker safety is to the coal mining sector. The CMWMS seeks to guarantee the safety of coal mine workers by enhancing early danger identification, improving emergency response capabilities, and eventually mitigating hazards through the combination of wearable sensors, wireless communication technologies, and advanced data analytics. The IOT-based CMWMS's design, parts, and operational features will all be covered in this article, along with how it could be able to redefine safety standards in coal mining operations. Concerns about the safety and welfare of coal miners are growing, and in order to properly reduce hazards, sophisticated monitoring systems must be used. Conventional monitoring techniques, such routine physical monitoring stations, often fall short of providing real-time insights necessary for ensuring worker safety in dynamic environment.

The suggested IOT-Based Coal Mine Worker Monitoring System (CMWMS) provides a comprehensive solution to this dilemma, acknowledging the transformative potential of IOT. The continuous, remote monitoring capabilities of the CMWMS are achieved by the integration of several sensors to monitor environmental variables and vital signs. This involves monitoring the ambient temperature and gas levels in the mine, in addition to the heart rate, body temperature, and breathing rate of the world.

LITERATURE REVIEW

Y. Zhang and H. Xiao-

The mining industry, particularly coal mining, is inherently hazardous, with workers facing a multitude of risks ranging from environmental hazards to equipment-related

accidents. In response to these challenges, there's a growing interest in leveraging advanced technologies to enhance safety protocols and improve the well-being of coal mine workers. This paper presents a comprehensive exploration of an IOT-Based Coal Mine Worker Monitoring System (CMWMS) developed by researchers Y. Zhang and H. Xiao. The CMWMS represents a paradigm shift in how coal mine worker safety iS monitored and managed. At its core, the system integrates a variety of cutting-edge technologies, including wearable sensors, wireless communication protocols, real-time data analytics, and geo location technology. Wearable sensors are strategically deployed to monitor vital signs such as heart rate, body temperature, and respiratory rate of coal mine workers continuously. These sensors are designed to be rugged and non- intrusive, ensuring seamless integration into the workers' daily routines while providing accurate data.

Purnima, Neetu, and Anandrai Jadhav-

Purnima Neetu delves into the critical realm of coal mine worker safety with a comprehensive exploration of the IOT-Based Coal Mine Worker Monitoring System (CMWMS). Neetu's research addresses the longstanding challenges faced by coal miners, whose work environments are rife with inherent dangers, from environmental hazards to the risk of equipment-related accidents. Against this backdrop, Neetu's study emerges as a beacon of innovation, offering a transformative solution to enhance safety protocols and improve the well-being of coal mine workers. At the heart of Neetu's research lies the CMWMS, a groundbreaking system that harnesses the power of advanced technologies to revolutionize safety monitoring in coal mines. Through meticulous analysis and empirical investigation, Neetu elucidates the core components and functionalities of the CMWMS, offering insights into its design, implementation, and potential impact on mining operation. The cornerstone of the CMWMS is its integration of wearable sensors, meticulously designed to continuously monitor vital signs such as heart rate, body temperature, and respiratory rate. Neetu delves into the technical intricacies of these sensors, emphasizing their robustness and non-intrusive nature, which enables seamless integration into the daily routines of coal mine workers while ensuring accurate and reliable health data collection.

E. Alam and Hua Fang, Md. Mahmud-

In their groundbreaking study, E. Alam and Hua Fang delve into the critical domain of coal mine worker safety with a comprehensive exploration of the IOT-Based Coal Mine

Worker Monitoring System (CMWMS). The coal mining industry, notorious for its inherent hazards and risks, presents a pressing need for innovative solutions to ensure the well-being of its workforce. Against this backdrop, Alam and Fang's research emerges as a beacon of innovation, offering a transformative approach to safety monitoring in coal mines. At the heart of their research lies the CMWMS, a cutting-edge system that harnesses the power of IOT technologies to revolutionize safety protocols. Through meticulous analysis and empirical investigation, Alam and Fang unravel the intricacies of the CMWMS, shedding light on its core components, functionalities, and potential impact on mining operations. Central to the CMWMS is the integration of wearable sensors, meticulously engineered.

EXISTING SYSTEM

- Approximately 80% of elderly individuals, according to medical research surveys, have at least one chronic illness, making it difficult for many of them to take care of themselves.

- Information is transmitted via GSM technology in the current patient monitoring system.

- In case of an emergency, the gadget transmits pre- identities, such as family members.

- Upon receipt of the alert message, the client must notify contacts in the area about the patient's status.

-

PROPOSED SYSTEM

- The suggested system-based. The two hardware elements in the coal mine safety helmet monitoring project are a transmitter and a receiver.

- An Arduino board serves as the primary controller in both modules. The coal mine is where the transmitter module is situated. The temperature, humidity, and smoke sensors are all located in the transmitter module. Every two minutes, the Arduino uses the Wi Fi module to transfer the sensor data to the distant IOT server.

- The buzzer is activated to alert the relevant staff if any of the sensor values surpass a specific   threshold level.

- An Internet of Things platform is placed on the remote server, allowing users to monitor and control the device while displaying pertinent data through a graphical user interface.

BLOCK DIAGRAM
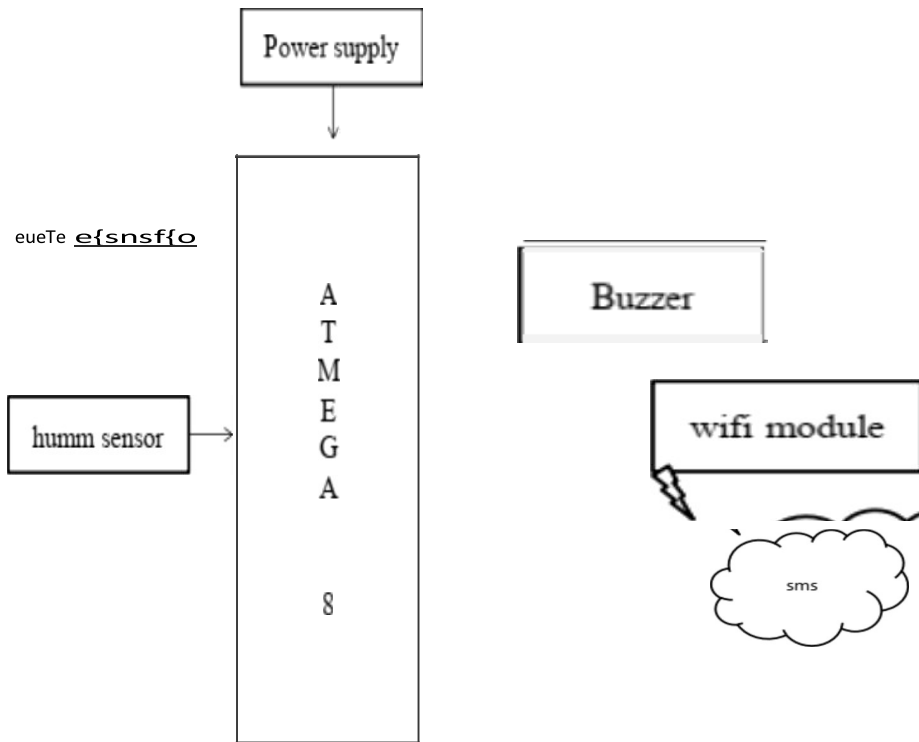
SYSTEM REQUIREMENTS HARDWARE DESCRIPTION

TEMPERATURE SENSOR

FIG 1 Temperature Sensor

The LM35 device is perfect for various applications because of its extremely broad power supply voltage range of 4-V to 30-V.

Greater capacitances might be needed; this depends on the noise level of the power source. Temperature sensors are essential parts that allow accurate temperature control and monitoring in many different applications.

They are crucial instruments for guaranteeing crucial performance and efficiency in a variety of sectors due to their dependability, versatility, and accuracy.

SMOKE SENSOR

Fig 2 Smoke Sensor

A smoke sensor is a device used to detect smoke in the air. It is often referred to as a smoke detector or smoke alarm. It is frequently used to provide early warning of possible fires in a variety of contexts, including commercial, industrial, and residential ones.

Photoelectric smoke sensors, on the other hand, rely on a light source and a photosensitive receiver. The quantity of light that reaches the receiver is decreased when smoke particles get into the sensor's chamber and scatter the light. This shift in illumination is what sets off the alert.

Dual-sensor smoke sensors provide enhanced detection capabilities over a larger range of fire types, including both fast-flaming and smoldering flames, by combining both ionization and photoelectric detection technologies.

To enable early fire detection, smoke sensors are frequently included into building automation, security, and fire alarm systems.

HUMIDITY SENSOR
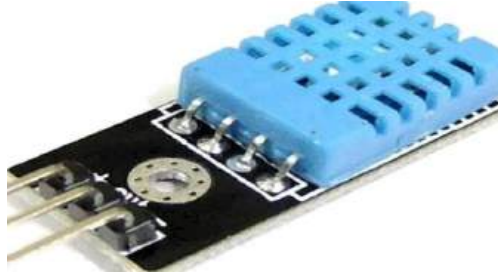
Fig 3 Humidity Sensor

A humidity sensor, sometimes referred to as a hygrometer, is a tool for determining the air's absolute humidity (AH) or relative humidity (RH). Numerous applications, such as weather monitoring, HVAC systems, industrial operations, agriculture, and environmental monitoring, make extensive use of humidity sensors.

For a variety of applications and settings, humidity sensors come in multiple form factors, such as probes, independent modules, and integrated circuits (ICs). They are essential for monitoring environmental conditions in a variety of sectors, maintaining ideal humidity levels in controlled environments, and guaranteeing the correct operation of machinery and processes that are susceptible to variations in humidity.

These sensors monitor humidity using optical characteristics like light absorption or refractive index.   Humidity levels and changes in these optical characteristics caused by moisture absorption or desorption are connected.

LCD Display

Fig 4 LCD Display

Characters, numbers, and graphics can be displayed on LCD. The showcase is interfaced with the I/O port of the microcontroller (P0.0−P0.7). The presentation is in multiplexed mode. In one-tenth of a second, the following exhibition illuminates. As a result of Vision's hard work, the show will provide an ongoing tally display.

A liquid crystal solution is layered between two transparent electrodes and glass substrates to form the fundamental building blocks of an LCD. A thin film transistor (TFT) array or other alignment methods are used to align the liquid crystal molecules in a specific orientation. The molecules in the liquid crystal layer rotate when an electric field is applied across them, changing the polarization of light that passes through them.

Electronic circuits in LCDs regulate the voltage applied to individual pixels, changing their optical characteristics and producing images. In order to create the intended image, the display controller interprets input signals and transmits the proper signals to each pixel.

LCDs have many benefits, including as wide viewing angles, great image clarity, high resolution, and interoperability with a variety of input sources. Because of their dependability and versatility, they are widely employed in applications ranging from consumer electronics to industrial and medical devices.

SCREENSHOT

Buzzer Sound

CONCLUSION

To sum up, the adoption of an Internet of Things (IoT)-based coal mine worker monitoring system is a major step forward in guaranteeing the security and welfare of coal mine employees. This system provides a holistic approach to worker safety monitoring and management in coal mines through the integration of wearable sensors, wireless communication protocols, real-time data analytics, and geo-location technologies.

The system facilitates timely action to limit risks and prevent accidents by continuously monitoring vital signs and environmental factors. This allows for the early detection of potential hazards such as gas leaks, excessive temperatures, or irregular heart rates.

Supervisors and safety staff are better equipped to make decisions in real time and protect worker safety when sensor data is remotely transmitted to a centralized monitoring station.

In addition, the use of geo-location technology improves emergency response capacities, permitting prompt and focused actions in case of mishaps or crises within the mine. By offering insights into trends and patterns, the application of sophisticated data analytics algorithms boosts the system's efficacy and makes proactive risk management techniques possible. All things considered, the IOT-based Coal Mine Worker Monitoring System provides a scalable, effective, and trustworthy way to improve safety procedures in coal mining operations.

As technology continues to evolve, further advancements in IOT-based monitoring systems are expected, driving continuous improvements in worker safety and well-being in the mining industry.

The system's main advantages are its scalability and versatility, which make it simple to add new sensors or capabilities as needed to meet the changing needs of coal mine safety. Furthermore, it is crucial to guarantee the security and privacy of the data that has been gathered.

Strong encryption methods and access restrictions protect private data from being altered or accessed by unauthorized parties. To guarantee correct use of the monitoring system, mine staff should receive sufficient training. User-friendly interfaces in conjunction with unambiguous operating guidelines encourage user adoption and compliance.

Adopting a continuous improvement mindset makes it possible to optimize and improve the monitoring systems over time.

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CHAPTER 42

HARNESSING EEG INNOVATIONS AND LORA TECHNOLOGY IN A NEURO-INSPIRED ROBOT

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Abstract

The Cognitive Rover project offers a novel approach to handling portable mechanical technology by combining advanced neuro-innovations with long-range communication capabilities to create a mechanical stage that is adaptable and adaptive. The primary goal of the job is to develop a flexible robot capable of autonomous navigation and adaptation to its environment, guided by brain impulses obtained via electroencephalography (EEG) technology. The robot establishes robust network overstretched distances using the LoRa (Long Range) correspondence standard. This enables remote activity and information transfer in many scenarios, such as remote review errands, hazardous climate examination, and search and salvage missions. The two main components of the suggested framework design are a correspondence module and a neuro-driven control framework. The neuro-driven control architecture interprets user commands and natural boosters using EEG signals captured from a Mind Wave headset. The framework interprets EEG signals into notable commands for autonomous path, obstacle avoidance, and task execution using AI computations and continuous sign management algorithms. The correspondence module uses LoRa innovation to enable consistent information exchange between the robot and remote administrators, enabling real-time video streaming, control, and continuous observation over long distances. The Cognitive Rover's adaptability to various environments, natural client connection via brain-computer interface technology, and robust long-range communication capabilities are some of its main advantages. The project also advances human-robot interaction, mechanical technology, and assistive technologies, with potential applications in foundation review, ecological checking, and unfortunate response.

Keywords

Brain Computer Interface (BCI), Bluetooth Low Energy (BLE), Cognitive Rover (CR), LoRa (Long Range), Electroencephalography (EEG), and Transmitter (Tx).

OVERVIEW

Recent advances in advanced mechanics and mental science have led to a reclassification of possible outcomes for human-machine interaction. This convergence gives rise to the "Cognitive Rover" project, which aims to pioneer a novel approach to handling portable mechanical technology. Through containing the power of EEG impulses and integrating them with cutting-edge correspondence innovation, the project aims to develop a flexible robot capable of comprehending and responding to human mental commands. Conventional methods of controlling robots usually rely on clear directives or preset computations, which limits their adaptability and response in particular circumstances. On the other hand, neuro-driven control provides an extra intuitive and consistent means of cooperation, enabling users to express instructions directly from their mental states. The innovative aspect of this project is how it combines LoRa communication with Brain-Computer Interface (BCI) technology based on EEG data, enabling reliable communication over long distances between the client and the robot. Clients can now remotely direct the robot's progress and actions thanks to this reconciliation, opening up new possibilities for research, assistance, and reconnaissance applications.

According to a review by academics, an individual's electroencephalogram (EEG) can more accurately reflect their various states. Therefore, if the driver's EEG data can be accumulated progressively in the advanced Astute Transportation Frameworks, which principally organize and process characters, we can operate the car in accordance with mental instructions. The electrophysiological monitoring method known as electroencephalography (EEG) records the electrical activity of the brain. If it is often used to manage a meanderer, we can introduce a fantastic advancement in the transportation industry. Wheelchairs controlled by the brain are becoming available. We are revealing the possible effects of EEG in the sphere of transportation one step ahead of that.
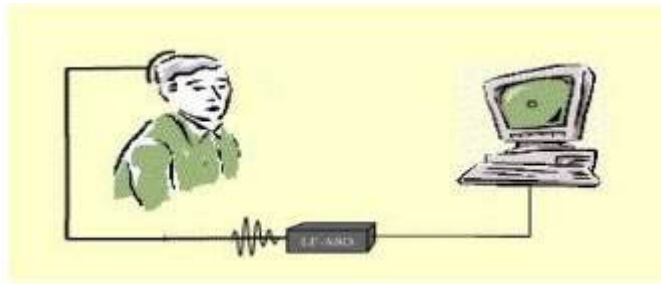
Figure 1: Brain-Computer Interface (BCI)

As was previously mentioned, this framework is formed through the use of remote innovation. We currently have a small number of remote conventions, such as BLE (Bluetooth Low Energy), Wi-Fi, and cell, among others. However, as these developments were designed to transmit data across long distances with little cost and effort, they are not ideal for Internet of Things sensor hubs. Apart from this, the horticultural industry relies heavily on LoRa innovation.

For this reason, we are using LoRa technology, which enables very long-range data or information transmission at low cost and without the need for a web connection. LoRa is an acronym for Long Reach. Sem Tech has introduced an innovative solution for remote radio recurrence. LoRa is used to transmitting data over long distances in both directions. Typically, LoRa can cover 15 to 20 kilometers and last a year on a single charge. BLE uses less power in distant innovation arrangements, however it is not able to transmit data over long distances. LoRa eliminates the drawbacks of WiFi and BLE communication by enabling high-distance communication without the need for an online connection.

RELATED WORKS

A brain-machine interface (BCI) provides a connection step that maintains the whole duplex correspondence between the mind and an external device. The method by which brain-machine interfaces (BCIs) are configured suggests that they are either innocuous or intrusive. Adhesive anodes are used in benign BCIs. They give a generally high transient objective, are inexpensive, easy to use, safe, and convenient. The terminals used in obtrusive BCIs are implanted inside the scalp. Better benefits in terms of sufficiency, spatial objective, and noise reduction are provided by relatively painless BCIs. Nevertheless, they are dangerous and expensive, requiring duties involving neurosurgery. Additionally, scar

tissues lessen the severity of the indications. BCIs are used in a painless manner for the most part.

Several safe philosophies are applied in BCI innovation, such as magnetoencephalography (MEG), which screens the attractive activity of the mind, EEG, which records the electric movement of the cerebrum, and Positron Emission Tomography (PET), functional Magnetic Resonance Imaging (fMRI), and Near-Infrared Spectroscopy (NIRS), which study changes made in the blood stream. Both fMRI and NIRS BCIs provide high spatial goal, but regrettably low worldly goal. Additionally, MEG and PET BCIs have high spatial and global goals. In any event, the vaccination of a radioactive material into the circulatory system is necessary for PET BCIs. Furthermore, the use of expensive and massive equipment is a prerequisite for both fMRI and MEG procedures. EEG BCIs are by far the most well-known kind because of their high worldwide objective, low cost, and straightforward establishment, despite their typically subpar spatial goal. [6]

Additionally, depending on the concept of the information signals, BCIs are assigned either an external or an endogenous role. The movement of the cerebrum caused by external advancements is disrupted by exogenous BCIs. They are easy to set up and have high piece rates, but they need the customer to respond consistently to external requests, which might be demanding or even unfeasible. Brainwave self-guidance is employed by endogenous BCIs without external enhancements. Although they have slower information transfer rates, clients with physical organ damage or engine neuron illnesses can nonetheless use them by maintaining their composure. [10]

Additionally, BCI frameworks are classified as simultaneous or offbeat according on the method used to handle input data. Coordinated BCIs only decode mental cues after a specific interval and within predetermined time frames. As a result, when mental cues are ignored, the client is free to make any kind of developments that would result in ancient rarities, and the overall cycle is better coordinated. They also feature reliable execution, great exactness, and little preparation needed. By gradually analyzing mental inputs, Offbeat BCIs enable the client to behave with increasing freedom. As so, they provide more consistent human-machine collaboration. However, they need extensive planning and preparation and are more confusing in terms of assessment and plan.

2023 Indrajitha Sissodia, the goal of this project is to develop a voice-activated robot car with obstacle recognition capabilities. With components like the HC-05 Bluetooth module, Arduino Uno microcontroller, and ultrasonic sensor, the framework allows users to interact with the robot by voice commands. The hands-free functionality provided by the voice-controlled interface improves customer comfort and wellness. Additionally, the robot's autonomous avoidance of hits is made possible by the consideration of snag finding innovation, ensuring a reliable and productive path. However, issues like limited jargon recognition and possible sign occlusion could compromise the accuracy and dependability of the framework.

PROPOSED METHODOLOGY

By combining long-range correspondence innovation, advanced mechanics, and mental science, the suggested framework offers a fresh perspective on adaptable advanced mechanics. It has a rain-Computer Interface (BCI) that enables direct human-robot communication by interpreting mental states from EEG data received through a MindWave headset.

Figure-2: Proposed flow diagram

MATLAB considers consistent information management and examination at the interface between the BCI sensor and the PC. The LoRa breakthrough facilitates communication between a robot and a user interface, ensuring the efficient transfer of information over long distances.

Customers can direct the robot's movements and developments in certain ways using neuro-driven commands derived from EEG signals processed by MATLAB. This comprehensive framework aims to disrupt human-robot communication capabilities, setting the stage for uses in assistance, reconnaissance, and investigation.

The project integrates several components to create a comprehensive framework for mental meandering. By enabling direct correspondence between the client's mental cues and the robot's control framework, the Brain-Computer Interface (BCI) Execution module enables instinctive control. Combining LoRa with Reach provides long-range remote communication between the administrator and the robot, ensuring reliable information transfer over extended distances. The Neuro-Driven Control Framework uses sophisticated algorithms to interpret mental inputs and translate them into precise commands for managing the movements and advancements of the robot. Additionally, Continuous Video Web based provides administrators with visual input for remote observation and reconnaissance by using the ESP32-CAM to transfer live video feed from the robot's camera.

Computer-Brain Interface (BCI)

The Brain-Computer Interface (BCI) Execution module has sensors that can directly detect brainwave flags from the client's brain. These sensors, which are usually EEG (Electroencephalography) devices, detect electrical activity produced by brain neurons and translate it into digital information.

Figure-3: Brain-Link Headset

The raw brainwave data is preprocessed using high level sign handling techniques, such as sorting and element extraction computations, to improve the data's dependability and quality. The processed signals are subsequently interpreted by AI computations, such as

brain organizations or backing vector machines, which classify them into distinct mental states or orders. This gives the framework the ability to recognize clear cerebral designs associated with client objectives, such as development orders or mental errands.

The BCI framework considers consistent cooperation without the need for traditional information devices, and it lays out an instantaneous correspondence pathway between the client's mind and the robot. By adjusting their mental activity, clients can exert some control over the robot's actions. Some examples of this control include visualizing specific advancements or focusing on particular tasks. Continuous feedback mechanisms ensure that the framework provides a responsive and organic control understanding by continuously adjusting to the client's mental state. Furthermore, the BCI implementation is meant to be transparent and simple to comprehend, allowing anyone with varying levels of mental or technical competence to participate. This promotes diversity and gives a lot of customers the ability to interact with the robot in a meaningful way.

Through addressing brainwave flags, the BCI execution module expands the possibilities for controlling and communicating between humans and robots. It facilitates natural and routine communication between users and robots, improving the usability and accessibility of mechanical frameworks in a variety of contexts. Additionally, ongoing creative efforts in BCI innovation continue to advance sign handling computations, arrangement accuracy, and framework robustness, advancing the capabilities and performance of BCI-enabled robots. As a result, the BCI execution module plays a crucial role in creating intelligent and client-driven mechanical frameworks that can perfectly coordinate into various situations and assist clients in completing projects even more effectively and truly.

Including LoRa Communication

There are two distinct components that make up the LoRa Correspondence module's coordination: the transmitter and the collector. It is the transmitter's responsibility to communicate data from the robot to the user interface (UI), and the recipient's responsibility to receive data from the UI and deliver commands or feedback to the robot.

The equipment design of the robot incorporates the transmitter component of the LoRa Correspondence module. It consists of a LoRa handset module connected to the robot's installed microcontroller. The purpose of this updated module is to encode information

bundles that contain sensor readings, telemetry data, and status information about the robot. To transfer these bundles remotely over long distances, the LoRa device uses regulation processes, ensuring reliable communication with the collector.
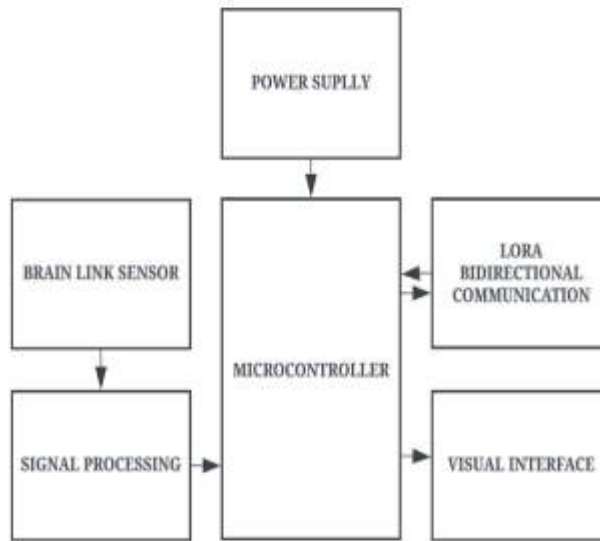
Figure-4: Block Diagram of Processing Side

The LoRa Correspondence module's beneficiary component is integrated into the hardware or programming connection point that controls or displays the robot's user interface. It consists of an additional LoRa handset module connected to a PC or microcontroller. The purpose of this module is to receive the data bundles transmitted by the robot's transmitter. The collector translates the data and cycles it in the same way after receiving the bundles. For example, if the information package includes commands for the robot, the receiver forwards these commands to the appropriate sections of the robot's control program.

The ranchers are able to remotely operate the engine by means of an Android application or website. The beneficiary of the framework acts as a transmitter here. Our transmitter is currently a variety of LoRa SX1278 and ESP32 with a 5V power supply, receiving wire, and controlling page.
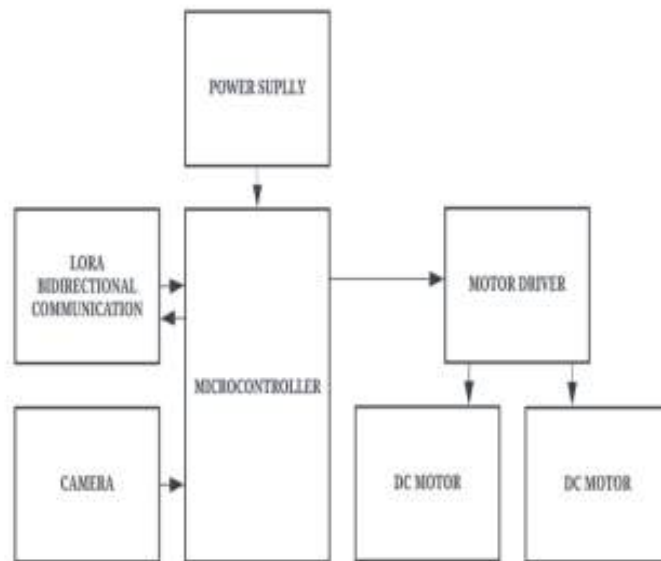
Figure-5: Block Diagram of Rover Side

The Cerebrum PC Point of interaction (BCI) innovation is outfitted with the Neuro-Driven Control Framework module to enable direct control of the robot's advancements and activities using brain signals. This creative framework uses spontaneous and responsive control to translate mental movements captured by BCI sensors into meaningful commands for the robot.

The first step in the module is the acquisition of brain signals using BCI sensors, such as electroencephalography (EEG) terminals or other neuroimaging devices. These sensors detect electrical signals generated by the client's brain activity, identifying instances associated with specific mental states or disorders.

Preprocessing and Feature Extraction

Separation was used to take out the optimal alpha brainwaves from the EEG readings. More specifically, to remove mains recurrence (50 Hz), a second request IIR score channel with a quality component Q equal to 35 was used.

As a result, a Butterworth IIR bandpass channel with cutoff frequencies of 5 and 15 Hz was also used to separate the signs. The biggest misfortune in the passband was thought to be 0.1 dB away. In essence, it was determined that the base weakening in the stopband equated to 30 db. The channels were designed and used with the SciPy Python package.

RESULT & DISCUSSION

Using the camera module that is installed, the ESP32-CAM records video and encodes it into a suitable format for transmission via the correspondence format. MJPEG and H.264 are two popular encoding methods that are used to modify the use of transport speed and video quality.

When encoded, the module considers factors such as network data transfer capability, resemblance with the less-than-ideal end, and dormant requirements before selecting an appropriate transmission convention, such as RTSP, RTP, or HTTP.

Next, a progressive transmission of the encoded video transfer is made across the correspondent network. The ESP32-CAM may connect to external modules like LoRa or GSM for long-range communication in open spaces or remote locations, or it can use Wi-Fi for remote communication indoors.

On the less-than-ideal end, a live video stream is displayed via a remote checking connection point, allowing managers to remotely observe the robot's exercises and surrounding conditions. The Bluetooth and WiFi versions of the EEG app utilized for close-quarters communication.

The ESP32-CAM provides a minimal and workable solution for integrating visual input into mechanical applications when used for continuous real-time video recording. However, challenges including monitoring inactivity, enhancing the utilization of data transfer capacity, and ensuring a robust organization network need to be addressed for effective execution.

CONCLUSIONS

Overall, the task covers a significant advancement in the fusion of mechanical technology, correspondence innovation, and mental science. The framework enables natural human-robot connection and controller by equipping EEG signals through a Cerebrum PC Point of interaction (BCI) and using LoRa correspondence for long-range network. The successful completion of this assignment shows promise for significant advancements in human-robot collaboration norms and opens doors to various applications in domains such as research, observation, and assistance. We intended to develop this into an application that everyone could use efficiently in the future. executing state-of-the-art AI computations to enable the

wanderer to continuously benefit from its collaborations and develop its mental faculties over time

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CHAPTER 43

BUILDING A CONNECTED FUTURE: IoT AND 5G IN ARCHITECTURE

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Abstract

The Internet of Things (IoT) and 5G technologies have brought previously unheard-of possibilities for improved building management, efficiency, and sustainability to the field of smart buildings. Using Arduino Nano microcontrollers, this project aims to maximize the potential of Internet of Things (IoT) sensors and actuators, such as gas and smoke sensors, PIR, HVAC, lighting, servo motors, buzzers, and displays. These microcontrollers coordinate actuator control and sensor data collecting as end nodes. The ESP32 microcontroller, a gateway device, receives the data collected and uses it to communicate with a wireless Wi-Fi router in order to maintain connectivity. The gateway sends data to the cloud via the Thing Speak platform, enabling real-time monitoring and analysis. By providing remote monitoring, predictive maintenance, energy efficiency, and improved occupant comfort and safety, this system promises to completely transform building management. This project intends to show the viability and efficacy of IoT and 5G technology integration in enabling future building infrastructures through rigorous testing and optimization.

Keywords

Heating, Ventilation, and Air Conditioning (HVAC), Light Dependent Resistor (LDR), (Digital Humidity and Temperature (DHT)

INTRODUCTION

The combination of 5G and Internet of Things (IoT) has become a disruptive force in the quickly changing field of smart infrastructure, providing unmatched potential to alter

building efficiency, sustainability, and management. The idea of intelligent, networked buildings is moving closer to reality with the rise of IoT devices and the introduction of 5G networks that offer high-speed and low-latency connectivity. In order to fully utilize IoT and 5G technology to power the infrastructure of the future, this project is a trailblazing attempt.

This project's main focus is on integrating and deploying a wide range of IoT sensors and actuators into the framework of smart buildings. These comprise, among other things, gas and smoke detectors, light-dependent resistors (LDR), digital humidity and temperature (DHT) sensors, passive infrared (PIR) sensors, and an actuator suite that includes lighting fixtures, servo motors, buzzers, displays, and HVAC (heating, ventilation, and air conditioning) systems.

Arduino Nano microcontrollers are the key nodes that organize the gathering of sensor data and the carrying out of control orders for the different actuators in this complex network of devices.

The foundation of the smart building ecosystem is the data that these sensors gather, which includes air quality indices, occupancy patterns, and environmental variables like temperature, humidity, and light levels. In addition to offering priceless insights into the building's existing condition, this abundance of data forms the basis for proactive decision-making and predictive analytics. The system facilitates real-time data collecting and analysis by ensuring seamless connection and coordination among the numerous IoT devices dispersed throughout the building. This is achieved by utilizing the capabilities of Arduino Nano microcontrollers.

But the data journey doesn't stop at the edge devices; instead, the strength of 5G connectivity propels it on a revolutionary path. The gateway device, an ESP32 microcontroller, which acts as a conduit for sensor data transmission to the cloud, is at the center of this transition. The gateway device creates a stable and fast connection to the internet by interacting with a wireless Wi-Fi router, setting up the framework for error-free data transfer. The gateway device enables real-time monitoring, analysis, and visualization of critical indicators by facilitating the smooth integration of building data into the cloud environment through the use of the Thing Speak platform.

Figure 1: System Architecture

This technological convergence portends a paradigm shift in building management and operation, with far-reaching ramifications beyond simple data transfer. Through the utilization of 5G and IoT technologies, this initiative aims to transform the way buildings are maintained, optimized, and monitored. Building managers can monitor vital systems remotely thanks to remote monitoring capabilities, and predictive maintenance algorithms can assist find and fix possible problems before they become more serious. This initiative is essentially evidence of the revolutionary potential of IoT and 5G technology in reshaping the building infrastructure of the future.

We want to show the viability and efficacy of this comprehensive strategy in enabling smart buildings to achieve new heights of efficiency, sustainability, and resilience in the face of a constantly changing world through rigorous testing, optimization, and validation.

PROPOSED METHODOLOGY

The suggested approach presents a state-of-the-art 5G Physical Layer Experimental Platform based on Software-Defined Radio (SDR) that is intended to investigate and improve various access methods in 5G networks. This cutting-edge technology creates a flexible and realistic testing environment by utilizing Wireless Sensor Networks (WSN) and Orthogonal Frequency Division Multiplexing (OFDM). The versatility and flexibility of the Software-Defined Radio architecture allow for the simulation of several access techniques and different 5G waveform options.
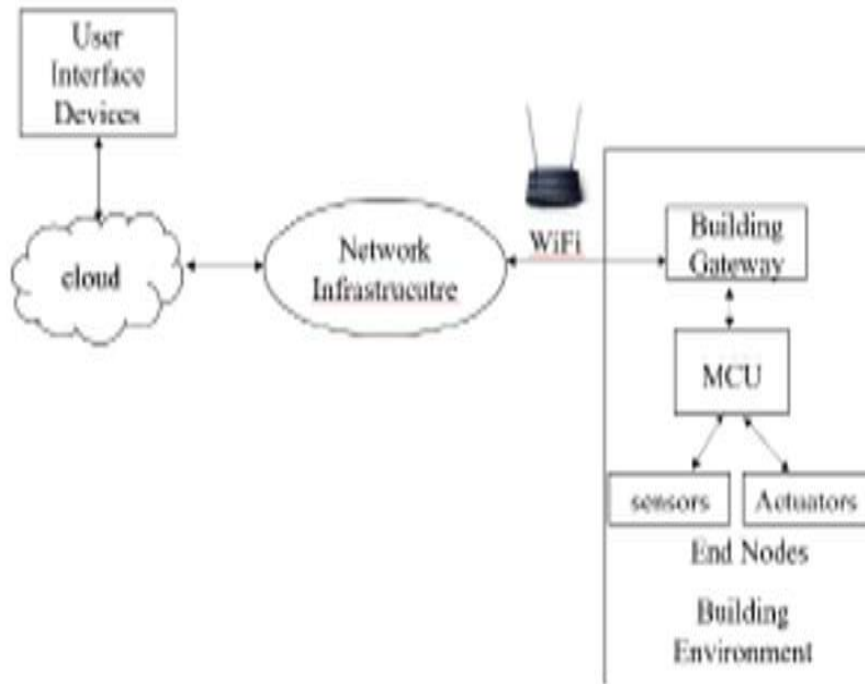
Figure 2: Design of IoT and 5G Technology

Sensor and Actuator Selection

Examine several actuator and sensor types that are appropriate for smart building applications, taking into account aspects like cost, precision, dependability, and compatibility with Arduino Nano microcontrollers. Choose sensors to keep an eye on characteristics like as temperature, humidity, occupancy, gas, and smoke. Actuators are used to regulate lighting, HVAC, and other systems.to connecting the ESP32 Microcontroller with a variety of sensors (IR, LDR, RFID, and DHT).It entails setting up sensor connections, interpreting sensor data, and putting error-handling procedures in place. accountable for managing actuators (such as door motors, lights, and AC fans) in response to user requests or sensor inputs. It entails putting actuator control algorithms into practice, like relay switching for lighting or PWM for controlling fan speed. As the intermediary device for communication between Arduino Nano nodes and the cloud, configure the ESP32 microcontroller.
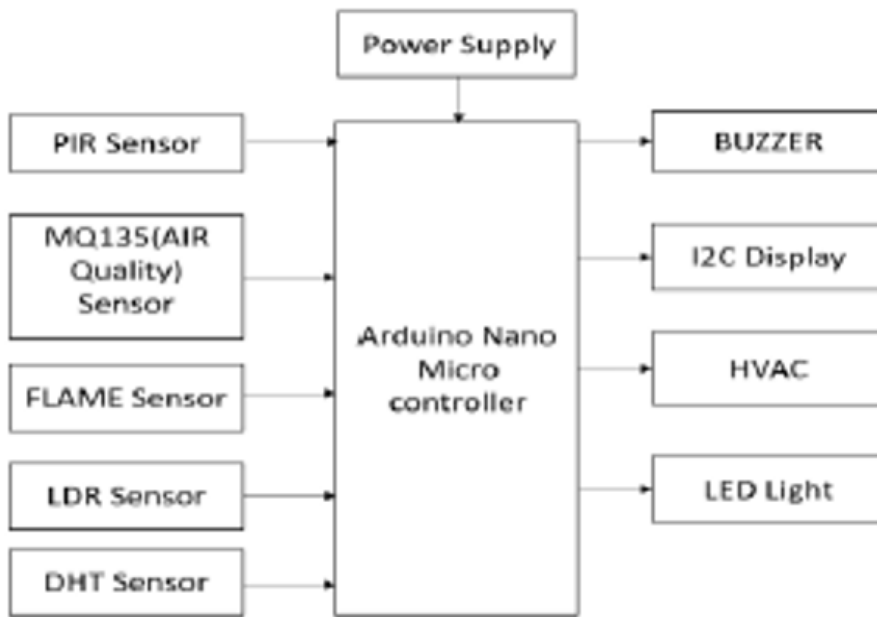
Figure 3: Sensor and Actuator Selection

Integration of Think Speak Cloud:

In Connect the gateway device to the Thing Speak platform to store and visualize data in the cloud. Create scripts or apps that use the proper APIs or protocols to transfer sensor data from the gateway to Thing Speak. Set up channels in Thing Speak to accept and handle incoming data streams. It enables customers to fully utilize the potential of their IoT deployments by providing an intuitive interface for data visualization, real-time monitoring, and analytics.

Thing Speak facilitates easy data collecting from sensors and devices, enabling well-informed decision-making and actionable insights through seamless integration and extensive APIs. The process of integrating Thing Speak include creating channels to collect and store data from Internet of Things devices. A collection of data streams related to various sensor readings or measurements is represented by each channel. It is possible to set up these data streams to receive incoming data on a regular basis, usually through the HTTP or MQTT protocols. Users can use Thing Speak channels' built-in visualization features to construct custom dashboards and plots for real-time monitoring and analysis after the data has been digested. Additionally, Thing Speak supports MATLAB analytics, which enables users to use sophisticated algorithms for predictive modeling, anomaly detection, and data processing.
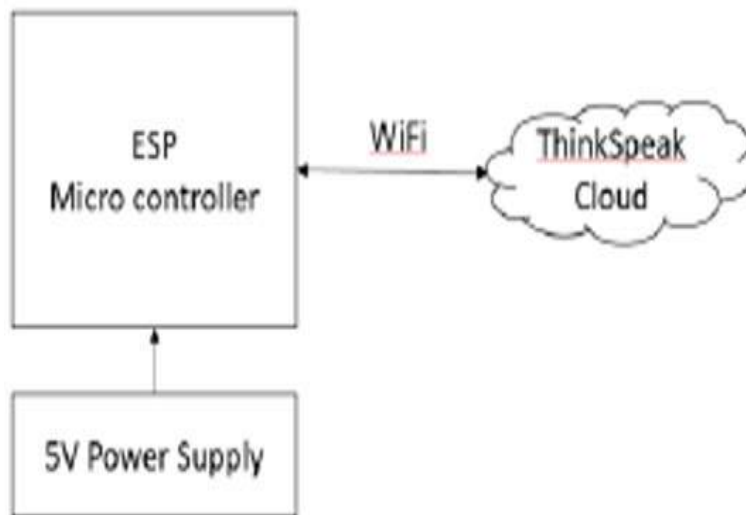
Figure 4: Integration of Think Speak Cloud

With the help of Thing Speak cloud integration, managing IoT data is made simple and effective, giving users the ability to obtain insightful information and make decisions based on data that is updated in real time from their connected devices. Through an Android application or website, the ranchers can operate the engine remotely.

Network Communication:

To access the internet, configure the ESP32 to establish a connection with the 5G Wi-Fi router. There are several additional bands used by 5G, which fall into three different categories. All frequencies that function below 2.3 GHz, which offer a wide coverage but slightly faster speeds than 4G/LTE, are typically included in the low-band 5G category. Not helping matters is the fact that 5G frequently uses the same frequencies as 4G/LTE signals, forcing it to share the spectrum with the latter traffic in order to give way to the former utilizing a more recent 5G technology called Dynamic Spectrum Sharing (DSS). This implies that 5G users would experience even greater slowdown as 4G/LTE devices will always have priority on those frequencies.

Optimal performance and efficiency are guaranteed by real-time monitoring, predictive maintenance, and energy optimization capabilities. Notifications and alarms that arrive on time allow for quick reactions to problems as they arise, improving security and safety. Building automation and efficiency have advanced significantly as operators can make well-informed decisions to lower costs and increase sustainability by utilizing data-driven

insights. the stratosphere of Extremely High Frequency (EHF) radio waves, which begin at roughly 24GHz and offer incredible speeds but a range that is limited to a city block.

User Interface Development and Monitoring:

Thing Speak's "User Interface Module" is made to make it easier for users to engage with their IoT data. Users may simply view and interact with the data gathered from their connected devices or sensors thanks to its user-friendly dashboard interface. Users can customize their dashboard to display specific information, including temperature trends, humidity levels, or energy usage patterns, with the help of visualization tools and configurable widgets. Provide systems for continuing the smart building system's maintenance and monitoring. Use remote monitoring tools to monitor system health, identify problems, and update or modify software as necessary.

CONCLUSIONS

As a result, the project effectively illustrates how IoT and 5G technology may revolutionize building management. Through the integration of many sensors and actuators with Arduino Nano microcontrollers, a resilient framework for real-time data collection and control has been built. Remote monitoring and analysis are made possible by the gateway microcontroller ESP32, which enables smooth data transmission over wireless Wi-Fi routers to the Thing Speak website. By putting this into practice, we can improve building safety, optimize energy use, and do predictive maintenance. By using 5G technology, data transmission is accelerated, leading to quicker reaction times and increased productivity. In addition, keep the following in mind for future development: Investigate incorporating touchscreens and mobile apps as user interfaces for data visualization and user control. Use machine learning algorithms to optimize building operations and do predictive maintenance.

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CHAPTER 44

EFFICIENT B-NET ALGORITHM FOR DETECTING MULTIPLE BRAIN TUMORS USING DEEP LEARNING

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Abstract

Because of their complexity and sensitivity, categorizing brain illnesses is a tough undertaking. Because brain tumors are dangerous and often fatal, early discovery and diagnosis are critical for creating an effective treatment strategy. Magnetic resonance imaging (MRI) is a critical medical imaging tool that enables for thorough, non-invasive examination of the brain's interior components. Magnetic resonance imaging (MRI) is extremely useful in diagnosing and treating brain cancers. Beginning with dataset preparation, the strategy applies to MRI scans and clinical data from persons with a variety of brain disorders, including tumors and non-tumors. The dataset is made up of both training and testing sets. MRI tumor identification necessitates a number of procedures, including feature extraction, classification, and picture postprocessing. To classify brain Networks with Efficient Net model a pre-trained model using the transfer learning method. The proposed framework not only leverages the pre-trained model to improve the performance of training a better model, but it also employs thresholding to improve the dataset's accuracy and data augmentation to increase the number of images in the dataset. The Efficient Net family of models outperforms prior CNN architectures, according to preliminary results, since it uses the compound coefficient to scale all dimensions of an image's depth, width, and resolution with a consistent ratio. The results also showed that scaling the baseline architecture allows the model to incorporate intricate features, improving overall model performance.

KEYWORDS

Brain tumor classification, convolutional neural network, medical imaging, deep learning, transfer learning.

INTRODUCTION

The brain, one of the most important organs in the human body, helps in decision-making and regulates the function of all other organs. It is primarily responsible for coordinating daily voluntary and involuntary body functions and acts as the central nervous system's command center. The tumor is an unregulated, proliferating mass of undesired tissue growth within our brain that looks like a fibrous web. This year, an estimated 3,540 children under the age of 15 will be diagnosed with brain tumors. To prevent and cure brain tumors, it is critical to have a thorough grasp of the disease's stages. An intracranial tumor, also known as a brain tumour, is an abnormal mass of tissue in which cells proliferate and reproduce rapidly, appearing unaffected by the systems that control normal cells. Although over 150 different forms of brain tumors have been identified, the two most common are primary and metastatic brain tumors. Primary brain tumors are those that develop in the brain or its surrounding tissues. Primary tumors are classed as benign or malignant, glial (made up of glial cells) or non-glial (formed on or within brain structures such as nerves, blood arteries, and glands). Tumors that begin in other regions of the body, such as the breast or lungs, and spread to the brain, typically via the bloodstream, are known as metastatic brain tumors. Metastatic tumors are malignant and classified as cancer. The types of tumors are depicted in Figure 1.
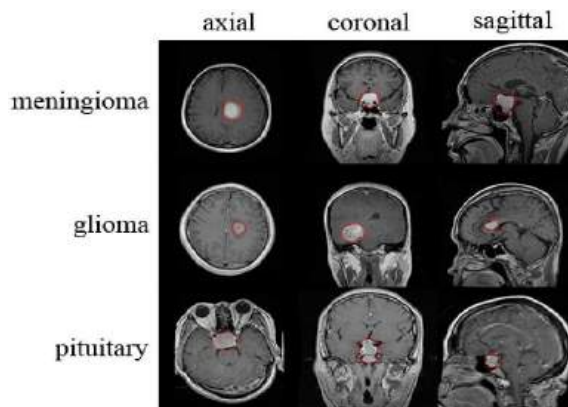
Fig1: Types of Tumors

RELATED WORK

Saeed Mohsen et al. [1] used hyper-parameter tuning to improve the accuracy of brain tumor identification and classification using ResNext101_32 × 8d and VGG19 models, respectively. These two models have the advantage of being structurally basic, which can reduce computing cost (training time), and they rely on a transfer learning process. The Kaggle repository included a dataset that was used to test and train the models. The first of six phases entailed uploading the MRI image dataset, which was separated into training and testing images. The second step was image normalization, which involves pre-processing MRI scans. The third stage was determining the total number of training epochs. In the fourth stage, a fitting function was used to train the model. Selected MRI pictures. The fifth phase was testing the VGG19 model's prediction capacity using MRI test pictures. The model's performance was finally evaluated on the MRI test images using several measures.

Solanki, Shubhangi, et al. [2] shown that precise imaging is critical in the clinical setting for producing correct diagnoses. The procedures used to acquire artifacts, such as CT, PET, and magnetic resonance imaging, influence the effectiveness of clinical images. Real images from a magnetic resonance scan may contain a lot of unneeded and undesirable detail. Rician noise causes magnetic resonance imaging. This survey contains all of the notable characteristics and the most recent study completed so far, along with its Limitations and impediments. Researchers will gain from a greater grasp of how to conduct new research in an appropriate manner and within a reasonable timeline. Despite the significant contributions of deep learning algorithms, a broader strategy is still necessary. When training and testing are performed on similar achievement features (intensity range and resolution), these approaches generate better outcomes; however, even little differences between the training and testing images have a direct impact on the robustness of the procedures. Future research could be undertaken to better accurately diagnose brain tumours by using real patient data rather than inferior image capturing technology (scanners). Combining deep features with handcrafted characteristics can improve classification accuracy.

Shah et al. [3] carried performed to diagnose brain cancers, VS-BEAM, a novel computer-aided diagnosis system, has been developed. To assess whether malignancies are present in MRI images, the ensemble architecture incorporates multiple models. The algorithm

determines the final anomaly using a voting method, which improves diagnostic accuracy and efficiency. To improve feature extraction, we include Squeeze and Excitation (SE) Attention Blocks into the CNN (Convolutional Neural Network) network. We concluded that SE attention mixed with CNN is more reasonable than CNN networks alone. The VS-BEAM technique employs ensemble learning by combining multiple classifier algorithms. The first method approaches the multiclass brain tumor classification problem as three binary class classification problems, whereas the second method, also a dense classifier, to handle the challenge of multiclass classification, a traditional dense network is used. Finally, the final classifier uses a Bayesian classifier that estimates the posterior distribution to categorize the tumour. During the evaluation stage, the proposed method for recognizing and dividing up brain tumors in MRI images shown great performance. The end-to-end model produced promising results and may be used in ongoing clinical trials for computer-assisted brain tumor diagnosis.

Ferdous et al. [4] proposed an LCDEiT framework for identifying malignancies from brain MRIs that was developed by teachers and students. The framework is based on external attention. For image categorization, an image transformer backbone is used, together with a gated-pooled CNN-based teacher model for knowledge extraction. The knowledge obtained from the instructor model offsets the need for a large dataset of vision transformers. Adding external attention to the backbone transformer model reduces complexity linearly with respect to the number of patches, removing the quadratic complexity produced by self-attention in the transformer encoder. According to the findings, the transformer-based student model at the heart of the proposed framework achieves the best classification results, with F1-scores of 0.978 and 0.937 for the Fig share and BraTS-21 datasets, respectively. This demonstrates how successfully image transformers with robust learners may be used in the field of medical imaging, when rapid computation is required to begin treating a critically ill patient. To solve the issues associated with a higher misclassification rate for lower sample classes, an unbalanced dataset handling strategy, such as class-wise augmentation, may be applied in the future. Even though the proposed LCDEiT model performed better on two separate Fig share and BraTS-21 datasets, its universality could be improved by expanding the experimental database.

Two research issues, including the security issue with the IoMT environment and the classification of brain tumors, were resolved by Ramprasad et al. [5]. The goal of this work is to offer a comprehensive solution to these issues. The study focuses on securing brain tumor images through the use of TIWT in the MIW implementation. The purpose of this is to safeguard patient privacy and confidentiality when medical data is transmitted over the Internet of medical devices. The goal is to ensure that the source image of the brain tumor is transmitted over a secured environment, thereby preventing attackers from seeing the image. Creating a precise system for classifying brain tumors is another goal of the research. It makes use of transfer learning techniques, namely BWO-GA for feature extraction and a transfer learning- based RU-Net model for segmentation. AlexNet, a transfer learning-based network, is then used to classify the segmented tumor region into benign and malignant tumors. The ultimate goal is to increase the accuracy of brain tumor classification, which will allow for early prediction and possibly save lives. The

Resolved two research concerns, namely the security of the IoMT environment and the classification of brain tumors [5]. The purpose of this study is to present a thorough answer to these problems. The project focuses on safeguarding brain tumor images using TIWT in the MIW implementation. The goal is to protect patient privacy and confidentiality when medical data is sent over the Internet via medical devices. The purpose is to ensure that the source image of the brain tumor is sent in a secure environment, preventing adversaries from viewing it. The research also aims to develop a precise system for classifying brain cancers. It takes use of transfer learning mechanisms, specifically BWO-GA was used to extract features, and a transfer learning-based RU-Net model was used to segment them. AlexNet, a transfer learning network, is then utilized to categorize the segmented tumor region as benign or malignant. The ultimate goal is to improve the accuracy of brain tumour categorization, allowing for earlier detection and maybe saving lives. The The RU-Net model is used for segmentation at the IoMT receiver to determine the exact location of the tumor. Furthermore, multilevel features are extracted by BWO-GA, and the best features are chosen based on properties observed in nature. Furthermore, an AlexNet based on transfer learning is trained using the most effective tumor classification features.

EXISTING METHODOLOGIES

Use machine learning techniques in the existing system to classify brain cancers based on feature extraction and classification. Machine learning algorithms play an important role in the early detection and successful treatment of brain tumors using medical pictures.

Despite its simplicity, the K-Nearest Neighbors (K-NN) algorithm remains an effective strategy. It is useful for identifying similar situations within a dataset since it assigns a class label to a data point based on the majority class of its nearest neighbors in the feature space. AdaBoost and Gradient Boosting are two ensemble approaches that have been shown to improve classification accuracy by integrating predictions from many classifiers. These strategies exploit the advantages of various base classifiers to increase the model's resilience and generalizability. When it comes to brain tumor diagnosis, these machine learning algorithms are an invaluable resource for medical experts. They contribute to the rapid and accurate detection of brain cancers, which improves patient outcomes.

Support Vector Machines (SVM) are another useful tool, especially for binary classification tasks such as distinguishing between tumor and non-tumor regions in medical pictures. SVMs may employ retrieved image properties such as texture, intensity, and form descriptors to achieve precise classifications.

Decision trees and random forests are also widely used. They can be used for classification jobs and offer the benefit of feature selection. These algorithms use characteristics and attributes taken from medical pictures to discriminate between tumorous and non-tumorigenic regions.

PROPOSED METHODOLOGIES

Brain tumor identification is an important medical method that determines whether the brain contains tumors or other abnormal growths. Brain tumors must be diagnosed as soon as feasible in order to be treated successfully and with positive patient outcomes. The most commonly utilized method involves medical imaging techniques, notably CT and MRI scans. Trained radiologists and clinicians can detect and locate tumors using these non-invasive procedures that create precise images of the brain. Machine learning and artificial intelligence, especially deep learning models such as Convolutional Neural Networks

(CNNs), are increasingly being utilized to assist radiologists in the interpretation of medical pictures. These models improve accuracy and efficiency by automatically recognizing and categorizing cancers in photographs. The process of developing effective treatment strategies, which could include the accuracy of brain tumor detection is critical for treatment options such as radiation therapy, chemotherapy, surgery, or a combination thereof. To improve patient outcomes and quality of life, early diagnosis and detection are critical.

The suggested approach, called "Brain Tumor Detection Using Transfer Learning," promises to significantly increase the effectiveness and precision of brain tumor identification in medical imaging. This approach leverages the power of transfer learning by applying pre-trained deep learning models to vast datasets and fine-tuning them for the specific objective of brain tumor identification. Data gathering and preparation are critical phases in system architecture. A variety of MRI scan images, both with and without malignancies, are collected. Data augmentation, pixel leveling, and image resizing are examples of preprocessing procedures used to enhance the quality and diversity of dataset. The transfer learning approach is the system's core component. The essential architecture is a pre-trained deep learning model, such as VGG16 or Inception. The brain tumor identification problem employs features and knowledge gathered from a huge dataset in other disciplines. The pre-trained model's convolutional layers extract features, while the fully connected layers tailor the model to the complexities of brain tumor classification. This speeds up the development process and improves the model's ability to detect brain tumors accurately. The system's strength is its ability to attain high accuracy while minimizing the need for a huge dataset of brain tumor images.

To comprehensively analyze the system's efficacy and generalizability, the dataset is partitioned into three subsets: training, validation, and testing. Cross-validation techniques can also be used to test the model's resilience and limit the risk of overfitting. Another important aspect of fine-tuning is hyperparameter tuning, which involves optimizing variables such as learning rates, batch sizes, and regularization procedures. This fine-tuning method is required to ensure the model's optimal performance and efficient convergence. The next phase is model evaluation, which involves assessing the system's performance using standard measures such as accuracy, precision, recall, and F1-score. This assessment is done out on the specific testing dataset, which allows for a precise understanding of the

system's capacity. to correctly diagnose brain cancers. Furthermore, this method can speed up the development of brain tumour detection models and make them available for real-world medical applications, thereby enhancing patient care and outcomes. The proposed paradigm is illustrated in Figure 2.
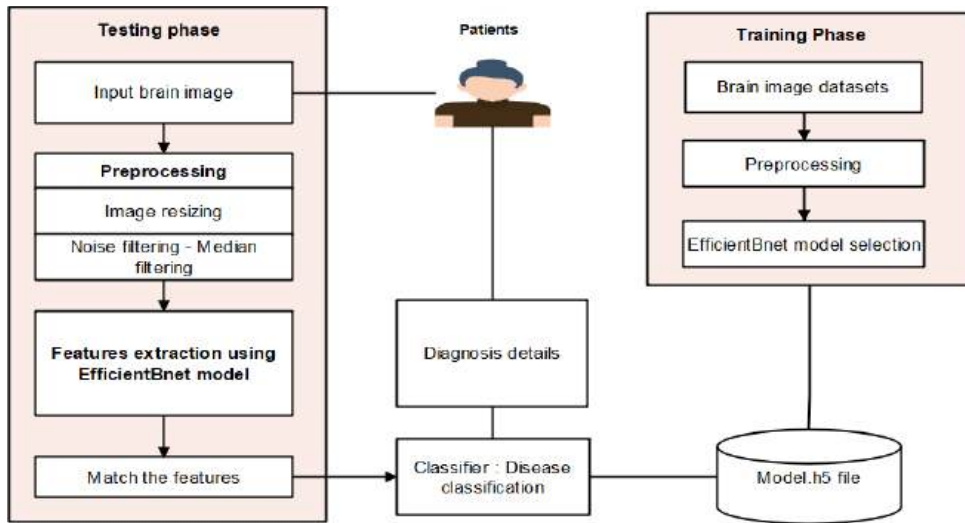
Fig 2: Proposed Block Diagram

Figure 2 shows photographs from KAGGLE websites linked to brain malignancies such as glioma, meningioma, pituitary tumor, and no tumor. Then proceed with preprocessing processes such as noise removal using the median filtering technique. Finally, select a pretrained model, such as the Efficient Net model. Calculate the performance system based on tumor categorization, including the accuracy and confusion matrix. In the testing phase, load the brain image and do classification with the best model file. Finally, forecast malignancies and provide precautionary details.

EFFICIENT NET MODEL

To use the Efficient Net model for brain tumor detection, start by creating a dataset of brain MRI images that are precisely labeled to indicate the presence or absence of tumors. The dataset is meticulously preprocessed to ensure dimension uniformity, contrast modifications, and intensity value normalization, which improves the model's capacity to identify significant features. The suitable Efficient Net variation (B0 to B7) must be chosen

based on the size and complexity of the dataset. Start with a Smaller variants, such as B0, are recommended for smaller datasets, with scaling up as needed. The Efficient Net architecture's balanced scaling of depth, width, and resolution provides peak performance while maximizing computational resources. To train the model, feed the preprocessed MRI images into the Efficient Net network and iteratively update the model's parameters using backpropagation to minimize classification errors. Fine-tuning hyperparameters and monitoring model performance with validation metrics are critical steps in improving the model's accuracy. Finally, the trained Efficient Net model can efficiently interpret brain MRI images, assisting in the accurate detection and diagnosis of brain cancers, allowing for timely medical intervention and treatment. Efficient Net employs Mobile Inverted Bottleneck (MBConv) layers, which consist of depth-wise separable convolutions and inverted residual blocks. Furthermore, the model architecture utilizes the Squeeze-and-Excitation (SE) optimization is used to improve the model's performance.
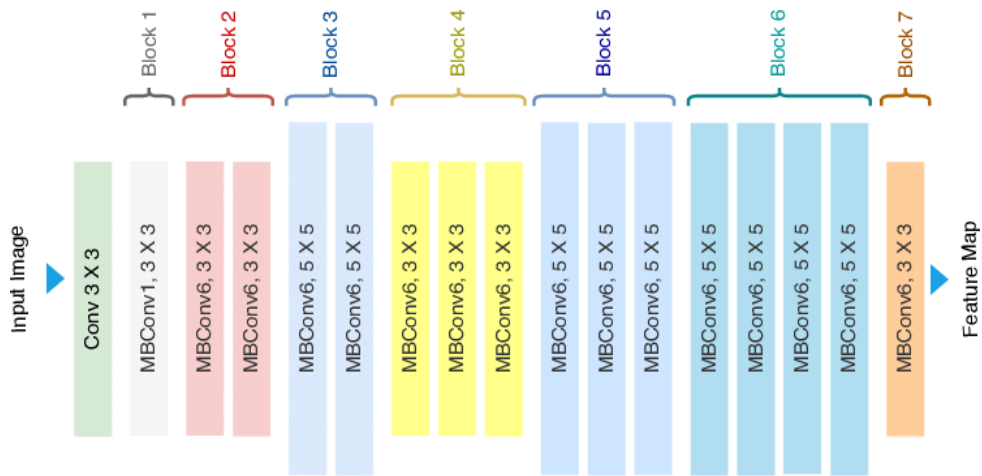
Fig 3: Efficient Net Architecture

CONCLUSION

To summarize, the use of Efficient Net models for brain tumor identification is a tremendous development in medical imaging and healthcare. These deep learning models, which are well-known for their success in image processing, provide significant tools to help medical practitioners diagnose brain cancers early and accurately. The Efficient Net model, with its well-established architecture and powerful picture categorization capabilities, lays a solid platform for this crucial task. Its adaptability and versatility make it an excellent

candidate for classifying brain MRI and CT data, increasing the speed and accuracy of cancer detection. The Efficient net model may be tweaked and fine-tuned to meet unique dataset needs, enabling for precise brain tumor diagnosis while conforming to healthcare ethics and regulations. Its versatility extends to a variety of medical imaging activities, including the detection of anomalies in X-rays and MRI scans. The application of the Efficient net model resulted in enhanced disease prediction efficiency. As a result, the user can input an image and be sorted into brain tumour categories with diagnosis details.

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CHAPTER 45

A DEEP LEARNING STRATERGY TO CARDIOVASCULAR RISK ANALYSIS FOR DISEASE PREDICTION

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Abstract

The heart is among the most vital organs in the human body. It functions as the central nervous system. Heart disease is a dangerous, sometimes fatal illness that can result in either a major, irreversible disability or death. Finding hidden patterns and connections in e-health data is difficult due to the lack of effective tools. If lives are to be saved, medical diagnosis is a challenging procedure that needs to be completed accurately and efficiently. An adequate and accurate computer-based automated decision support system is required to reduce the cost of conducting clinical testing. It has been suggested that health analytics be used to analyze patient data accurately. The data produced by the healthcare industry is not mined. In the medical field, data mining techniques may be applied to generate intelligent models using patient risk factor-containing data sets. The development of strategies and techniques for data exploitation has shocked the field of knowledge discovery in databases. This paper clarifies the machine learning and deep learning methods utilized in illness identification. Many data mining classifiers for rapid and precise sickness detection have been discussed recently. The objective of this study is to create a heart attack prediction system that predicts a patient's risk of developing heart-related illnesses using deep learning techniques, particularly Multi-Layer Perceptron (MLP). MLP, a very effective classification method, uses the Artificial Neural Networks Deep Learning approach. The proposed approach integrates data mining and deep learning to produce dependable results with low errors.

Keywords

Cardiovascular prediction, deep neural network, multi-layer Perceptron, disease diagnosis.

INTRODUCTION

In recent years, machine learning algorithms have been used to predict the risk of heart disease by analyzing various risk factors and clinical variables. These models have shown promising results in predicting the likelihood of developing heart disease, allowing for early intervention and improved outcomes. The objective of using the MLP (Multilayer Perceptron) algorithm for heart disease prediction is to develop an accurate predictive model that can identify individuals at high risk of developing heart disease. The MLP algorithm is a type of neural network that can learn and make predictions based on patterns in data. The MLP algorithm can be trained on a dataset containing various risk factors and clinical variables, such as age, gender, blood pressure, cholesterol levels, smoking status, diabetes, and family history of heart disease. The algorithm can then use this information to predict the likelihood of an individual developing heart disease. The ultimate goal of using the MLP algorithm for heart disease prediction is to improve early detection and diagnosis of heart disease, which can lead to earlier intervention and better outcomes for patients. By accurately identifying individuals at high risk of developing heart disease, healthcare providers can develop targeted interventions, such as lifestyle changes or medication, to reduce the risk of heart disease and improve overall health outcomes. Data mining tasks that systematically incorporate domain knowledge, particularly formal semantics, into the process are referred to as semantic data mining.

METHODS AND MATERIALS

Machine learning algorithms also used to find correlations and associations between different diseases. Nowadays many people are dying because of sudden heart attack. Prediction and diagnosing of heart disease becomes a challenging factor faced by doctors and hospitals both in India and abroad. In order to reduce number of deaths because of heart diseases, we have to predict whether person is at the risk of heart disease or not in advance. Data mining techniques and machine learning algorithms play a very important role in this area. Many researchers are carrying out their research in this area to develop software that can help doctors to take decision regarding both prediction and diagnosing of heart disease. In this paper we focused on how data mining techniques can be used to predict heart disease in advance such that patient is well treated. An important task of any diagnostic system is

the process of attempting to determine and/or identify a possible disease or disorder and the decision reached by this process. For this purpose, machine learning algorithms are widely employed. For these machine learning techniques to be useful in medical diagnostic problems, they must be characterized by high performance, the ability to deal with missing data and with noisy data, the transparency of diagnostic knowledge, and the ability to explain decisions. As people are generating more data everyday so there is a need for such a classifier which can classify those newly generated data accurately and efficiently. This System mainly focuses on the supervised learning technique called the Random forests for classification of data by changing the values of different hyper parameters in Random Forests Classifier.

CARDIOVASCULAR DISEASE PREDICTION

Cardiovascular disease continues to claim an alarming number of lives across the globe. CVD disease is the greatest scourge affecting the industrialized nations. CVD not only strikes down a significant fraction of the population without warning but also causes prolonged suffering and disability in an even larger number. Although large proportion of CVDs is preventable they continue to rise mainly because preventive measures are inadequate. Heart disease diagnosis has become a difficult task in the field of medicine. This diagnosis depends on a thorough and accurate study of the patient's clinical tests data on the health history of an individual. The tremendous improvement in the field of machine learning aim at developing intelligent automated systems which helps the medical practitioners in predicting as well as making decisions about the disease. Such an automated system for medical diagnosis would enhance timely medical care followed by
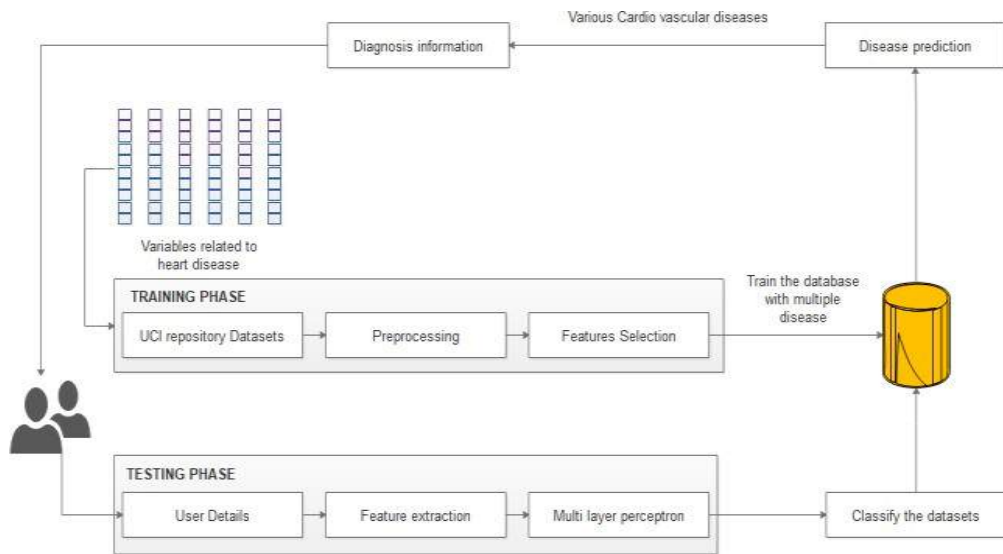
Figure1: Proposed Framework

proper subsequent treatment thereby resulting in significant lifesaving. Incorporating the techniques of classification in these intelligent systems achieve at accurate diagnosis. Neural Networks has emerged as an important method of classification. Multi-layer Perceptron Neural Network with Back-propagation has been employed as the training algorithm in this work. This project proposes a diagnostic system for predicting heart disease with improved accuracy. The propagation algorithm has been repeated until minimum error rate was observed. And it is quite evident from the results presented in the previous section that the accuracy rate is maximized.

DATASETS ACQUISITION

The data set may comprise data for one or more members, corresponding to the number of rows. Upload the cardiovascular datasets related to heart diseases which includes the attributes such as age, gender, height, weight, systolic blood pressure, diastolic blood pressure, cholesterol, glucose, smoke, alcohol, active status, cardio labels.

PREPROCESSING

Data pre-processing is an important step in the [data mining] process. The phrase "garbage in, garbage out" is particularly applicable to data mining and machine learning

projects. In this module, we can eliminate the irrelevant values and also estimate the missing values of data. Finally provide structured datasets.

FEATURES SELECTION

Feature selection refers to the process of reducing the inputs for processing and analysis, or of finding the most meaningful inputs. In this module, select the multiple features from uploaded datasets. And train the datasets with various disease labels such as Coronary heart diseases, Cardiac arrest, High blood pressure, Arrhythmia and normal.

CLASSIFICATION

In this module implement classification algorithm to predict the heart diseases and using deep learning algorithm such as multi-layer perceptron algorithm to predict the diseases. A multilayer perceptron (MLP) is a feed forward artificial neural network model that maps sets of input data onto a set of appropriate outputs.

Multilayer perceptron (MLP) is a supplement of feed forward neural network. It consists of three types of layers—the input layer, output layer and hidden layer, the input layer receives the input signal to be processed. The required task such as prediction and classification are performed by the output layer. An arbitrary number of hidden layers that are placed in between the input and output layer are the true computational engine of the MLP. Similar to a feed forward network in a MLP the data flows in the forward direction from input to output layer. The neurons in the MLP are trained with the back propagation learning algorithm. MLPs are designed to approximate any continuous function and can solve problems which are not linearly separable. The major use cases of MLP are pattern classification, recognition, prediction and approximation.

DISEASE DIAGNOSIS

In this module, provide the diagnosis information based on predicted heart diseases. Proposed system provides improved accuracy in heart disease prediction. Risk factors are conditions or habits that make a person more likely to develop a disease.

CONCLUSION

Implemented preprocessing the classification rule algorithms namely multi-layer perceptron is used for classifying datasets which are uploaded by user. By analyzing the experimental results, it is observed that the Multi-layer perceptron technique has yields better result than other techniques. Data mining technology provides an important means for extracting valuable medical rules hidden in medical data and acts as an important role in disease prediction and clinical diagnosis. There is an increasing interest in using classification to identify disease which is present or not. In the current study, have demonstrated, using a large sample of patients hospitalized with classification

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CHAPTER 46
Enhanced Method to Predict Machine Life Using Deep Learning

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Abstract

The term "remaining useful life" refers to how long a gadget may continue to operate in a competitive manner while completing the same purpose. By determining when to replace components and utilities by figuring out the remaining useable life, manufacturers can lower development costs. The machine's remaining useful life is the amount of time that its original parts should continue to function flawlessly before needing to be upgraded. The term "remaining useful life" refers to the number of cycles or time that a machine can theoretically be employed in normal service. Its remaining usable life is the number of years (usually) that a piece of machinery or equipment is expected to survive before becoming obsolete. A tree of decisions.

Keywords

Cycle-consistent learning, deep learning, degradation alignment, prognostics, remaining useful life (RUL) prediction

INTRODUCTION

Equipment prognostics and health management (PHM), which increases system reliability, boosts operational safety, and reduces maintenance costs, is highly valued in modern businesses. The financial benefits of PHM techniques have led to their successful development and widespread application in a variety of industrial processes, including those in the automotive, intelligent manufacturing, and aerospace industries [1]–[4].Model-based, data-driven, and hybrid approaches are the three types of modern PHM strategies. Decades-old model-based approaches [5] state that effective prognostics may usually be obtained when the precise physical model can be developed for the target equipment. But when industrial gear gets more complicated, it gets harder to create a precise physical model

of the system, which lowers the effectiveness of model-based processes and hinders their further development and application [6].

Nevertheless, developing an effective hybrid approach for complicated systems is still frequently very challenging. Thus, the purpose of this article is to investigate potential data-driven techniques. Deep learning has become a very effective technique for data-driven algorithms in recent years, and this could greatly improve PHM performance [10], [11].

In order to support its superior feature extraction and pattern recognition skills with relation to industrial huge data, deep neural network design frequently includes several hidden layers [12], [13]. Many application scenarios, including as object identification, speech recognition, and detection, have benefited immensely from the development of deep learning [14]. Cipollini et al. [15] proposed a deep learning-based architecture to automatically extract features from the stator current data, offering a simple and effective bearing fault.
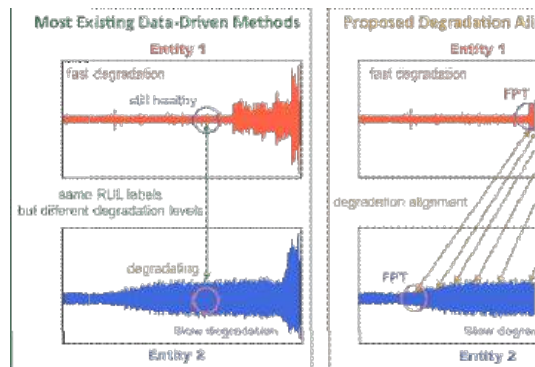
Fig.1 RUL label setting problem in data-driven methods and the proposed degradation alignment scheme

RELATED WORK

The cycle-consistent learning system has been effectively implemented in several computer vision tasks, including image matching [8] and video correspondence [9], and it has been employed in the present literature to match data pairs by cycling between two or more samples. The investigation of the cyclic relations has also helped with the data transformation learning challenges. For example, Cycle GAN [10] uses cycle consistent adversarial networks to provide promising image-to-image translation performance.

Hoffman et al.'s [11] cycle-consistent adversarial domain adaptation model was used to address several domain adaptation issues in visual recognition.

It should be mentioned that the prognostic problem cannot be resolved with the existing image and video processing techniques, even with the advancements in cycle-consistent learning. For example, the FPT is essential.

This paper proposes a novel deep learning RUL prediction method based on system degradation alignment. A summary of the study's major innovations and contributions is provided below.[12] A cycle-consistent learning approach for prognostics is presented, which aims to align the data of different machine entities with similar degrees of deterioration in the high-level subspace where an encoding function parameterized as deep neural network is used for representation learning.[13] It is possible to properly determine the percentage RUL during machine degradations by using prior training data, and a unique approach for calculating FPT is proposed. The exact RUL values can also be determined using the framework.[14] The feasibility of the proposed method is validated by experimental results on two prognostic data sets. Comparable in terms of degradation, the condition monitoring information of different.

EXPERIMENTAL STUDY

DETAILS ABOUT THE DATA IMPLEMENTATION AND DESCRIPTION
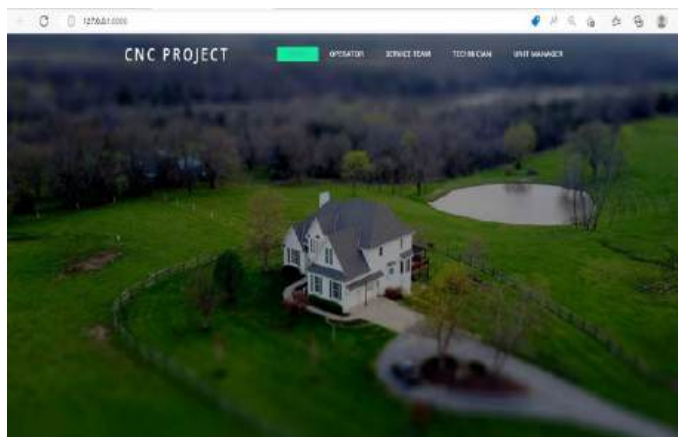
Fig.2 Home Page

The Data Set for C-MAPSS Prognostics and health management are highly prioritized in the aircraft industry [1]. NASA's turbofan engine deterioration data collection is used in the

evaluation used in this work [2], [3]. The data set contains real-world data simulations produced by the Commercial Modular Aero-Propulsion System Simulation (C-MAPSS) program. Twenty-one sensors provide time series data, and four sub data sets (FD001, FD002, FD003, and FD004) with different fault modes are provided.

The training data set of each sub data set contains the run-to-failure data of several engine units; however, the data for testing units is only available up to a certain time during the run-to-failure operations. However, the testing units' real RUL is provided. Details the run-to-failure training data from the C-MAPSS data set's subdata sets FD001 and FD003 are aligned and displayed, respectively. It is clear that encouraging cycle-consistent learning outcomes have been generated.

METHODOLOGY

CNC OPERATOR

This module details how to register a CNC operator, providing the necessary details such as name, age, address, phone number, and password. This allows the operator to log in and view the operator page. In the event that the operator is new, they create a new account. The operator selects the kind of CNC machine after logging in and alerts the manager to the impending work. Once the operator receives the manager's consent, the process will start. After then, he will start processing and might see some variations in the result. Should this be the case, he will notify the unit manager of the faulty data and stop the mass production. After then, the operator carries out the task.

Fig.3 Operator Home Page

SERVICE TEAM

To register with the service team, you need to submit the following details: your name, email address, phone number, password, addresses, and age. This allows the service team to log in and access the service team page. If it's a new service team, he creates a new account. After logging in, he checks the ledger for the most recent service. He would then notify the manager of the service details if the date had passed. After obtaining the information on Remaining Useful Life (RUL), he selects the service and makes sure it has a higher RUL. The maintenance team does an assessment, provides the necessary support, and ensures that the process is not interrupted. The logs and report are sent to the support group.

Fig.4 Service Team Home Page

TECHNICIAN

This module provides instructions on how to retrieve information such as email address, phone number, passwords, address, and age. Considering the age. If the technician is unable to match the data that is currently available, he can create a new account and decide what information needs to be sent to management. After analyzing the machine's issue, obtain the manager's RUL and submit it to the mnagement.

Fig.5 Submitting the details about machine in Technician Page

UNIT MANAGER

During the registration process, this module gives the manager's name, email address, phone number, password, addresses, and age. This allows the manager to log in and view the operator page. Look for any requests from the CNC operator after logging in, and suggest that the support team perform an inspection. After receiving the data, the manager sends it along with the machine's expected service life to the technical team. After obtaining the data from the technical department, advise the operator on whether to proceed or wait. Obtains the details regarding the faulty goods and forwards the report to the technical staff. After he receives the CNC machines, he gives the RUL to the service staff. Next, a statistical analysis is requested from the technical team.
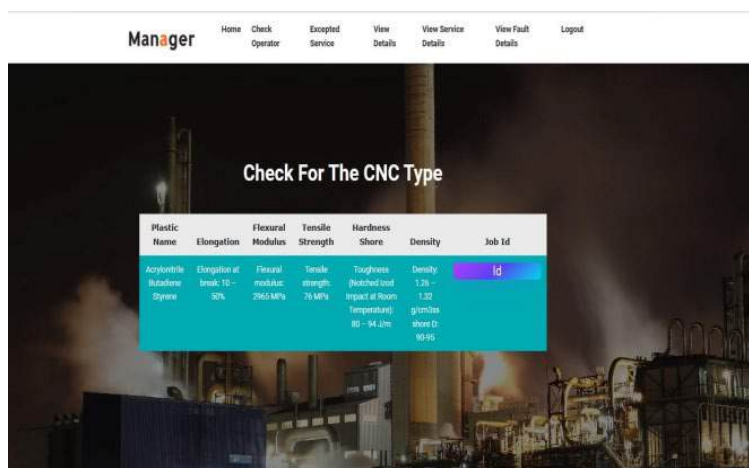
Fig.6 CNC details in Manager Page

SUMMARY

A CNC machine is a tool used for shaping or molding relatively big amounts of plastic, as well as for working on enormous frames and structural elements. a comprehensive breakdown of a machine, including every part and its operation. Does CNC machine learning necessitate interim servicing, or not? For the CNC controller to identify and locate machine problems, temporary service is essential. In addition to variable selection, batch normalisation is used by the regression analysis approach called Lasso (also spelt Lasso or LASSO) to improve prediction. precision and interoperability of the statistical model that was developed. Decision analysis is a formalized method for selecting the optimum course of action in the face of uncertainty. It permits the user to enter.

FUTURE AREA

We think that the industry will continue to take advantage of the numerous growth opportunities that the future of a machine offers as automation and technology advance. Right now, we are predicting a machine's rule of law. We hope that one day, machines will be able to advance continually without help from people. We therefore think that as time goes on, this technology will advance and get more trustworthy. To produce a new product with improved performance, the best materials and high machine productivity are required. The machine's increasing sensor count causes erroneous data, making it difficult to determine the precise remaining useful life in the current scenario, even though we can foresee the broad level of RUL.

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CHAPTER 47
COGNIDRIVE INTELLIGENT DROWSINESS DETECTION SYSTEM UNSING DEEP LEARNING

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Abstract

Drowsiness and fatigue of automobile drivers reduce the drivers' abilities of car manage, herbal reflex, recognition and notion. Such diminished vigilance stage of drivers is found at night time driving or overdriving, causing twist of fate and pose extreme danger to mankind and society. Therefore, it is very tons essential in this recent fashion in vehicle industry to include driving force help system which could hit upon drowsiness and fatigue of the drivers. This undertaking offers a nonintrusive prototype computer vision gadget for monitoring a driving force's vigilance in real time. Eye tracking is one of the key technologies for destiny motive force help systems for the reason that human eyes contain lots statistics approximately the driver's condition which includes gaze, attention stage, and fatigue degree. One problem commonplace too many eyes monitoring strategies proposed to this point is their sensitivity to lighting fixtures situation exchange. This has a tendency to seriously restrict their scope for car packages. Real-time detection and monitoring of the attention is an energetic region of research in laptop imaginative and prescient community. Localization and monitoring of the attention can be beneficial in face alignment. This challenge describes actual time eye detection and tracking approach that works underneath variable and sensible lighting fixtures situations.

INTRODUCTION

Road accidents are frequently caused by sleepiness at some point throughout the driving process. In many nations, road accidents are quickly becoming a major issue, since they have risen to become one of the primary causes of mortality and accidents. The majority of people believe that drunk driving is a major cause of accidents, but many are unaware of the

dangers of drowsy riding. It also impairs vigilance, attention, and awareness, making it difficult to engage in several cognition-based totally sports (including riding). It also reduces concentration, impairs judgment, and increases the risk of crashing. Apart from drunken riding and rush driving accidents, road injuries caused by driver weariness are more severe and result in death. Drowsy driving accidents are more dangerous since the driver loses focus, resulting in severe injuries or death. People who travel in automobiles are not the only ones who suffer. Pedestrians may be affected as well. It's difficult to know with precision what caused a fatal incident involving drowsy driving. Several signs at the crash scene, according to investigators, show the character fell asleep at the wheel. Drowsy driving-related injuries, for example, frequently occur in vehicles in which the driver is alone, and the accidents appear to be critical or deadly, particularly at night, when drivers drive under stress on roads and, as a result, lose control of their vehicles and become accident victims. The classification of motive force behaviour is regarded as a complicated problem since it is a multi-dimensional problem that is subjected to multiple driving force and visitor kingdom peculiarities. The traffic country is calculated using a number of characteristics such as road conditions, vehicle kinematics, and driver behavior. All of these variables can be determined using a set of hard and fast riding rules created through time for specific drivers and settings. As a result, motivational force should be acquired in terms of eye monitoring and methods. To analyse and comprehend driving style, a variety of aspects must be considered, including environmental factors, street conditions and vehicle, incident kind and identification, and biological and physiological status. Fig 1 shows the existing system for driver drowsiness detection system

LITERATURE SURVEY

Vu, toan h., an dang et.al…develop a deep neural network (DNN) for detecting driver drowsiness in videos. The proposed DNN model that receives driver's faces extracted from video frames as inputs consists of three components - a convolutional neural network (CNN), a convolutional control gate-based recurrent neural network (ConvCGRNN), and a voting layer. The CNN is to learn facial representations from global faces which are then fed to the ConvCGRNN to learn their temporal dependencies. The voting layer works like an ensemble of many sub classifiers to predict drowsiness state. In particular, previous works

require face alignment to locate and learn relevant features from specific facial regions. However, performing face detection and alignment on every frame has many challenges such as different illumination conditions, hard human poses, and occlusions. Additionally, it increases overall processing time. In our work, we work directly with global faces. Face detection and face tracking are combined together to extract driver's faces from video frames, which is simple, accurate, and very fast. The proposed model firstly extracts facial representations from global faces by its CNN part, then its ConvCGRNN part is to learn their temporal relations while remaining spatial properties before feeding to a voting layer. Specifically, the model sequentially makes predictions by processing frame by frame instead of making window-based predictions. Thus, it is very fast, consuming much less computational cost, and capable to work in real-time. [1]

Niloy, Amit Raha, et.al,. The main objective of this research paper is to review different driver drowsiness detection techniques in detail so that people can easily decide which detection techniques are better and also to help in making decision on drowsiness accurately as this review is based on the recent techniques. Driver drowsiness is the momentous factor in a huge number of vehicle accidents. This driver drowsiness detection system has been valued highly and applied in various fields recently such as driver visual attention monitoring and driver activity tracking. Drowsiness can be detected through the driver face monitoring system. Nowadays smartphone-based application has developed rapidly and thus also used for driver safety monitoring system. In this paper, a detailed review of driver drowsiness detection techniques implemented in the smartphone has been reviewed. The review has also been focused on insight into recent and state-of-the-art techniques. The advantages and limitations of each have been summarized. A comparative study of recently implemented smartphone-based approaches and mostly used desktop-based approaches has also been discussed in this review paper. And the most important thing is this paper helps others to decide better techniques for the effective drowsiness detection. [2]

Ngxande, mkhuseli, Jules Raymond tapamo, et.al,. The convolutional neural network (CNN) has rapidly gained popularity in many social aspects and has been applied across a range of areas, including self-driving cars, collision detection, identification of criminal activities, and to aid the granting of bank loans. Historically, these tasks were generally performed by humans, but the advancement of machine learning is leading to the

automation of these processes. This work evaluates the performance obtained when training convolutional neural network models on commonly used driver drowsiness detection datasets and testing on datasets specifically chosen for broader representation. Results show that models trained using publicly available datasets suffer extensively from over-fitting, and can exhibit racial bias, as shown by testing on a more representative dataset. We propose a novel visualisation technique that can assist in identifying groups of people where there might be the potential of discrimination, using Principal Component Analysis (PCA) to produce a grid of faces sorted by similarity, and combining these with a model accuracy overlay. Drowsiness detection systems that are currently implemented are typically available only in high-end vehicles, which disadvantages citizens using public transport. As a result, a number of researchers have aimed to develop similar systems on mobile phones, which are more easily accessible. [3]

EXISTING METHODOLOGIES

Real-time abnormal driving behaviors monitoring is a corner stone to improving driving safety. Existing works on driving behaviors monitoring using smart phones only provide a coarse-grained result, i.e. distinguishing abnormal driving behaviors from normal ones. Detection using sensors: To eliminate the need of pre-deployed infrastructures and additional hardware's, recent studies concentrate on using smartphones to detect abnormal driving behaviours. In particular, uses accelerometers, magnetometers and GPS sensors to determine whether high-risk motorcycle maneuvers or accidents occur and uses of accelerometers, gyroscopes and magnetometers to estimate a driver's driving style as Safe or Unsafe and usage of accelerometers to detect drunk driving and sudden driving maneuver, respectively. Therefore, none of existing works can realize fine-grained identification.

PROPOSED METHODOLOGIES

Driving at night has become a tricky situation with a lot of accidents and concerns for the transport authorities and common man especially because of the increasing heavy vehicle movement. The drivers are forced to drive with minimal rest which takes a toll on their driving capability after a few days of continuous driving leading to reduction in their

reflexes and thus causing accidents. In most of the cases of accidents, fatigue is found to be the reason for nodding off. The term fatigue refers to a combination of symptoms such as impaired performance and a subjective feeling of drowsiness. Even with the intensive research that has been performed, the term fatigue still does not have a universally accepted definition. From the viewpoint of individual organ functionality, there are different kinds of fatigue, such as the following cases:

- local physical fatigue (e.g., in a skeletal or ocular muscle);
- general physical fatigue (following heavy manual labor);
- central nervous fatigue (sleepiness);
- mental fatigue (not having the energy to do anything).

In this proposed system, we can implement the system for detecting the faces using Linear discriminate analysis and also track the eyes states with improved accuracy. In case of abnormal behavior that is drivers eyes found to be closed as a corrective action alarm signal will be raised. The system enters into analysis stage after locating the driver's head and eyes properly in image captured through camera.

SYSTEM ARCHITECTURE
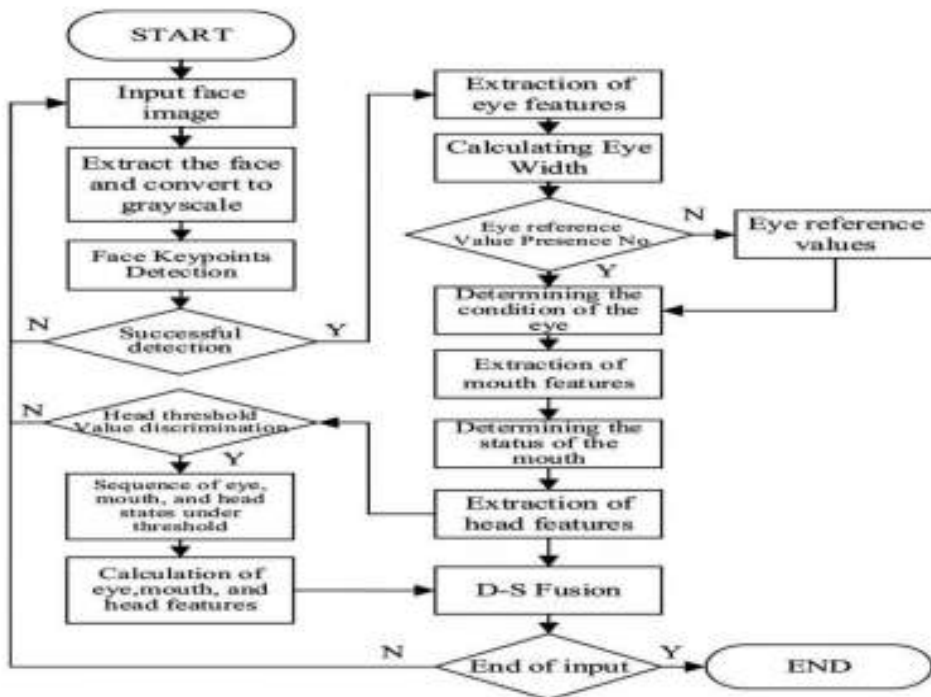
EXPERIMENTAL RESULTS

In this study we can develop the framework in Python as Front end and MYSQL as back end. Then using the real time face datasets to detect the eye-opening states. The performance can be evaluated in terms of False Rejection Rate. In the context of driver drowsiness detection systems, the false rejection rate (FRR) refers to the rate at which the system incorrectly identifies a non-drowsy driver as being drowsy. It's a critical metric because it directly impacts the effectiveness and reliability of the system in ensuring driver safety. A low FRR means that the system accurately detects drowsiness when it is present without unnecessarily alarming or inconveniencing the driver. High FRR values can lead to instances where drowsy drivers are not appropriately identified, potentially resulting in accidents or other safety hazards. Therefore, minimizing the FRR is essential for the overall performance and usability of driver drowsiness detection systems.

CONCLUSION

Drowsiness and fatigue of automobile drivers reduce the drivers' abilities of vehicle control, natural reflex, recognition and perception. Such diminished vigilance level of drivers is observed at night driving or overdriving, causing accident and pose severe threat to mankind and society. The proposed system can be used for driver's safety and its consequences. The system detects drowsiness of driver through eye conditions. It based on face detection using well known HAAR Cascade algorithm, eyes are detected through proposed crop Eye algorithm which segments the face in different segments in order to get left and right eye. Conditions of open and close eye are determined by intensity values,

distance between eye brow and eye lash is calculated. If calculated distance is greater than threshold value, eyes are closed otherwise open. An alarm is triggered if eyes are found to be closed for consecutive frames. The proposed method was tested in video sequence recorded in vehicle as well as in lab environment. The proposed system works in real time with minimal computational complexity. Therefore, it is also suitable for implementing in surveillance environment. The system produces 90% accurate results for different faces.

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CHAPTER 48

SECURING EXAM INTEGRITY: DETECTING AND PREVENTING FRAUD ACTIVITIES IN EXAMINATION CENTERS USING PYTHON

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Abstract

Exam malpractice is defined as any international wrong doing that is contrary to the examination's standards and intended to provide a candidate an unfair advantage. Exam malpractice, commonly referred to as cheating, is the unethical behavior that students engage in during tests in an effort to improve their grades by taking shortcuts. Exam malpractice is any act or irregular way of testing applicants that violates the laws and customs governing how exams are conducted. In order to pull off the magic they are accustomed to in every exam, many students have neglected their books, which has caused a great deal of harm to the students. Examinee fraud has received a lot of attention in the real time educational system and is considered as a significant problem by not just the test bodies but also school administrators, the entire educational system, the government and society at large. In order to establish a better system for conducting exams, which can aid in lowering malpractice occurring in testing facilities, it is critical to identify impersonators in examination halls. Exam malpractice caused by the use of impersonators could be prevented using a biometric approach. With the use of facial features that have been retrieved and exploited by algorithms or other methods, candidates can be identified using face recognition technology, which is widely employed in many applications. This issue needs to be resolved effectively, yet with fewer resources. The development of deep learning algorithm has made it simple to resolve this issue. In this research, a framework for facial recognition and student behavior analysis that uses the Grossmann algorithm and convolution neural network algorithm is being developed.

INTRODUCTION

Online Exams have got a surprising momentum especially during the pandemic. Almost every college is switching their traditional exam format to Online Examinations. They are able to conduct mcq exams with help of available platforms but the platforms lack strong candidate verification. Moreover, those platforms have increased the malpractices of candidates during exams. Hence, we introduce this study. The main objective is to develop an online exam system which is secure and through online exams we can save time expending between paper and result. The main idea behind developing this project is to provide fast way of conducting exam through internet in a secure environment. The project will have various features to conduct exams in secure manner like proctoring and face recognition for user authentication. The results will be stored in a excel sheet so it will be useful for teachers to keep records of student grades. It can reduce the hectic job of manually assessing the answers as responses from the candidate can be checked automatically and instantly and the user can give the exam anytime and anywhere. The major problem that occurs in examination system is malpractices. This is identified due to the absence of credible identity verification system for offline and also for online examinations. In order to overcome the above problem researchers have focused on the use of artificial techniques and use of biometrics. In the past history work has been carried out on examination malpractices. ANN classifiers are used for similarity measure between trained and test features. Monitoring can be done using authentication techniques. An iris recognition method based on the natural open eyes. In order to realize exactly matching, it must eliminate these factors through the image pre-processing. Iris image pre-processing includes iris location, eyelid fitting, eyelash detection and normalization. Image quality assessment for liveness detection technique is used to detect the fake biometrics. A biometric system should have the uniqueness, stability, collectability, performance, acceptability and forge resistance. Image quality measurements for out real and fake user. Multi model biometric is also done in which more than one biometric grouped together & compare with the existing databases. The system uses the face recognition approach for the automatic attendance of students in the classroom environment.

PURPOSE

The purpose of developing a system to detect and prevent fraud activities in examination centers using Python is multifaceted. At its core, the aim is to safeguard the integrity and fairness of academic assessments. By leveraging Python's versatile libraries and frameworks, this system seeks to ensure that all candidates are evaluated based on their own merits, without unfair advantages gained through cheating or impersonation. Upholding the credibility and reputation of educational institutions is paramount, as it ensures that academic qualifications accurately reflect genuine knowledge and skills. Moreover, by demonstrating a commitment to combatting fraud, institutions can foster trust among stakeholders, including students, educators, employers, and accrediting bodies, in the reliability and validity of their assessments. Automated fraud detection mechanisms enable efficient analysis of large volumes of data, including video footage, audio recordings, and exam papers, enhancing accuracy and consistency compared to manual monitoring methods. Compliance with regulatory requirements and standards for exam security is essential to maintain accreditation and uphold legal obligations. Furthermore, by continuously analyzing patterns of fraud and adapting detection techniques, institutions can stay ahead of evolving threats and ensure that examinations remain a valid measure of individuals' capabilities. Ultimately, the purpose of this system is to uphold the fundamental principles of fairness, integrity, and trust in academic assessments, ensuring that qualifications earned through examinations hold true value and meaning.

PROBLEM STATEMENT

The problem statement for developing a system to detect and prevent fraud activities in examination centers using Python revolves around addressing the challenges associated with maintaining the integrity of academic assessments. In many educational institutions, instances of cheating, impersonation, and other fraudulent activities during examinations undermine the fairness and credibility of the assessment process. These activities not only compromise the validity of academic qualifications but also erode trust among stakeholders, including students, educators, and accrediting bodies. Manual monitoring methods are often inadequate for detecting sophisticated forms of fraud, and existing solutions may lack scalability, accuracy, and efficiency. Therefore, there is a pressing need for an automated

system that can effectively analyze various types of data, such as video footage, audio recordings, and exam papers, using advanced algorithms implemented in Python. This system should be capable of detecting suspicious behaviors, anomalies, and irregularities indicative of fraud, thereby ensuring that examinations are conducted with integrity and fairness.

LITRATURE SURVEY

Xu Yang, et.al,…[1] offer a remedy to the remote examination platform on Zoom, face recognition and verification is needed for the whole session. Therefore, we try to build a novel supervising system called iExam to identify the suspicious behavior when faces disappear. If someone's face is not capable of being recognized in a default timeslot setting, then the system will note down the corresponding period. Through this study, we address the difficulty of online examination supervision and management on Zoom and truly achieve the goal of automatically monitoring the process by analyzing the recording video. At the same time, iExam will separately generate the text and chart feedback for integrating detection results.

Hui guo, et.al,…[2] propose an end-to-end method for detecting GAN-generated faces by visually comparing the two eyes. A residual attention network model is incorporated to better focus on the inconsistencies of the eyes e.g. corneal specular highlights and other artifacts. Our fake face detection method is interpretable, and the proposed cues can be leveraged by human beings as well to perform examinations. And introduce the WMW-AUC loss that approximates the direct optimization of the AUC. This can also effectively address the data imbalance learning problem in contrast to other sampling or data augmentation approaches.

Riseulryu, et.al,…[3] provide a review of context-aware continuous implicit authentication systems applied in online learning environments, covering aspects such as authenticators, the authentication process, contextual information, and evaluation approaches. To the best of our knowledge, this is the most up-to-date review of context aware continuous implicit authentication in online learning environments. This paper has provided are view of works in authentication in online learning platforms by categorizing systems based on their targeted scope so that the reader can readily perform comparisons.

The scope has been divided into online exams, online learning platforms and virtual laboratories with detailed analysis of the design of context-aware continuous implicit authentication systems provided.

Abdul Cader Mohamed Nafrees, et.al,…[4] provided to reduce OE fraudulent activities but those mechanisms are having some drawbacks such as data privacy& security, higher cost, a limited number of students only can join at the same time, no user-friendliness, not suitable for all types of courses, and a few more. Some of the research concluded that facial expressions can be used to identify examination malpractices but there is no unique UML technique provided to accurately

.Recognize students' facial expressions. Therefore, this study confirmed that CNN provided a quick and higher accuracy rate for facial recognition compared to other ML techniques while the CK+ dataset is most used by the researcher for facial recognition compared to other free facial dataset to train the models developed by CNN or ML.

Mohamed Abdul Hassan, et.al,…[5] investigated the feasibility of using a digital camera to capture eye movements during digitally adapted clinical eye exams (NeuroEye). We presented the performance of a novel method NeuroGaze along with other state-of-the-art digital camera-based eye tracking methods and compared them internally and to a COTS eye tracker. NeuroGaze demonstrated the ability to estimate eye conjugacy consistently better than other state-of-the-art methods, under fair comparison conditions. NeuroGaze did so by having the most similar conjugacy estimates to the "Tobii" reference and less variability. Specific to NeuroGaze, our method tested accurately foremost participants of the H-Test and Dot-Test, and a few participants of the OKN-test.

Biying Fu, et.al,…[6] develop the research questions concerning the face image utility correlation with general image quality and face specific quality metrics, we thoroughly investigated a total of 25 quality metrics. Therefore, they demonstrate no clear indications to be useful as a generalized metric to assess face image utility. DL-based FIQA methods, as a face image utility predictor, are optimized for face images and show superior performance over IQA methods across different setups. Nevertheless, IQA methods show a clear correlation to face image utility, even though they do not outperform DL-based FIQA methods. Visualization of the IQA methods output revealed a focus on areas in the background, rather than solely on the face as in the learned FIQA methods. Accompanied

with the advantage of FR model- independent training of such IQA methods, combining IQA metric with DL-based FIQA metric could lead to a more generalized measure across different FR systems and application scenarios.

Significant features and 21 proposed tools for online exams. Moreover, 16 important techniques / algorithms and 11 datasets are presented. Furthermore, the participation of 25 countries in online exam research is investigated. Finally, on the basis of SLR results, four key factors for the global adoption of online exams are identified i.e. Network Infrastructure, Hardware Requirements, Implementation Complexity and Training Requirements. Subsequently, the comparative analysis of global adoption factors with significant online exams features is performed. This provides a solid platform for the global adoption of online exams where different countries and institutes can initiate online exams systems on the basis of their existing E-learning infrastructure and overall economic situations.

M.Geetha, et.al,…[9] developed a machine learning based face detection and recognition system using SVM model is proposed to detect the faces of students for monitoring their activities during online examinations. The proposed system aids in detecting the faces in a faster manner by obtaining feature vectors from the input images. Several algorithms such as LBPH, Fisher faces, SIFT and SURF can also be applied along with this method to build more efficient recognition models that can detect faces in varying illuminations and light intensities. Still better optimal values can also be obtained by applying different algorithms. Higher accuracy can be obtained using convolutional neural networks.

M. A. Haytom, et.al,[10] addresses the general problem of the protection of the privacy of a user during are mote examination. It seeks to define the different forms it can take fraud, as well as the expected properties of a secure biometric anti-cheat system that respects the privacy of learners. To conclude, the integration of biometrics into distance learning systems will help teachers to effectively control student authentication, course tracking, provide certificates in an automated manner, analyses student behavior during exams, the validation of the certificates of success as well as the detection of fraud with a high level of accuracy. The proposed solution is effective against identity theft and fraud attempts. Indeed, this system is able to detect fraud automatically, it respects the privacy and confidentiality of the data exchanged and solves an important part of a major problem

EXISTINGSYSTEM

A face-based examination system is a type of online examination system that uses facial recognition technology to verify the identity of the test-taker and ensure that they are the same person who registered for the exam. The system uses a camera to capture the test-takers face and compare it with the stored image of their face in the database. If the images match, the test- taker is allowed to proceed with the exam. Otherwise, the test-taker is denied access to the exam. In recent time students are currently adopting various examination malpractice methods. The most ramparts among the approach is impersonation which cannot be easily detect especially in a very large class and conspiracy of some invigilator or teachers. This project is focused on design of biometric control examination attendance register deter impersonation during examination. There is various approaches to biometric usage which include the fingerprint, face recognition, DNA, hand geometry, iris recognition, retina etc. This project work adopted face recognition biometric technology that recognized different faces. Database of the captured image was built through the use of HAAR cascade algorithm model and deep learning algorithms to initiate and refining the database model respectively. Face recognition was done via skin segmentation, candidates face search, and verification, while face recognition was carried out by face image processing and classification. The entire process was coded using python and the resulted system was tested with return shows significant accuracy of recognition test for candidate/students used in the training and testing phase.

DISADVANTAGES

- The current system is very time consuming.
- It is very difficult to analyze the exam manually.
- To take exam of more candidates more invigilators are required but no need of invigilator in case of on-line exam.

PROPOSEDSYSTEM

The advent of technology has steadily digitized all services and offerings, taking them to the online platform, and education has been no exception. With the ubiquitous high-speed

internet and laptops, the pervasiveness of technology has enabled a seamless transition to the online ecosystem. Universities, schools and various educational institutions have progressed and adapted to Learning Management Systems (LMSs), where software application tracks, reports, administers and documents materials shared with the students. The objective of online exams is to ensure that assessment givers can undertake the paradigm shift from offline to online processes. The online industry is growing rapidly, and factors such as convenience, scalability, increased reach and customization are shaping its adoption. Established evaluation techniques are now nearing saturation and would soon become obsolete. Online examination, also known as e-examination, enables examiners to conduct exams using the internet or a company-wide intranet for remote candidates. Most online exams include answer processing modules, allowing evaluators to issue results moments after the candidates complete the test. This fully-automated system evaluates the examinees thoroughly and presents the results in considerably lesser time. As well as facial recognition technology more and more used and developed for various applications including security systems, attendance systems or other things. As well as attendance system that is are curing transaction because it is associated with controlling the presence of a person in activity. In the field of education, examination system is very important because the presence of students is part of a good assessment for teaching and learning. This project we can implement Grassmann algorithm to detect the face based on facial feature points and classify the faces using Convolutional neural network algorithm with improved accuracy rate. And also provide motion details, head movement and gesture details at the time exam and alert about misbehaving students.

ADVANTAGES

- Time saving
- Increased efficiency
- Allows neat handling of data rather than error prone records.
- Accurate
- Real time implementation

SYSTEM ARCHITECTURE
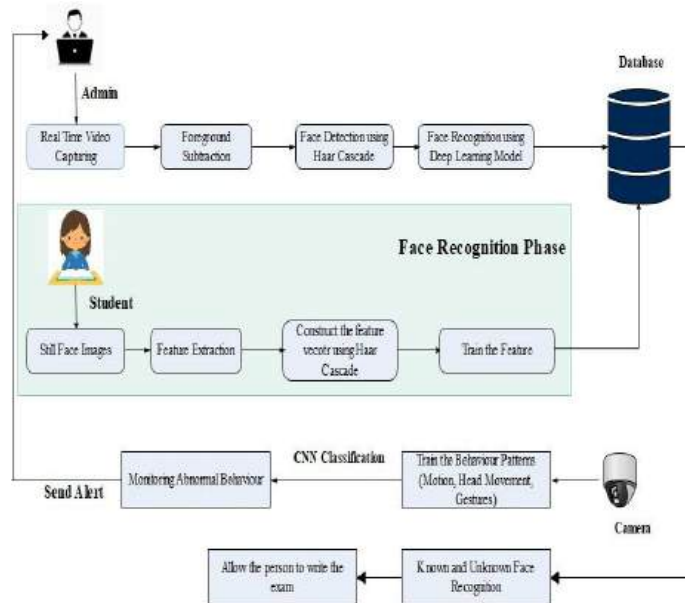
Fig 1 System Architecture

CONCLUSION AND FUTURE ENHANCEMENT

Impersonation of the candidate is a fundamental problem in examination system often referred as malpractice. Hall ticket and identity cards are normally used in the examination system for fraud detection. Existing examination system mainly deals with document image analysis techniques and biometric system in identification, recognition and classification of the candidate. Generally, fraud is detected by using document image analysis where as the proposed model is focus on the image/video for analysis. In project we can implement face recognition techniques. Face recognition of Biometric techniques is part of facial image applications with increasing research area and integration. This system will be beneficial as it will provide enhanced candidate authentication and verification and reduce the problem of Student impersonation. The staff will be able to proctor the student and keep a track of his/her activities throughout the exam. This system is totally online leading lower no usage of paper. This system can be more reliable and efficient platform for conducting online examinations. And also extend the system to analyse the activities of student from video surveillance system. The activities include human behaviours that are classified as motion,

gestures and head movements. If the activities considered as abnormal means, provide alarm with improved accuracy rate.

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CHAPTER 49
Air-Writing Recognition in Tamil Characters Using Inception V3

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Abstract

The rapid advancement of artificial intelligence has spurred the development of intelligent applications, with communication being a key challenge. To bridge this gap, this project introduces a novel air-writing recognition approach leveraging inceptionv3 algorithm This paper presents a novel approach to air-writing recognition tailored specifically for the Tamil language. In the rapidly advancing field of artificial intelligence, effective communication remains a key challenge. To address this gap, we introduce a methodology leveraging inceptionv3 algorithm and a robust hand tracking algorithm. Central to our approach is the elimination of restrictive user constraints such as delimiters or imaginary boxes, achieved through the development of a sophisticated hand tracking algorithm capable of capturing air-writing trajectories using a single web camera. Additionally, we propose an innovative pre-processing scheme to transform these trajectories into optimized data forms, simplifying inceptionv3 algorithm training and enhancing recognition accuracy. Our methodology overcomes traditional limitations such as the push-to-write issue and user-imposed constraints, promising a more seamless and effective means of interaction in AI-driven applications. By harnessing inceptionv3 and sophisticated hand tracking, our approach represents a significant advancement in air-writing recognition for the Tamil language, with broad potential applications in human-machine interaction and communication.

INTRODUCTION

The dawn of gesture-based interfaces marks a significant leap forward in human-computer interaction, providing users with intuitive and hands-free alternatives to traditional input modalities. Among these, air-writing recognition stands out as a pioneering application, enabling individuals to convey information effortlessly through gestures in the

air. This cutting-edge system harnesses the synergy of image processing techniques and Convolutional Neural Networks (CNNs) to decipher and interpret hand movements, thereby revolutionizing the way we communicate with technology. By leveraging a camera to capture dynamic hand motions and employing sophisticated image processing algorithms to extract per tenant features, the system endeavours to translate these movements into recognizable characters, opening up a realm of possibilities for seamless interaction. Central to this innovative approach is the integration of CNNs, which serves to elevate recognition accuracy by discerning the intricate patterns inherent in air-written symbols. Through iterative learning, these neural networks become adept at discerning and categorizing diverse gestures, thereby enhancing the system's ability to interpret user inputs accurately. Beyond facilitating natural and spontaneous communication, this novel methodology holds immense promise for a myriad of applications that demand hands-free input methods, ranging from augmented reality interfaces to assistive technologies for individuals with disabilities. In essence, the fusion of image processing and CNNs heralds a new era in human-computer interaction, where communication transcends physical barriers and empowers users with unprecedented levels of control and convenience.

LITERATURE SURVEY

Sanda Sri Harsha; B P N Madhu Kumar [1] Identifying text in an image or video is a process called text recognition. Both documents and other real-time visuals, including arbitrary photos, use this method. For this, numerous hardware elements and algorithms were created. This study tries to determine which of the two algorithms has the best feature extraction method. A dataset of arbitrary real-time photos with text is collected for this use using an ICDAR dataset. Every image in the collection is pre-processed using one of two techniques. They are image scaling and picture enhancement. The pre-processed photos are then asked for text localization. The extraction techniques are the HOG or the Histogram of Oriented Gradients method and the LBP or the Local Binary Pattern recognition technique.

Yen-Min Su; Hsing-Wei Peng [2] Image recognition and optical character recognition technologies have become an integral part of our everyday life due in part to the ever-increasing power of computing and the ubiquity of scanning devices. This study demonstrates how image- processing technologies can be used in combination with optical

character recognition to improve recognition accuracy and to improve the efficiency of extracting text from images. Two software systems are developed and tested during this study: a character recognition system applied to cosmetic-related advertising images and a text detection and recognition system for natural scenes. The results of the experiment demonstrate that the proposed systems can accurately recognize text in images.

Bidya Debnath; Adrita Anika [3] This paper proposes a system for converting handwritten words and numbers into a text file. Our system uses A CNN based method to identify letter and digits. This Automatic system requires image preprocessing, classifying into letters and digits and saving the letter into a text file. The system consists of a touchscreen as a user interface, an Arduino board (microcontroller AT mega 2560) and MATLAB. Any type of handwriting is tested with the classifying process; we got 89% accuracy using our own dataset. Both letter and digits can be recognized and converted into text file using this process. The proposed system will lessen the labour of creating electronic documents and provide easy preservation of data.

Rohan Vaidya; Darshan Trivedi [4] In this paper we present an innovative method for offline handwritten character detection using deep neural networks. In today world it has become easier to train deep neural networks because of availability of huge amount of data and various Algorithmic innovations which are taking place. Now-a-days the amount of computational power needed to train a neural network has increased due to the availability of GPU's and other cloud-based services like Google Cloud platform and Amazon Web Services which provide resources to train a Neural network on the cloud.

METHODS
HAND TRACKING

The ability of the air-writing recognition system to precisely record and comprehend the user's hand movements is largely dependent on the hand tracking procedure. Using computer vision techniques, the first step in the hand tracking process is to identify regions of interest that correlate to the user's hand by evaluating the visual input from the camera. To separate the hand from the background, either skin-tone zones must be identified or hand identification techniques must be used. Following the identification of the hand region, the tracking procedure carries out the estimation of the hand's trajectory over time by

establishing correspondence between successive frames. The movement of certain characteristics or important spots on the hand can be tracked using a variety of motion tracking methods, including feature-based tracking and optical flow. Pixel intensity is analyzed by these algorithms.
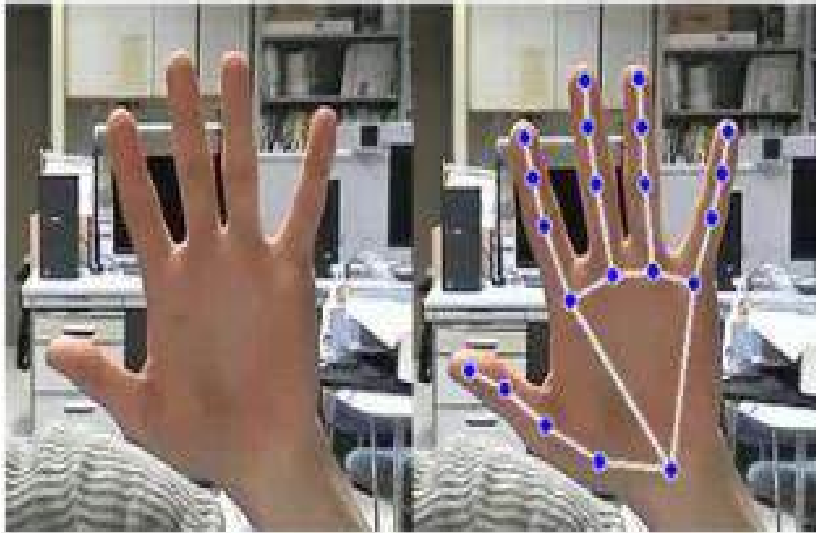
CAMERA INTERFACE

The camera hardware and the air-writing recognition system are connected via the Camera Interface module. It controls the camera's communication and settings, including exposure, frame rate, and resolution. This module makes sure that the user's hand movements are captured on high-quality video input by the camera, giving the gestures a precise and understandable representation for the processing stages that follow. This module provides real-time hand trajectory data collecting by directly interacting with the camera, which paves the way for reliable recognition and interpretation.

TRAJECTORY ACQUISITION

The camera detects hand movements, which are captured and processed by the Trajectory Acquisition module. It creates a trajectory that depicts the user's hand's trajectory over time by extracting the hand's spatial coordinates from a series of video frames. This module creates a continuous stream of trajectory data by identifying the hand within the camera frame and tracking its movement using computer vision algorithms. This information serves

as the foundation for additional analysis and processing, and it is crucial for motion tracking, pre-processing, and training phases.

MOTION TRACKING

By utilizing algorithms like optical flow or Kalman filtering to track the spatial coordinates of the hand across consecutive frames, motion blur, noise, and occlusions are compensated for. The Motion Tracking module processes the trajectory data acquired from the camera to accurately estimate the position and movement of the user's hand. This module guarantees that the air-writing recognition system can interpret user gestures with precision and reliability by tracking the hand's spatial coordinates.

PREPROCESSING

The trajectory data obtained from the camera is made more useful and of higher quality by the Pre-processing module. The trajectory data is cleaned and refined using a variety of approaches, including noise reduction, outlier removal, and smoothing, which eliminate distortions and inconsistencies caused by camera noise, lighting fluctuations, or unsteady hand motions. Additionally, in order to guarantee consistency and compatibility with phases of downstream processing, this module may scale or normalize the trajectory data. The trajectory data is pre-processed by this module to improve the accuracy and efficiency of the air-writing recognition system before it is fed into the training Convolutional Neural Network (CNN) and real-time processing stages.

TRAINING CONVOLUTIONAL NEURAL NETWORK (CNN)

The Training Convolutional Neural Network (CNN) module is responsible for training a deep learning model to recognize Tamil letters and interpret air-written symbols from the pre- processed trajectory data. It utilizes labelled datasets of air-writing gestures to train the CNN, teaching it to discern the intricate patterns and variations associated with different symbols. Through iterative learning and optimization, this module adjusts the parameters of the CNN to minimize recognition errors and maximize accuracy. By training the CNN on diverse and representative datasets, this module ensures that the air-writing recognition

system can accurately interpret a wide range of gestures, enabling effective communication and interaction.

DATA STORAGE

The Data Storage module handles the storage and management of trajectory data, training datasets, and model parameters used by the air-writing recognition system. It provides mechanisms for storing trajectory samples, labeled training data, and intermediate results in a structured and efficient manner.

REAL-TIME PROCESSING

The Real-Time Processing module performs on-the-fly analysis and interpretation of the trajectory data to provide immediate feedback to the user. It utilizes the trained CNN model to classify and recognize air-written symbols in real-time, converting them into actionable commands or input. This module enables seamless interaction and communication with the air- writing recognition system, allowing users to convey information and execute commands through intuitive hand gestures. By processing trajectory data in real-time, this module enhances the responsiveness and usability of the air-writing recognition system, providing a natural and efficient means of interaction.

RESULTS AND DISCUSSION

The future of air-writing recognition systems seems promising as research and development in this area continue to advance, opening up new possibilities for intuitive and hands-free communication in the digital era. Moreover, the triumph of air-writing identification systems highlights the revolutionary potential of multidisciplinary cooperation among computer vision, machine learning, and human-computer interaction. Therefore, further funding for research and development in this field looks to open up even more opportunities for improving our interactions with technology, which will eventually improve our quality of life and push the boundaries of human-computer interaction.

CONCLUSIONS

In conclusion, a viable strategy for improving air-writing recognition systems is the combination of image processing methods and the Inceptionv3 algorithm. The system's ability to capture and analyze dynamic hand gestures with previously unheard-of accuracy and efficiency is a result of the seamless integration of these technologies. This breakthrough has the potential to significantly improve human-computer interaction as well as transform a broad range of applications, such as assistive technology for people with impairments and augmented reality interfaces.

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CHAPTER 50

AI-Driven Detection of Deepfake Manipulated Faces in Videos

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Abstract

Media manipulation has significantly increased as a result of recent technical development and the simplicity with which false information can be produced. The commonness of video forgeries has increased in particular as a result of regular breaches in information security, underscoring the critical need for efficient techniques to track and identify such phony content. A unique method for identifying Deepfake videos has been presented in order to address this problem. Pre-trained DenseNet CNN algorithm is used to predict the Deepfake images. This technique makes use of the dense block-based DenseNet convolutional neural network (CNN) algorithm. Each and every layer in DenseNet receives inputs from all the layer before it, which increased feature extraction and network performance as a whole. A standard dataset is used to training and testing the DenseNet CNN to predict the Deepfake videos. Extracting an information from the video frames, the DenseNet model learns which one is real or fake videos. Once training process is over, further testing process is carried on. The goal of this mix of conventional analytic techniques and sophisticated feature extraction is to efficiently detect instances of video counterfeiting.

Keywords

Face Detection and Recognition, DenseNet Algorithm, Deepfake Detection.

INTRODUCTION

The fast development of cross-platform, computationally inexpensive video editing software has made video material more widely available online. This ease of access, along with high-performance, user-friendly editing tools and advanced AI algorithms, has led to a surge in bogus videos. These edited videos are used for different goals, including

distributing misleading information, circumventing facial recognition systems, and for fun. As information security breaches become more prevalent, video counterfeiting is also on the rise, underscoring the urgent need for comprehensive monitoring and detection tools.

The proliferation of false videos fuels social turmoil and creates security risks. As a result, applications for video forgery detection have gained importance in domains such as digital investigations, forensic analysis, media science, and video authenticity verification. Video forensic technology distinguishes authentic videos from counterfeit ones by extracting and analyzing particular properties of video frames.

Advancements in deep learning, driven by improved processing capacity, have created new obstacles in addition to their benefits. One notable advance is the development of "DeepFakes" with deep generative adversarial networks (GANs). These networks can alter videos and small clips to create extremely realistic fake material.

To detect DeepFakes efficiently, it is important to understand how GANs work. GANs take a video and a photograph of a certain human (the 'target') as input and produce a new video in which the target's face is replaced with that of another individual (the'source'). Deep adversarial neural networks, trained on face photos and target movies, are at the heart of DeepFakes. They translate facial expressions and attributes from the source to the target. With advanced post-processing, these generated videos can achieve a high degree of realism.

GANs function by dividing the input image into separate frames, altering each one, and then reconstructing the video. This procedure frequently employs autoencoders to aid in the transformation. In response to these issues, we present a novel deep learning-based strategy for effectively distinguishing DeepFake movies from legitimate ones.

LITERATURE REVIEW

Wu, Rongliang, Tao Chen, and colleagues [1] developled the Cascade Expression Focal GAN (Cascade EF-GAN), a cutting-edge network for gradual facial expression modulation. This unique deep learning approach incorporates local expression focuses, assisting in the preservation of significant identifying traits and small details around the mouth, face, and nose. The Cascade EF-GAN reduces artifacts and blurring efficiently, leading to more realistic facial images.

Li, Yuezun, Xin Yang, and Siwei Lyu [2] devleoped Celeb-DF3, a standard dataset aimed to improve DeepFake detection systems which will minimizes the social issues and build the trusted society. Celeb-DF3 comprises 5,639 DeepFake videos and more than 2 million frames collected from publicly available YouTube footage of 59 celebrities of diverse genders, ages, and races. This enormous data set is intended to facilitate the development and assessment of more effective DeepFake detection techniques. Using this Deepfake detection techniques we can reduce the more problems like economically, emotionally, etc

Shen, Yujun, Jinjin Gu, Xiaoou Tang, and Bolei Zhou [3] introduced InterFaceGAN, a framework for interpreting the semantics included in the latent space of well-trained face synthesis models. InterFaceGAN enables semantic face modification by finding and exploiting several semantic vectors in the latent space. This framework provides both theoretical and experimental results to increase face synthesis skills using GAN inversion approaches and encoder-involved models.

Nirkin, Yuval, Yosi Keller, and Tal Hassner [4] presented an iterative deep learning-based technique to face recreation. Their strategy accounts for large differences in posture and expression in both individual photos and video sequences. It provides continuous interpolation of facial images using Delaunay Triangulation and barycentric coordinates, as well as smoothing bounding boxes and face landmarks to improve accuracy.

Nguyen, Thanh Thi, Cuong M. Nguyen, and colleagues [5] handled DeepFake detection like a binary classification problem. They acknowledged the difficulty of having a large and diversified dataset of actual and false videos for training. They used the VidTIMIT database to construct low and high-quality DeepFakes and test various detection algorithms. Their findings explores that popular facial recognition algorithms such as VGG and Facenet struggled to detect DeepFake accurately.

Huang, Yihao, Geguang Pu, and his team [6] demonstrated Fake Locator, a method for high-resolution localization of altered facial photographs. This method use a grayscale fakeness map to retain additional information about fake locations. GAN-generated textures are unique from actual textures, making them useful for detecting false facial photos.

Wang, Zhi, Yiwen Guo, and Wangmeng Zuo [7] to improve model resilience and generalization, they have used adversarial training in Deep Fake detection. They proposed a novel way for creating adversarial instances using image blurring, which proved effective

in adversarial training environments. based on individual images or sequences inside a film, prediction have been made. Rana, Md Shohel, Andrew H. Sung, and their colleagues [8] carried out a systematic literature review (SLR) on DeepFake detection, integrating studies from 2018 to 2020. They analyzed 112 relevant articles and divided strategies into four categories: deep learning-based techniques, traditional machine learning methods, statistical techniques, and blockchain-based approaches. Their evaluation emphasizes DeepFake technology's dual-use nature, citing both legitimate and criminal applications.

Wubet, Worku Muluye, and their team [9] analyzed DeepFake detection problems, focusing on eye blink patterns. To train detection methods, they used the eye aspect ratio to categorize eye blink rates using the UADFV dataset of actual and false videos . Based on eye blinking patterns and eye aspect ration, they detect the DeepFakes

Tripathy, Soumya, Juho Kannala, EsaRahtu, and colleagues [10] presented FACEGAN, a Facial Attribute Controllable Reenactment GAN. FACEGAN transfers facial motion using an Action Unit (AU) representation that is independent of facial structure, hence preventing identity leaking. To maximize output quality, the model processes face and backdrop regions individually, modifying source face landmarks with driving facial features to achieve realistic facial motion while retaining the source.

PURPOSE

The main aim of the project stated above is to address the growing problem of video forgeries, particularly deepfake films, and to develop a viable approach for detecting such fabrications. The project focuses on several critical areas:

1. **Security Enhancement:** The project's goal is to find and detect deepfake films in order to enhance security in a variety of sectors, including media, law enforcement, and digital communications. It seeks to mitigate the potential harm caused by misleading content by preventing the spread of erroneous information.

2. **Maintaining Media Integrity:** Ensuring the authenticity of video content is critical to preserving media integrity. The project's attempts to detect and delete deepfake films help to maintain trust in digital media platforms and prevent the spread of disinformation.

3. **Forensic Analysis:** This deepfake detection systmes is important in legal contexts, investigations, and any scenario where the credibility of video footage is more crucial.

4. **Technological Advancement:** Deepfake detection methods help boost technological progress in artificial intelligence, machine learning, deep learning, and multimedia analysis. This involves enhancing advanced neural network architectures such as DenseNet to meet real-world problems relating to people.

5. **Social Impact:** The primary aim of this project is to create a more resilient society by classifying true and fraudulent information. By doing so, we can lessen the instances of misinformation that has been impacting our people in many forms such as emotionally, financially, physically, etc.

OBJECTIVES

The goal of this research is to develop a reliable system for recognizing deepfake videos among the large amount of digital content available. With the growing threat of video counterfeiting, particularly with the emergence of deepfake technology, the project intends to address this issue with advanced neural networks such as DenseNet.

The paper main goal is to train the algorithm to identify little symptoms of deception by accumulating an enormous dataset of both authentic and altered films. The objective of intensive testing and refining is to provide high accuracy and reliability in recognizing deepfakes throughout a variety of contexts.

In addition, the initiative aims to create multimedia analysis technologies while addressing serious issues such as misinformation and media trust. By establishing a strong deepfake detection system, the project hopes to increase security, build trust in digital media, and equip consumers with dependable tools to comfortably traverse the increasingly complex world of online information. By establishing a strong deepfake detection system, the project hopes to increase security, build trust in digital media, and equip consumers with dependable tools to effectively traverse the increasingly complex world of online information.

EXISTING SYSTEM

The existing system incorporates a method known as the Meta-Deepfake Detection (MDD) algorithm, which uses meta-learning to improve face representation learning in both synthetic and real-world domains. The MDD technique employs a meta-optimization objective to efficiently transfer information from source domains to target domains, improving model generalization. It encompasses gradients from the meta-training and meta-testing phases utilizing meta-optimization, allowing the model to accommodate previously unknown areas without necessitating updates for each new domain.

To accomplish domain generalization, the source domains are divided during training into meta-train and meta-test domains. This method simulates the domain shift problem that occurs in real-world circumstances, guiding the model to gain universal features that perform well across multiple domains with variable distributions.

Meta-batches are generated by randomly partitioning the source domains into N batches to aid in training and testing. These batches contain both actual and artificial face pairs, with no overlapping patterns between domains. This arrangement improves the model's capacity to distinguish between actual and fake images by increasing inter-class separability, resulting in higher feature learning and model performance.

Because supervised learning methods are often unable to generalize to novel manipulation techniques, partitioning the source domain into meta-train and meta-test sets enables the model to generalize more effectively. Furthermore, random shuffling and sample selection within these meta-sets help to reduce overfitting. The meta-splitting method thereby improves the model's ability to manage the various and previously unexpected data encountered in everyday applications.

DISADVANTAGES

- The rapid advancement of face forgery generation algorithms has resulted in more similar samples with only slight differences.
- Identifying actual and phony elements in photographs is becoming increasingly difficult.
- Calculating the mean embedding for each class in each iteration is wasteful and may not be feasible when considering the whole training set.

PROPOSED SYSTEM

To solve the challenges of distinguishing AI-generated false movies (DF films) from genuine ones, a novel deep learning-based solution is provided. This technology is critical for detecting and mitigating the proliferation of deepfakes online. While Convolutional Neural Networks (CNNs) have become a standard and effective technique for classifying multidimensional data, their effectiveness can be limited by the high cost of processing and potential accuracy difficulties posed by the vast number of calculations required for training and testing.

The suggested strategy utilizes effective DenseNet Convolutional Neural Network architecture to distinguish between real and deepfake images or videos. The process begins with the construction of a comprehensive dataset containing both actual and modified samples. This dataset is properly preprocessed and enhanced to increase the model's robustness.

The model uses transfer learning to gain advantage from pre-trained DenseNet parameters that have been fine-tuned for best deepfake detection performance. The training process includes thorough validation to ensure accuracy and adaptability. Hyperparameter tuning and intensive testing against hostile attacks improve the system's resilience.

Post-processing procedures are used to refine the results. Once trained, the model will be used in real-time or batch processing, giving an accurate instrument for countering deepfake content.
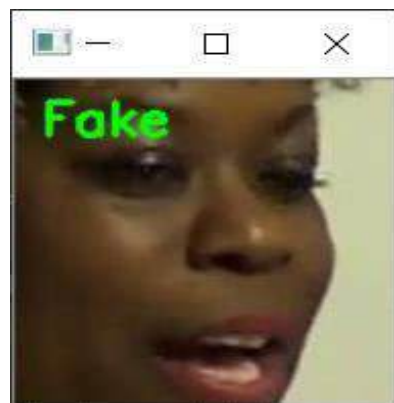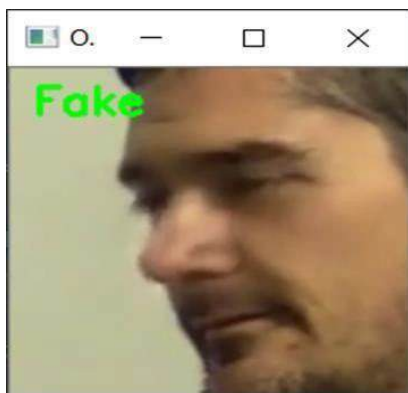
ADVANTAGES

The proposed technique efficiently differentiates between fake and authentic videos.

- DenseNet-based CNN feature classification succeeds at detecting forgeries.

- DenseNet allows for faster learning of discriminative features and shorter inference times.

SYSTEMARCHITECTURE
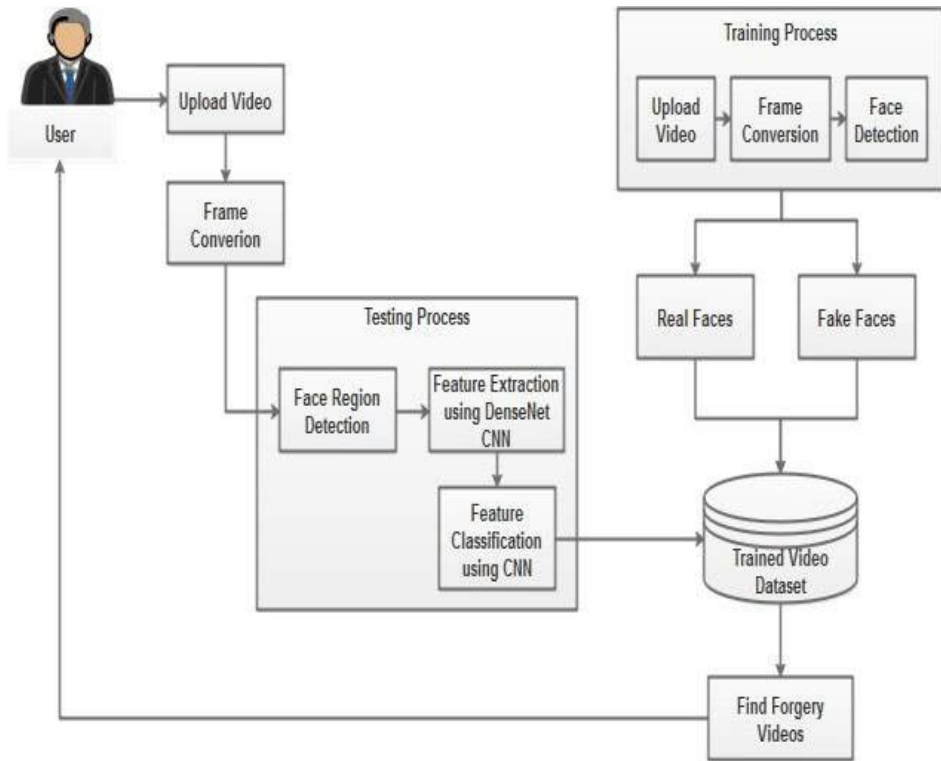
RESULT ANALYSIS
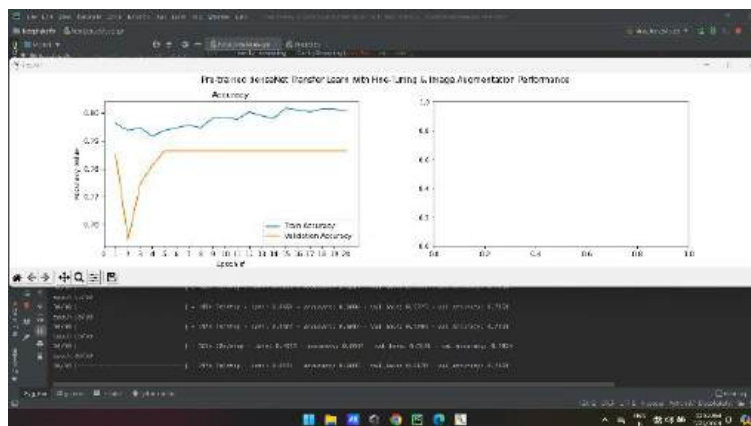
It is crucial to use an extensive dataset that includes both actual and deepfake-manipulated videos. The data collection should include a variety of lighting situations, angles, facial expressions, and backgrounds.

Evaluate the model's ability to detect deepfake-manipulated faces through evaluating its accuracy in detecting between authentic and manipulated videos. It is critical to focus on minimizing both false positives and false negatives. The model had an accuracy of 80%.

FUTUREENHANCEMENT

Deep Fakes are constantly changing, with new and increasingly convincing fakes emerging on a regular basis. It is critical to create more CNN models capable of acknowledging a greater range of deepfakes, particularly those created using unique methodologies. Real-time detection of deepfakes is critical for preventing misinformation from spreading throughout social media platforms. Future research should focus on developing CNN models that can detect deepfakes in real time while using limited computational resources.

CONCLUSION

Using a Deep Fake video dataset, we developed a Deep Fake detection model to identify video forgeries. The model employs DenseNet, a sophisticated convolutional neural network (CNN) architecture noted for its ability to capture complicated spatial characteristics and patterns via densely connected blocks. This architecture enables seamless information flow between layers, which improves feature extraction. The detection network has fully linked layers that process sequence descriptors to determine whether each frame sequence is legitimate or deepfake. When trained on big datasets, our suggested model outperformed previous deep learning algorithms. The fully connected detection network uses sequence descriptors as input to accurately determine the chance of a frame sequence belonging to the authentic or deepfake class. The model reached an 80% accuracy rate, offering a strong defense against AI-generated bogus videos. This approach significantly improves the detection of video forgeries and helps to reduce the dissemination of misleading content.

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CHAPTER 51

RECORDED FOR STORAGE IDENTIFICATION AND SECURE INFORMATION PASSING VIA CLOUD COMPUTING

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Abstract

Cloud storage has become increasingly popular due to its scalability and accessibility, but managing the growing volume of data efficiently remains a challenge. One key solution is data deduplication, a technique aimed at reducing storage costs and improving data management. This method is essential for ensuring secure cloud storage and data sharing. In our approach, we introduce a chunk-based partitioning system for deduplication in cloud environments. Data is split into fixed-size chunks, and a deduplication mechanism identifies and eliminates redundant pieces. This process boosts storage efficiency and reduces data redundancy, saving storage space and improving data retrieval by minimizing the amount of data transferred over the network. Additionally, our system enhances cloud storage security by using Base64 encoding and AES (Advanced Encryption Standard) re-encryption techniques for data sharing. Base64 encoding transforms binary data into text, reducing the risk of accidental changes during transmission and storage. AES encryption re-encrypts shared data with unique keys, ensuring that only authorized users can access and decrypt the information. This approach strengthens data confidentiality, prevents unauthorized access, and enhances the overall security of cloud-based data sharing.

INTRODUCTION

Cloud computing technology involves the use of computing resources delivered as services over a network. In this model, users grant access to their data for storage and business operations, making it essential for cloud service providers to ensure trust and security, as they handle large volumes of valuable and sensitive data. Issues related to flexible, scalable, and fine-grained access control in cloud computing are common concerns.

With the continuous growth of cloud computing, major providers like Amazon, Google, Microsoft, and Yahoo offer solutions such as software-as-a-service (SaaS), platform-as-a-service (PaaS), storage-as-a-service, and infrastructure-as-a-service (IaaS).Cloud computing is highly efficient for reducing costs through optimization and improving both operational and economic effectiveness. It enhances collaboration, speed, and scalability, supporting a global computing model on internet infrastructure. Additionally, cloud computing provides scalable, fault-tolerant services, and manages resources more efficiently by freeing users from the responsibility of managing storage. Users can request additional storage from their cloud provider when needed and release it when no longer required, or move data to lower-cost, long-term storage. This flexibility allows users to efficiently manage dynamic resources without worrying about storage and associated costs. In this evolving landscape of cloud data management, optimizing storage utilization, detecting duplicates, and ensuring secure data sharing are critical. This project proposes a chunk-based similarity checking approach to enhance duplicate detection and improve sharing efficiency in cloud storage. By breaking data into smaller chunks and performing similarity checks, the system identifies and removes redundant data, optimizing storage space and creating a more cost-effective storage environment. Additionally, a re-encryption mechanism is introduced to strengthen data security during sharing. Data owners can re-encrypt chunks with new encryption keys before sharing; ensuring that only authorized users with the correct decryption keys can access the shared information. This process not only improves security but also promotes controlled and secure data-sharing practices, aligning with modern standards of privacy and confidentiality in cloud computing.

PROBLEM STATEMENT

Cloud data storage presents significant challenges related to security, redundancy, and efficient access control. Traditional storage methods often lead to data duplication, driving up costs and creating potential security vulnerabilities. Additionally, ensuring secure and controlled access to sensitive information in the cloud remains a pressing concern. The absence of a comprehensive solution addressing duplicate detection, data encoding, and secure access threatens the confidentiality and integrity of stored data. To address these challenges, this project introduces a holistic approach to cloud data management. It

implements an advanced duplicate detection mechanism using chunk-based similarity checking, which efficiently identifies and removes redundant data. Data integrity and storage efficiency are further improved through Base64 encoding, which optimizes space utilization before data is stored in the cloud. Secure access requests are handled through encryption with the AES algorithm, ensuring that sensitive information remains protected both in storage and during transmission. New decryption keys are issued to authorized users, allowing secure access, while local decryption using shared keys ensures that only permitted individuals can verify and retrieve the stored data. This multifaceted solution tackles key issues in cloud storage, providing a robust framework that enhances storage efficiency, strengthens data security, and ensures controlled, secure access to sensitive information.

LITERATURE SURVEY

Wu, Yunyun, Jingyu Hou, Jing Liu, Wanlei Zhou, and Shaowen Yao, et al. [1] Propose a novel scheme that supports the search with the user-specified number of keywords contained in the search result. This number n can be used to customize the keyword relevancy. As a result, the data owner could obtain the desired search results containing any n keywords from a keyword set. The proposed scheme also supports the traditional disjunctive and conjunctive keyword searches when n equals 1, or the size of the keyword set, respectively. The keyword could be positive or negative. The proposed scheme borrows the idea of attribute-based encryption by representing the attributes as the keywords and the access policy as the search expression to enhance the search. In order to apply the idea in the proposed scheme, we first solve the problem of the keyword security (responding to the attribute security) and then improve the method to obtain the search results that contain any n keywords of a keyword set, rather than the boolean search results that the current schemes could support. In addition, the proposed scheme allows the keywords to be positive or negative, which enhances the search flexibility. A positive keyword means it is contained in the document, while a negative keyword means it is not contained in the document. At last, we define a security model based on PERKS that can defend not only against the adaptively chosen keyword attack but also against the offline keyword guessing attack. Most of the existing PEKS schemes are under the offline keyword guessing attack. Since the

adversary can generate the encrypted index for the keywords, it may determine the relationship between keywords and the search token received. Under the proposed security model, the adversary can only learn the structure of the expression tree rather than the information about keywords. Yuan, Haoran, and Robert H. Deng, et al. [2] Propose a secure data deduplication scheme with efficient re-encryption based on the convergent all-or-nothing transform (CAONT) and randomly sampled bits from the Bloom filter. Due to the intrinsic property of the one-way hash function, our scheme can resist the stub-reserved attack and guarantee the privacy of data owners' sensitive data. Moreover, instead of re-encrypting the entire package, data owners are only required to re-encrypt a small part of it through the CAONT, thereby effectively reducing the computation overhead of the system. The proposed scheme is designed for enterprises or user groups in which multiple users want to outsource the data to a remote cloud service provider. The cloud service provider can conduct deduplication on ciphertexts and save abundant storage overhead. The system of our scheme contains three entities: cloud user, key server, and cloud service provider (CSP). The CAONT mechanism has the property that one must decrypt the entire cryptotext before one can determine even one message block. If a data owner transforms a message into the t and C2 packages by using CAONT, the data owner is not required to re-encrypt the entire package but only a small part of the package C2, which saves excessive computation overhead. However, to protect the privacy of data owners' sensitive data, not only do we need to prevent the revoked cloud user from accessing the original message, but we also need to prevent the CSP from accessing the original message. In order to solve the above problems, we propose a Bloom filter-based location selection method and a secure data deduplication scheme with efficient re-encryption. Han, Lidong, and Chengliang Tian, et al.

[3] construct a fast and secure public key authenticated searchable encryption scheme with a designed server. Our scheme can resist keyword guessing attacks, chosen multi-keyword attacks, and multi-trapdoor attacks. The search function in our scheme achieves the logarithmic search time in terms of the terms of the number of keywords, while most existing schemes required the linear time. It should be noted we do not discuss the technique of how to encrypt the files since it is not within the scope of our research. The data owner extracts a set of keywords from the data. He encrypts the files and keywords and then builds a secure index for different keywords. Next, the index and the ciphertexts of data are

uploaded by the data owner to the cloud server. When a user searches some data containing the queried keyword in the cloud, he constructs a keyword trapdoor and then sends it to the server. After receiving the search query, the cloud server utilizes the trapdoor to do a search operation over the index and sends the search result to the user. Efficiency and security are two important aspects of evaluating the public key searchable encryption schemes. Sometimes they are one pair of irreconcilable contradictions. In order to make testing very fast, our scheme is based on the trust of a server and allows a server to distinguish the keyword cipher texts and trapdoors. Despite its weakness, the server cannot break the ciphertexts and trapdoors. It is hard to distinguish the keyword cipher texts and trapdoors for any external adversary. 8 Cui, Yuanbo, Fei Gao, and Kaitai Liang et al.

EXISTING SYSTEM

In the current system, Public Key Encryption with Keyword Search (PEKS) is utilized to detect duplicate files by matching keywords with trapdoors, while Proxy Re-encryption (PRE) is used for data recovery. The scheme consists of two main processes: data deduplication and data recovery. For data deduplication, the data owner uploads the encrypted file (ciphertext), a file tag, and a re-encryption key to the cloud server. The file tag points to the ciphertext, and the re-encryption key is stored in a corresponding ciphertext chain table. If a test indicates that the file is already on the server, the user doesn't need to re-upload the ciphertext but only submits the re-encryption key for the specified file to the chain. This process effectively reduces storage overhead for the cloud server. If the file is not found on the server, the data owner must upload the ciphertext, file tag, and re-encryption key. For data recovery, users only need to store their personal user key locally, rather than storing file-specific keys. The user key is generated locally, eliminating the need for a key generation center (KGC) and mitigating risks from key substitution and malicious KGC attacks. When a user requests a file, the cloud server uses the user's re-encryption key from the ciphertext chain table to re-encrypt the file, producing a transformed ciphertext. The transformed ciphertext is then sent to the user, who can decrypt it using their private key.

DISADVANTAGES:

- The computational overhead of the scheme is increased due to the generation of test tags.

- As the number of elements in the data holder's tag set grows, the communication cost increases proportionally.

- The computational complexity of signature verification becomes significantly higher as the number of tags increases.

PROPOSED SYSTEM

Cloud services would rather major in their core business than managing the humongous amount of data that keeps piling up each day. Such a work was studied with respect to various aspects of deduplication of data. There were certain differences in the need for the cloud services with regards to data management, data deduplication, and encryption. The project implemented a scenario where the cloud service can duplicate the uploaded data. The project incorporates several advanced techniques to improve the efficiency of data storage, security, and controlled data sharing. Data first gets encoded into Base64 format before it gets stored in the server. Base64 encoding allows for easy interoperability and readability across different platforms, such that the stored data does not lose its integrity when it undergoes the processes of storage and retrieval. To maximize storage efficiency, the project applies a deduplication method in a chunk-based approach. This takes into account data segmentation with the intention of elimination of duplicated chunks before storing on the server. This is required in the reduction of redundant data chunks and hence conserves storage space with improved efficiency and reduced footprints. In secure sharing, this includes AES-based re-encryption mechanism along with sharing of keys. Upon a request for access to encrypted data, the data owner creates a fresh encryption key based on AES. A new key is then used to encrypt the data, creating another layer of security. At the same time, the owner of the data securely provides the decryption key to the requester. Only authorized persons with the right keys can decrypt and access the information shared through the process. The process ensures safe sharing of data while controlling the distribution of sensitive information to the users and protecting their private information.

ADVANTAGES:

- Deduplication of storage chunks optimizes space storage. Redundant data chunks get erased from storage devices.

- Base64 encoding preserves data readability so that it is easily interpretable from the information stored.

- AES-based re-encryption is used to add another layer of security that makes sure data protection when shared.

- Storage needs actually do reduce as the more sustainable and environmentally friendly Method of using data storage is adopted.

SYSTEM ARCHITECTURE

This high-level structure of abstraction of the software system forms the system architecture by using decomposition and composition, along with architectural style and quality attributes. A software architecture design must align with the system's core functionality and performance requirements, as well as meet non-functional requirements such as reliability, scalability, portability, and availability. It is to describe a group of components of its software architecture, their connections, interactions among them, and the deployment configuration of all the components
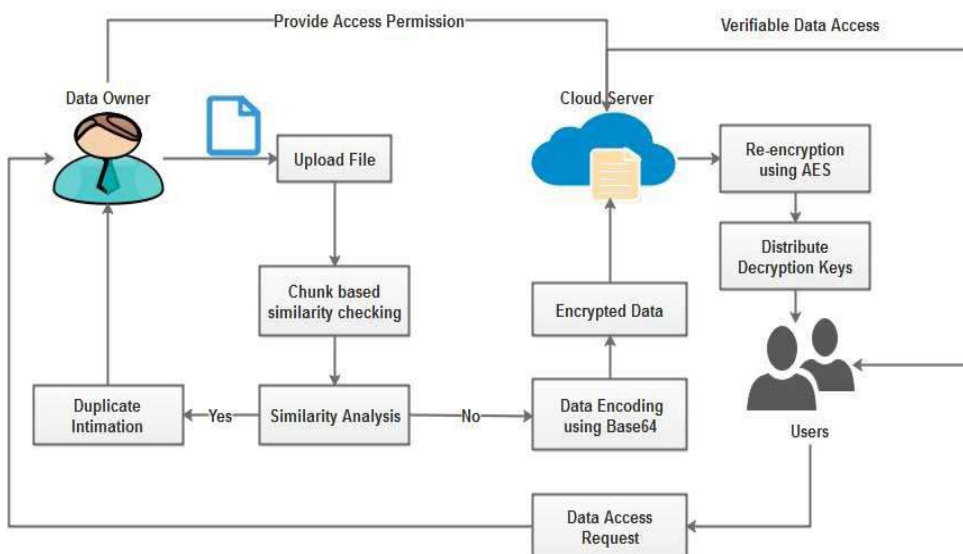
Fig 1 System Architecture

CONCLUSION

The proposed project gives cloud data storage that makes use of Base64 encoding and AES encryption so that safe and effective management of data is ensured. Data sharing technique uses re-encryption with the similarity checking method adopting chunk-based duplication detection. Making use of AES encryption guarantees that privacy and safety of data kept in cloud storage are efficiently guarded against unauthorized access. AES encryption provides strong security features, a strong defence against the possible breaking in of data and violation of privacy, without which modern data storage would be incomplete. Such a system can identify and delete the redundant pieces of data, thereby reducing the cost involved in storage and enhancing the performance of this cloud-based storage system. Re-encryption is one major development that makes data sharing safe without tampering with data integrity.

FUTURE ENHANCEMENT

Future work will explore the role of Blockchain technology in making transaction records and access records tamper-proof and non-modifiable. Further research in more advanced encryption mechanisms and key management systems can further improve the security profile of the solution. The future iterations may also make an effort to include the machine learning algorithms that will dynamically adapt to the changing patterns of data and improve the accuracy of detection of duplicates.

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CHAPTER 52

SMART GLASSES FOR VISUALLY IMPAIRED PEOPLE WITH FACIAL RECOGNITION USING IOT AND MACHINE LEARNING

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Abstract

This project presents the design and development of smart glasses aimed at enhancing the daily lives of visually impaired individuals through advanced technologies. The proposed smart glasses integrate facial recognition capabilities with features tailored to improve navigation, communication, and accessibility. The system includes a high-resolution camera for facial feature capture, coupled with real-time facial recognition software. Additionally, the device incorporates text-to-speech and speech-to-text functionalities for seamless communication. Navigation assistance is provided through GPS and obstacle detection sensors, ensuring users can navigate their surroundings independently. Connectivity features such as Bluetooth and Wi-Fi enable seamless communication with smart phones and other devices, allowing for expanded functionality through mobile apps. The smart glasses also support voice commands, gesture controls, and haptic feedback, ensuring hands-free operation and user-friendly interaction. Personalization is a key focus, with customizable settings and user profiles catering to individual preferences. The device prioritizes comfort and accessibility with a lightweight, adjustable design compatible with existing eyewear or prescription lenses. The inclusion of long-lasting batteries and quick charging capabilities ensures sustained use throughout the day. Moreover, the smart glasses integrate with virtual assistants, providing additional support and information. Robust security measures safeguard facial recognition data, and users have control over data sharing and storage

INTRODUCTION

Visual impairment presents significant challenges to individuals' daily lives, affecting their ability to navigate, recognize faces, and access essential information. In response to these difficulties, emerging technologies are offering promising solutions to enhance the independence and quality of life for visually impaired individuals. This project introduces an innovative development: smart glasses specifically designed for the visually impaired, featuring advanced facial recognition capabilities. By incorporating facial recognition technology, these smart glasses aim to meet the unique needs of visually impaired users by providing real-time identification of people, thereby improving social interactions. Beyond facial recognition, the glasses are equipped with various features such as navigation assistance, communication tools, and accessibility options, making them a comprehensive assistive device.

This introduction will discuss the motivation behind the project, the current state of assistive technologies for the visually impaired, and the primary objectives of developing smart glasses with facial recognition. We will also outline the key components and features that make this technology a transformative solution for addressing the challenges faced by visually impaired individuals in their everyday lives. By harnessing cutting-edge technology, this project aims to empower visually impaired individuals, promoting greater autonomy and fostering a more inclusive and accessible world. The integration of facial recognition into smart glasses marks a significant advancement, offering a holistic solution that redefines how visually impaired people interact with their environment and engage with others.

LITERATURE SURVEY

Fatima Zahrae Ait Hamou Aadi and colleagues (2020) introduced a real-time vision system designed to assist visually impaired individuals using object detection and object-camera distance estimation. The system primarily utilizes the "You Only Look Once" (YOLO) approach for object detection, identifying obstacles in frame t, and tracking their bounding boxes across subsequent frames. Additionally, they applied DisNet, a deep learning-based method, for accurate distance estimation.

W.A.D.P.M. Gunethilake (2021) proposed a prototype system utilizing deep neural networks (DNN) for real-time obstacle detection and distance estimation, leveraging the high accuracy and performance of DNNs. The DNN was trained for obstacle detection using data gathered from a simulation environment. The system estimates the distance of obstacles based on the output of the obstacle detection model. The combined feedback from obstacle detection and distance estimation is then conveyed to the user through audio cues. This prototype was implemented on a smartphone, where the real-time video stream from the smartphone camera is processed to detect obstacles. The SSD MobileNet architecture was employed to train the DNN for obstacle detection, while a DNN-based MonoDepth algorithm was used for distance estimation.

Y. Kajiwara and Haruhiko Kimura (2019) proposed a method for assisting visually impaired individuals by tracking their position and surroundings. In this system, the position (x, z) of the visually impaired person within the world coordinate system (XwYwZw) is measured using a smart navigation system integrated with a high-frequency (HF) band RFID tag. An RFID reader, attached to the person's ankle, reads this data. The smart navigation system is installed along the path intended for the visually impaired. Additionally, the user wears a smartphone around their neck, which is equipped with a monocular camera, along with an accelerometer, gyroscope, and geomagnetic sensor to determine the phone's orientation. The monocular camera image, along with the position data of the user and the phone's posture, is uploaded to a cloud server via 5G. The server analyzes the image and calculates the coordinates (x(n)si, y(n)si, z(n)si) of pedestrians in the camera coordinate system (XsYsZs). Using these coordinates, along with the posture of the smartphone and the position of the user, the server also determines the gaits of nearby pedestrians by analyzing their skeletal structure.

Shrooq Alsenan and J. Ganesan (2020) proposed a deep learning-based system to assist visually impaired individuals by providing a voice-based representation of images embedded in printed text. The system is divided into three phases: collecting input images, extracting features to train the deep learning model, and evaluating its performance. The approach utilizes deep learning algorithms, specifically Convolutional Neural Networks (CNN) and Long Short-Term Memory (LSTM) networks. The CNN is used to detect and extract features from the printed images and their associated captions, while the LSTM

network generates descriptive captions for the detected text. Finally, the extracted captions and detected text are converted into voice messages using a Text-To-Speech API, enabling the user to understand the content through audio.

Raju Shrestha (2023) proposed Deep NAVI, a Smartphone-based navigation assistant that leverages deep learning to assist visually impaired users. The system not only identifies the type of obstacles but also provides information about their position, distance, motion status, and surrounding scene. This information is communicated to the user through audio, ensuring both portability and convenience. Designed with a compact model size and fast inference time, Deep NAVI can be deployed on portable devices like smart phones and function seamlessly in real-time environments. A pilot test with a user was conducted to evaluate the system's practicality and effectiveness, with results indicating its potential to be a valuable and functional navigation assistant for the visually impaired

METHODS

Hardware image front view

Hardware image side view
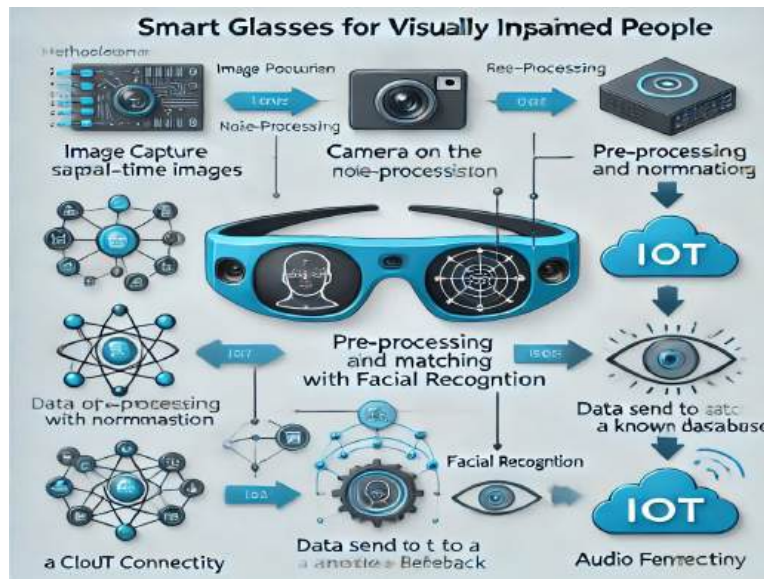
Data Collection Module:

The module collects continuous data from biometric sensors embedded in the wearable devices, including face detection, activity levels. Secure storage of these recordings is essential, and privacy measures should be in place to protect sensitive information. All data collected is time stamped to provide a chronological record of events, facilitating trend analysis and contextual understanding. Implements robust encryption protocols to secure user data, ensuring privacy and compliance with ethical standards.

Pre-Processing Module:

Models tend to perform better when input features are normalized or standardized. Consistent image size is typically required for model inputs. Noise reduction allows the model to focus on relevant patterns, while feature enhancement improves its ability to detect those patterns. Augmenting the dataset with variations also aids in improving the model's generalization capabilities.

Feature Extraction Module:

Feature Extraction uses an object-based approach to classify imagery, where an object (also called segment) is a group of pixels with similar spectral, spatial, and/or texture attributes. Traditional classification methods are pixel-based, meaning that spectral information in each pixel is used to classify imagery.

Object Detection Module:

Object detection models are usually trained to detect the presence of specific objects. The constructed models can be used in images, videos, or real-time operations. Even before the deep learning methodologies and modern-day image processing technologies, object detection had a high scope of interest. YOLOv4 was a real-time object detection model published in April 2020 that achieved state-of-the-art performance on the COCO dataset. It works by breaking the object detection task into two pieces, regression to identify object positioning via bounding boxes and classification to determine the object's class. YOLOv4 was a real-time object detection model published in April 2020 that achieved state-of-the-art performance on the COCO dataset. It works by breaking the object detection task into two pieces, regression to identify object positioning via bounding boxes and classification to determine the object's class.
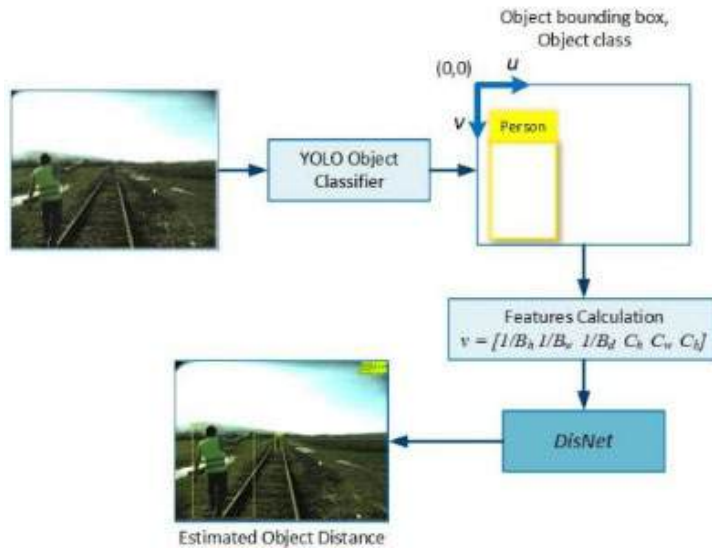
Dis Net-based system used for object distance estimation from a monocular camera

AUDIO FEEDBACK MODULE

The final output of the obstacle detection system by combining the results of both the obstacle detection model and the distance estimation module will be provided to the user. For this pre recorded audio will be used. When an obstacle is detected, the user will be

notified about the obstacle type and the directional recommendations. Voice algorithm is carried out by PYTTSX3.

PYTTSX3

Pyttsx3 is a text-to-speech conversion library in Python. Unlike alternative libraries, it works offline and is compatible with both Python 2 and 3. An application invokes the pyttsx3.init() factory function to get a reference to a pyttsx3. Engine instance. it is a very easy to use tool which converts the entered text into speech. The pyttsx3 module supports two voices first is female and the second is male which is provided by "sapi5" for windows. It supports three TTS engines:

This module using the following languages:

- English (male, female)
- Chinese(female)
- Japanese(female)

The text-to-speech features for this module are based on languages installed in your operating system. By default, it should come together with the language pack during the installation of the operating system. You need to install the language pack manually if you intend to use other languages. For Windows user, head over to the Language setting.

CONCLUSION

The integration of various solutions in a single assistive system is a huge challenge. This paper presents a contribution on this regard by setting out a system architecture based on deep learning techniques that allows blind people or people with low vision to detect and avoid obstacles. This system is mainly divided into three steps:

The first step is detecting the surrounding objects using YOLO which gives a high accuracy and speed performing the real time applications Second step is applying KFC to track the detected objects. Third step reserved to the object distance estimation using DisNet model, this latter was trained on 2000 object bounding boxes and their real distance to the camera measured by a laser The distance estimation results were mainly used to identify the obstacles risk on the user. The evaluation of this system was been evaluated on a real scene

video record, as a future work the authors will test the feasibility of this system on thereal field. Furthermore the object mention tracking step still needed an enhancement, in this regard, novel features will be used to improve the accuracy of object tracking and distance calculation for risk estimation and better understanding of the environment.

RESULTS

Numerous samples were created and evaluated, and one of them, as illustrated in Utilizing the Raspberry Pi 4 camera module, implemented an intelligent glass specifically designed for individuals with visual impairments. This innovative project introduces an affordable and accessible solution using a low-cost single-board computer, the Raspberry Pi 4, and its camera. The smart glasses showcased in this paper feature face recognition and distance measurement capabilities, with the potential to expand their functionality by incorporating additional models into the core program. However, the size of the Raspberry Pi's SD card may limit the number of tasks that can be added. Each model corresponds to a specific mode or task, enabling users to run their desired way independently.

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CHAPTER 53

AN INTELLIGENT SYSTEM DESIGNED FOR EARLYACCIDENT DETECTION AND PREVENTION INCORPORATING EMBEDDED TECHNOLOGY AND DEEP LEARNING

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Abstract

A car accident is considered as the most dangerous occurrences, with improper and high-speed driving being the major causes. Also, a lack of awareness can make it more difficult to reach accident scenario on time. The introduction of Internet of Things (IoT) technology provides a potential solution by reducing the frequency of such mishaps. This article outlines a smart technology that monitors and controls a car's speed while also caution others about an accident. This technology uses a distance sensor to continuously calculate the distance between a major obstacle and another vehicle. It will alert driver of critical situations, allowing them to slow down and reduce their speed accordingly.

INTRODUCTION

Deep learning's incorporation into the Internet of Things (IoT) has transformed a number of industries and opened up new avenues for improving productivity and security. Early accident detection and prevention systems represent one of the most significant uses of this confluence. Accidents can have serious repercussions, including fatalities and large financial losses, whether they happen in public areas, on roadways, in industrial settings, or somewhere else. The inability of conventional accident response systems to act swiftly enough to enable timely interventions might increase the probability and severity of incidents.

Creating sophisticated methods to anticipate and avert possible mishaps requires employing Internet of Things (IoT) gadgets that are network-connected and furnished with sensors. These gadgets gather a lot of data in real time from their surroundings.

Subsequently, Deep Learning algorithms scrutinize this data to detect intricate patterns and nuanced signs that may portend an imminent mishap.

This overview examines how deep learning and IoT can be used to improve early accident detection and prevention. It highlights how important these technologies are in reducing risks, saving lives, and making the most use of available resources. Additionally, it discusses the challenges in developing these kinds of systems, including issues with data privacy, processing requirements, and the need for reliability in practical implementations.

By examining these areas, we aim to demonstrate how IoT and Deep Learning can revolutionize safety and advance proactive measures to prevent accidents. Utilizing these technologies has the potential to lessen societal burdens and save lives in a future where accidents are increasingly preventable.

LITERATURE SURVEY

Yuta Maruyama And Gosuke Ohashi, Even in situations when the motion feature of the risk factors is minute, the authors' proposed model may accurately describe the decision basis when paired with Dynamic-Spatial-Attention, a deep learning-based accident prediction technique. Using information from the well-known Dashcam Accident Dataset, we classified accidents for this study. The proposed method makes use of the Dashcam Accident Dataset to achieve higher accident prediction performance in categories where the motion feature of risk factors tends to be small, while achieving the same accident prediction performance in categories where the motion feature of risk factors tends to be large as the baseline Dynamic-Spatial-Attention method.

Jeong-Hwa Cho, In-Bok Lee, This proposed system finds the ideal location for the fire sensor and operates the exhaust fan to remove smoke by taking into account the target subterranean utility tunnel's ventilation system. These results might be used in the future to create a fire response handbook for subsurface facilities. Future mishaps can be prevented by understanding and evaluating how fire spreads inside essential infrastructures. The ventilation system of the target subterranean utility tunnel was considered in this study in order to establish the optimal location for sensors that detect fires and activate fans to clear smoke. This study may have implications for the underground utility tunnel response

manual in the case of a fire. If the design of the underground utility tunnel is flawed, significant harm should be prevented.

Akira Uchiyama, Akihito Hiromori, this system's platform collects behavioral data from drivers and pedestrians using their smartphones, then uses the combined data to identify potentially dangerous traffic scenarios. In order to reduce processing and transmission overhead, we build a two-stage system wherein cell phones belonging to pedestrians and cars operate as local anomaly detectors, activating the event detector and classifier in the post-stage at the cloud server. Additionally, we present an unsupervised learning system that can handle unknown hazardous scenarios through the combined use of the risky situation classifier and the autoencoder-based anomaly detector. The assessment is carried out using both real experiments and simulations. The risky scenario detector achieves an F-measure of 0.89, according to the simulation result.

Lorenzo Tronchin, Ermanno Cordelli, The purpose of the suggested system is to improve the reliability of an AI agent in an insurance company's automated help program that is in charge of crash detection. The XAI layer allows us to optimize the distribution of emergency medical services by offering insights into the AI agent's decision-making process. The collection is made up of actual telemetry information gathered from cars fitted with black box equipment. To accurately interpret the forces applied to automobiles during accidents, it is necessary to explain the intricate interconnections within the multivariate time series data. This presents a problem. In order to achieve this, we modify two cutting-edge XAI model-specific techniques that were first created for photos for this particular context. We provide both a qualitative and a quantitative assessment, further confirming our results on an external dataset and comparing with a well-known agnostic method as well.

Lijie Yang, Guangyu Chen, this system proposes a novel wear state detection method for mining conveyor belts based on deep learning and machine vision. We refer to it as the RENY algorithm. The degree of belt wear is categorized and redefined in order to develop a new dataset specifically for conveyor belt wear detection using the mechanical characteristics data of the worn belt and the wear texture features. We thus introduce a unique conveyor belt wear detection algorithm in this work called Retinex EfficientNet-NAM-YOLOv8 (RENY method), which is based on deep learning and machine vision technologies, in order to replace manual detection and boost detection efficiency and

recognition accuracy. Reclassification of belts with different wear degrees is based on their mechanical properties and wear texture features.

Zetian Zheng, Shaowei Huang, the purpose of this proposed study is to use the HOS analysis to discover nonlinear behavior coming from hard limiters in the voltage source converter (VSC) control systems of wind farms that are bi- or unit-lateral saturation hard limiting. This work proposes an approach based on the HOS analysis, in which the PMSGs and VSGs are represented using a single VSC control model, with the goal of hard-limiting DNB in the VSC control system in wind farms. The typical descriptive function is initially enlarged in order to obtain the detailed frequency domain information on the bi- and unit-lateral saturation hard limits.

METHODS

Object detection - IR sensor

An IR emitter and a receiver make up a standard IR sensor module for object detection. The infrared light from the transmitter is blocked when an object enters the sensor's detecting range, changing the output of the receiver. The purpose of this change is to ascertain whether an object is present or not. Automation, proximity sensing, and obstacle detection applications all make extensive use of these modules. They can detect the frequency of automobile headlights and change between high and low beams independently.
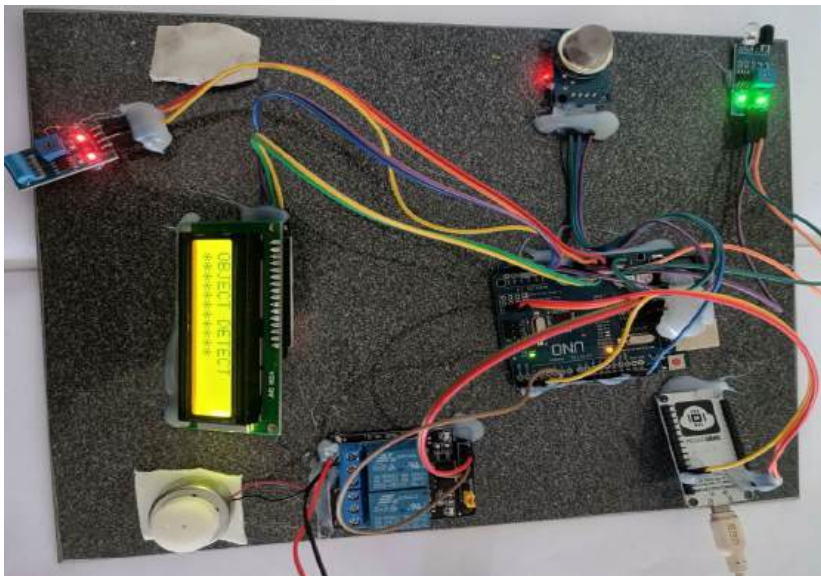
Fig 1: Object detection

Alcohol Sensor

Alcohol vapor in the atmosphere is to be identified using an alcohol sensor module. Typically, it has electronics for signal processing and output in addition to a sensor element that reacts to alcohol molecules. These modules are widely used in breathalyzers, ignition interlock devices, and automobile alcohol detection systems. They provide a quantitative or qualitative indication of the amount of alcohol present by measuring modifications to electrical conductivity or other alcohol-affected properties.

Photo signs detection

A software program used to identify and decipher signs or symbols contained in pictures or photos is called a photo sign detection module. To identify and categorize different kinds of signs, such as traffic, warning, or informational signs, it usually makes use of computer vision algorithms and machine learning techniques. This module improves the interpretation and comprehension of visual information and can be applied to autonomous cars, surveillance systems, and photo management software.

Automated brake sensor

An automatic brake sensor module is one crucial component of a car's braking system that detects when the brakes are engaged. It frequently makes use of sensors to track variables like pressure, wheel speed, or pedal position in order to decide when to activate the brakes. The device can either stop the automobile or slow it down in order to prevent a collision, depending on its speed. This feature improves safety by helping the driver or automatically applying the brakes if the driver doesn't respond fast enough. Automated braking systems are necessary for features like anti-lock brakes (ABS) and electronic stability control (ESC), which enhance performance and safety, depending on the make and model.

The system also includes a camera module that is affixed to an Arduino Uno or Node MCU, which enables it to capture pictures of traffic signs. To recognize and analyze these signals, it uses image processing techniques, maybe with the aid of libraries such as OpenCV. Then, using IoT messaging services, the system notifies drivers of speed limits, traffic laws, and other pertinent information. Through interaction with Internet of Things systems like Microsoft Azure IoT, Google Cloud IoT, and Amazon IoT, it enables data processing and transfer. The IoT platform guarantees prompt communication with pertinent parties by employing protocols such as MQTT or HTTP to receive alerts. Notifications are set to be

generated according to particular criteria or thresholds. The platform feeds the system with sensor data.

RESULTS AND DISCUSSION

The driver assistance system has been introduced in this study. The basic idea is to recognize and classify traffic signs from an input image. The image processing technique used in this system is based on the CNN algorithm. In the end, the speed is modified in accordance with the identification and classification of these potential road signs using a database of road sign patterns. How effectively this notion works depends on the quality of the input image in terms of size, contrast, and look of the signs in the image. This fully automated system takes the place of the existing manual process. Automation procedures, in turn, enhance precision, velocity, dependability, and reduce human error.

CONCLUSIONS

Our proposal, an Internet of Things (IoT) based smart system that could potentially reduce the incidence of accidental deaths, is completed in this paper. There is no denying that the approach we have presented has numerous advantages over conventional methods. The system has strong dependability and maintainability. In other words, the system is operational and accessible all day long. The constant alert and notification feature of an Internet of Things device accounts for its resilience.

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Management Studies

CHAPTER 54

AN ASSESSMENT ON THE EMPLOYEES QUALITY OF WORK- LIFE IN RETAIL INDUSTRY

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ABSTRACT

Quality of work life is referred to all the organizational inputs which aim at the employee's satisfaction and enhancing organization effectiveness. The purpose is to develop jobs and working condition that is excellent for employees as well as the economic health of the organization. It also refers to the satisfaction, motivation, commitment, and involvement of an individual experience concerning their line at work. The paper aims to study the concept "Quality of Work-Life" and the role it plays in enhancing the productivity and performance in the firm. The purpose of the study is mainly to understand the quality of work life of the employees with significant factors like Working Environment, Training, and Development, Compensation & Rewards, Organizational Commitment, Job Satisfaction, etc. The research design chosen is descriptive in nature. The sample size taken to conduct the research is 120 employees. For this study, the sampling technique chosen is convenience sampling. Structured questionnaire was used for primary data collection. Secondary data was collected from earlier research work, various published journals, websites and online articles. Simple Percentage, Chi – Square and Correlation tests are the tools used for data analysis. The investigation has remarkably pointed out that factors such as pay package, health and safety in the work environment, training and development, organizational environment and stress involved in the work affect the Quality of Work Life of the employees.

KEYWORDS

Quality of work life, Productivity, Working environment, Performance.

INTRODUCTION

Quality of work life (QWL) can be defined as an extent to which an employee is satisfied with personal and working needs through participating in the work place while achieving the goals of the organization. Factors influencing quality of work-life are Work Environment, Organization culture and climate, Relation and co-operation, Training and development, Compensation & rewards, Facilities, Autonomy of work and employee satisfaction. The quality of work-life is based on the four principles such as Security, Equity, Individualism & Democracy. The quality of work life is characterized by encouraging employees to participate in suggesting solutions for the highlighted issues, training imparted by the organization, choosing right person for the right job, Evaluation and analysis of results, including failures, leading to renewed efforts toward continual improvement, feedback and recognition for the good results achieved and implementation of practicable suggestions and explanations for rejected ideas.

Retailing consists of those business activities involved in the sale of goods and services to consumers for their personal, family, or household use. Retailing comprises of four elements customer orientation, coordinated effort, value-driven, and goal orientation. The Indian retail industry has emerged as one of the most dynamic and fast- growing industries due to the entry of several new players in the recent times along with rising income levels, growing aspirations, favorable demographics and easy credit availability. It constitutes over 10% of the country's Gross Domestic Product (GDP) and around 8% of the employment in our country. Globally, India is fifth-largest global destination in the retail space and is growing at a rate of 12% per annum. This paper is attempted to study the concept "Quality of Work-Life" and the role it plays in enhancing the productivity and performance in the retail firms.

REVIEW OF LITERATURE

S. Khodadadi et al (2023) investigated the QWL dimensions effect on the employees' job satisfaction. In this study independent variables were permanent security providing, salary and benefits payment policies, development and promotion opportunity, and job independence, job satisfaction as the dependent variables. The employees selected randomly for this study and two questionnaires of "quality of work life" and "job satisfaction" were used for data collection and Data analysis was done by using XL software. The results of the

study showed that the salary and benefits' policies have a significant and positive effect on Shuster's Shohola employees' job satisfaction. Conducted research on relationship between quality of work life and job satisfaction.

Sarina Muhamad (2022) Quality of Work Life among employees is important as it entails strong participation in many of the programs organized by firms. Moreover, having quality work life will lead to better well-being of the workers and society. This study was conducted at one of the largest factories in northern part of Malaysia. With a respond rate of 70%, Pearson correlation indicates that job satisfaction, job involvement and job security have significant relationship with quality of work life.

Straw and Heckscher (2021) QWL is a philosophy, a set of principles, which holds that people are the most important resource in the organization as they are trustworthy, responsible and capable of making valuable contribution hence, they should be treated with dignity and respect. Quality of work life is considered to be the quality of association between employees and the total working environment: with human dimensions, technical and economic consideration.

Klatt et al. (2020) the term quality of work life (QWL) has become well known not only to social scientists, but to lay men as well. They have identified eleven dimensions of QWL in the year l985. They are: pay and stubbles of employment, occupational stress, organizational health programmes, alternative work schedule, participative management and control of work, recognition, superior-subordinate relations, grievance procedure, and adequacy of resources, seniority and merit in promotion and development and employment on permanent basis.

OBJECTIVES

- To assess the factors affecting the quality of work life.
- To study the impact of stress on the quality of work life of employees.
- To determine the level of employees' satisfaction in the organization.

RESEARCH METHODOLOGY

Research Design

To assess the factors affecting the quality of work life, Descriptive research design is followed and the collected data were analyzed with the help of statistical tools like Simple Percentage analysis, Chi-square and Correlation analysis.

Sampling

The sampling frame considered for this study is retail outlets of Chennai and the sample units includes employees from all designations such as Staff Employee, Technician, Executive and Manager in a firm. The required sample was selected using a systematic random sampling technique. The sample size of this research study is 110 employees.

Tools for data collection

The data was collected from both primary and secondary sources. A structured questionnaire was used to collect the data from the employees. A total of 150 questionnaires were distributed to the employees and 137 were collected back. Finally, 110 were considered for the analysis.

ANALYSIS

Objective 1: To assess the factors affecting the quality of work life.

Table 1. Factors Most Significantly Affects Quality of Work-Life

FACTORS	RESPONDENTS	PERCENTAGE
Rigid work hours	21	19.1%
Work overload or unreasonable deadlines	33	30%
Less supervisor support	23	20.9%
Less family/ friends support	21	19.1%
Technology distractions	12	10.9%
TOTAL	**110**	**100.0%**

Source: Primary Data

Chart 1. Factors Most Significantly Affects Quality of Work-Life
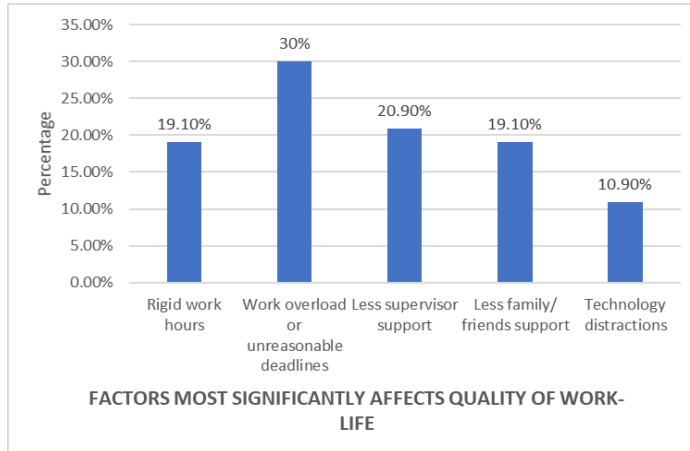
INTERPRETATION

The above table shows that factors most significantly affects quality of work- life, 19.1% of the respondents said rigid work hours affects quality of work-life, 30.0% of the respondents said work overload or unreasonable deadlines affects quality of work-life, 20.9% of the respondents said less supervisor support affects quality of work-life, 19.1% of the respondents said less family/ friends support affects quality of work-life and remaining 10.9% of the respondents said technology distractions affects quality of work-life.

Objective 2:

Table 2. Stress Level Affects Ability to Perform Job Effectively

STRESS LEVEL AFFECTS	RESPONDENTS	PERCENTAGE
Never	31	28.2%
Rarely	31	28.2%
Sometimes	23	20.9%
Often	14	12.7%
Very often	11	10%
TOTAL	**110**	**100.0%**

Chart 2. Stress Level Affects Ability to Perform Job Effectively
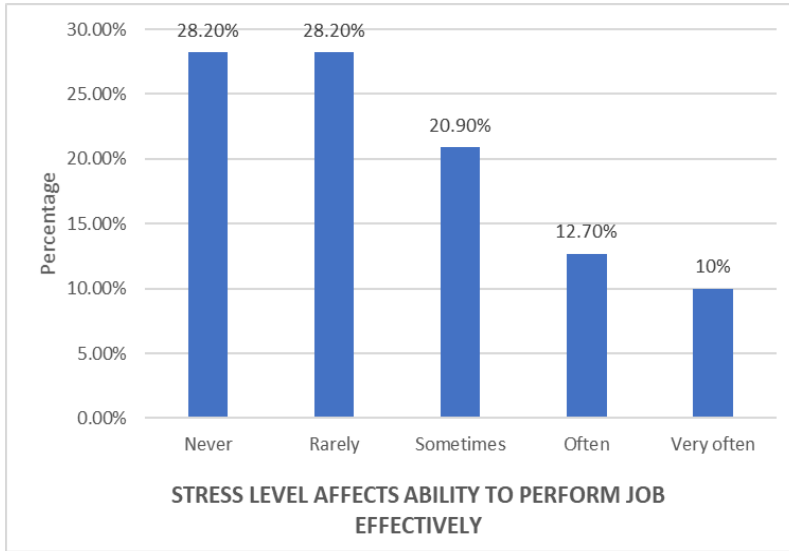
INTERPRETATION

The above table shows that stress level affects ability to perform job effectively, 28.2% of the respondents are never, 28.2% of the respondents are rarely, 20.9% of the respondents are sometimes, 12.7% of the respondents are often and remaining 10.0% of the respondents are very often.

Objective 3: To determine the level of employees' satisfaction in the organization.

Table 3. SATISFIED WITH THE JOB

SATISFIED WITH THE JOB	RESPONDENTS	PERCENTAGE
Strongly Agree	31	28.2%
Agree	42	38.2%
Neutral	22	20.0%
Disagree	6	5.5%
Strongly Disagree	9	8.2%
TOTAL	**110**	**100.0%**

Chart 3. Satisfied With the Job
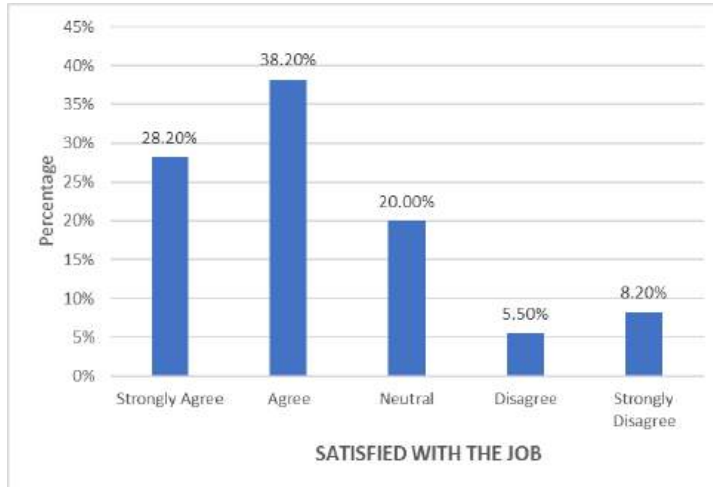
INTERPRETATION

The above table shows that satisfied with the job, 28.2% of the respondents are strongly agree,38.2% of the respondents are agree, 20.0%of the respondents are neutral, 5.5% of the respondents are disagree and remaining 8.2% of the respondents are strongly disagree.

FINDINGS & SUGGESTIONS

The factors that most significantly affects the quality of work-life are rigid working hours, work overload or unreasonable deadlines, less supervisor support & family support and technology distractions. The above mentioned factors have to be addressed in the retail sectors to maintain the quality of work-life of the employees which ultimately improves their performance in work.

Majority of the respondents have stated that stress in work place does not affect the ability to perform their jobs effectively. Stress in workplace is an important component to be handled by the employees themselves and together with their immediate supervisors to simplify the work processes.

Mixed comments have been received in terms of satisfaction of the job where majority has stated that they are satisfied with their job. Job satisfaction is vital which in turn leads to higher productivity. Welfare measures & recognition have to be improved to make the employees committed towards their work which finally leads to job satisfaction.

CONCLUSION

An assessment on the employee's quality of work - life at the organization reveals significant insights into its impact on employee commitment, productivity, and overall well-being. Additionally, it plays a pivotal role in promoting the overall well-being of employees, both personally and professionally. Understanding the concept of Quality of work-life balance emerges as a fundamental aspect, elucidating its importance in achieving harmony between personal and professional domains. The study emphasizes the need for organizations to recognize and prioritize work-life balance initiatives, as they directly influence employee satisfaction and organizational success. Moreover, the research provides valuable recommendations for enhancing work-life balance, emphasizing the implementation of suitable measures. These may include flexible work arrangements, wellness programs, and supportive organizational policies that accommodate employees' diverse needs and responsibilities.

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CHAPTER 55

A STUDY ON ORGANISATIONAL CULTURE AND IT'S IMPACT ON EMPLOYEE'S BEHAVIOUR IN LOGSKIM SOLUTION PVT.LTD., CHENNAI

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ABSTRACT

Organisational culture involves various beliefs and norms within an organisation. These have a definite impact on employee performance. Furthermore, it has also been seen that organizational culture affects the productivity as well as profitability of the employees. This overall influences their performance level that augments the productivity. Furthermore, it has also been seen that organisational culture affects the employee's behaviour. In this research study, the researcher has performed their study on about participants in order to understand the impact of organisational culture on employee performance. Furthermore, these employees were selected randomly from various organizations like retail as well as industry in order to understand the impact of this organisational culture. Furthermore, the researcher has used 5% significance level in order to understand this organisational culture. Therefore, it can be said that organisational culture has a definite impact on employee behaviour and their rate of performance.

KEYWORDS

Organisational culture, Employee behaviour

INTRODUCTION

The concept of organization culture was introduced to the field of management and organization study in the late 1970's and it began to attract significant scholarly attention in the early mid 1980's. Researcher suggested that organization culture could significantly affect organization outcome, reasoning that culture could be used as a resource to affect

employee action distinguish firm form one another and create competitive advantage with for those with culture. Organizational culture is now a prevalent topic among managers, among consultants and among academics. As a mean of distinguishes the members of one group from others, enterprise culture gives identities to organizations, groups and individuals. There is no single definition for the concept of the organizational culture. Instead, there are several. For instance, ―The process of thinking helps in establishing one member from another on the basis of cognitive thinking‖ ―The success guidance based upon different values and norm that makes culture effective‖ ―The set of beliefs, behavior, norms and values helps in making culture most effective‖. Organization culture defines the way employees complete tasks and interact with each other in an organization. The cultural paradigm comprises various beliefs, values, rituals and symbols that govern the operating style of the people within a company. Corporate culture binds the work force together and provide a direction for the company. In times of change, the biggest challenge for any organisation may be to change its culture, as the employees are already accustomed to a certain way of doing things.

REVIEW OF LITERATURE

S. Khodadadietal (2023) investigated the QWL dimensions effect on the employees' job satisfaction. In this study in dependent variables were permanent security providing,salaryandbenefitspaymentpolicies,developmentandpromotionopportunity,and job independence, job satisfaction asthe dependent variables. The employees elected randomly for this study and two question naires of "quality of work life" and "job satisfaction" were used for data collection and Data analysis was donebyusingXLsoftware.Theresultsofthestudyshowedthatthesalaryand benefits'policieshaveasignificantandpositiveeffectonShuster'sShohola employees' job satisfaction. Conducted research on relationship between quality of work life and job satisfaction.

Sarina Muhamad (2022) Quality of Work Life among employees is important as it entails strong participation in many of the programs organized by firms. Moreover, having quality work life will ead to better well-being of the workers and society. This study was conducted at one of the largest factories in northern part of Malaysia. With a respond rate of 70%,

Pearson correlation indicates that job satisfaction, job involvement and job security have significant relationship with quality of work life.

Straw and Heckscher (2021) QWL is a philosophy, a set of principles, which holds that people are the most important resource in the organization as they are trust worthy, responsible and capable of making valuable contribution hence, they should be treated with dignity and respect. Quality of work life is considered to be the quality of association between employees and the total working environment: with human dimensions, technical and economic consideration.

Klatt et al. (2020) the term quality of work life (QWL) has become well known not only to social scientists, but to lay men as well. They have identified eleven dimensions of QWL in the year l985. They are: pay and stubbles of employment, occupational stress, organizational health programmes, alternative work schedule, participative management and control of work, recognition, superior-subordinate relations, grievance procedure, and adequacy of resources, seniority and merit in promotion and development and employment on permanent basis.

OBJECTIVES

- To assess the factors affecting the Organizational Culture
- To study the impact of employee behaviour in the organization.
- To determine the level of employees' satisfaction in the organization.

RESEARCH METHODOLOGY:

Research Design:

To assess the factors affecting the quality of work life, Descriptive research design is followed and the collected data were analyzed with the help of statistical tools like Simple Percentage analysis, Chi-square and Correlation analysis.

Sampling:

The sampling frame considered for this study is retail outlets of Chennai and the sample units includes employees from all designations such as Staff Employee, Technician, Executive and Manager in a firm. The required sample was selected using a systematic random sampling technique. The sample size of this research study is 100 employees.

Tools for data collection:

The data was collected from both primary and secondary sources. A structured questionnaire was used to collect the data from the employees. A total of 50 questionnaires were distributed to the employees and 100 were collected back. Finally, 100 were considered for the analysis.

ANALYSIS

Relationship between organizational culture and employee behavior

Culture is socially learned and transmitted by members; it provides the rules for behavior within organizations the definition of organizational culture is of the belief that can guide staff in knowing what to do and what not to do, including practices, values, and assumptions about their work. Subordinates will be led by these values and the behavior of leaders, such that the behavior of both parties should become increasingly in line. When strong unified behavior, values and beliefs have been developed, a strong organizational culture emerges.

Table Improvements in working condition of organisation

WORKING CONDITION	NO OF RESPONDENTS	PERCENTAGE
Strongly agree	19	16%
Agree	55	46%
Neutral	25	20%
Disagree	14	12%
Strongly disagree	7	6%
Total	**120**	**100%**

Source: Primary Data
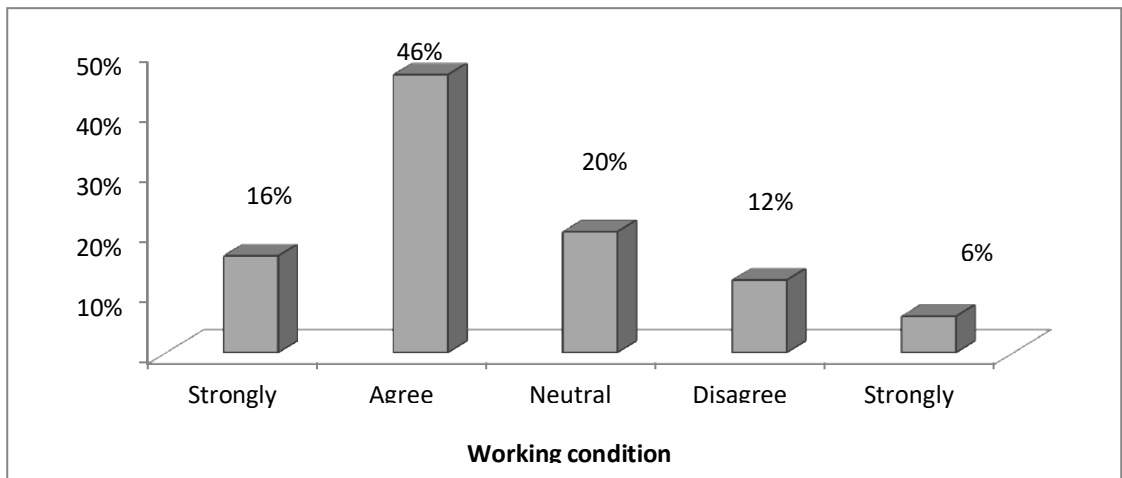
Chart 1- Improvements In Working Condition of Organisation

INTERPRETATION

The above table shows that improvements in working condition of organization, 16% of the respondents are strongly agree, 46% of the respondents are agree, 20% of the respondents are neutral, 12% of the respondents are disagree remaining 6% of the respondents are strongly disagree

FEEL COMFORTABLE WITH WORK ENVIRONMENT

WORK ENVIRONMENT	NO OF RESPONDENTS	PERCENT AGE
Strongly agree	26	22%
Agree	45	37%
Neutral	30	25%
Disagree	13	11%
Strongly disagree	6	5%
Total	**120**	**100%**

Source: Primary Data
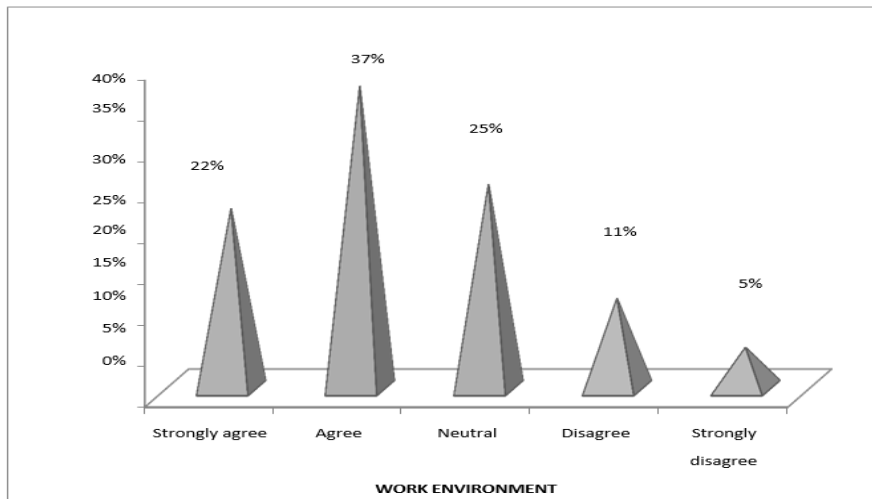
CHART 2 Feel Comfortable with Work Environment

INTERPRETATION

The above table shows that feel comfortable with work environment, 22% of the respondents are Strongly agree, 37% of the respondents are agree, 25% of the respondents are neutral, 11% of the respondents are disagree and 5% of the respondents are strongly disagree.

TESTING OF HYPOTHESIS

The relationship between health insurance and accidents benefits to the employees and management solve all your grievances.

Health insurance /Management grievances	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total
Highly satisfied	6	17	2	3	1	**29**
Satisfied	14	39	6	4	2	**65**
Neutral	4	13	2	1	1	**21**
Dissatisfied	2	2	0	0	0	**4**
Highly dissatisfied	0	1	0	0	0	**1**
Total	**26**	**72**	**10**	**8**	**4**	**120**

NULL HYPOTHESIS

HO: There is no significance relationship between health insurance and accidents benefits to the employees and management solve all your grievances.

ALTERNATIVE HYPOTHESIS

H1: There is a significance relationship between health insurance and accidents benefits to the employees and management solve all your grievances.

Particular	Observed Frequency (Oi)	Expected Frequency (Ei)	$(Oi-Ei)^2$	$(Oi-Ei)^2/Ei$
R_1C_1	6	6.28	0.078	0.012
R_1C_2	17	17.4	0.16	0.009
R_1C_3	2	1.93	0.004	0.002
R_1C_4	3	2.41	0.34	0.144
R_1C_5	1	0.96	0.001	0.001
R_2C_1	14	14.08	0.006	0.004
R_2C_2	39	39	0	0
R_2C_3	6	5.41	0.34	0.064
R_2C_4	4	4.33	0.108	0.025
R_2C_5	2	2.167	0.027	0.012
R_3C_1	4	4.55	0.302	0.06
R_3C_2	13	12.6	0.16	0.012
R_3C_3	1	1.75	0.56	0.32
R_3C_4	1	1.4	0.16	0.114
R_3C_5	1	0.7	0.09	0.128
R_4C_1	1	0.86	0.019	0.022
R_4C_2	2	2.4	0.16	0.066
R_4C_3	0	0.33	0.108	0.33
R_4C_4	0	0.26	0.067	0.26
R_4C_5	0	0.133	0.017	0.133
R_5C_1	0	0.21	0.044	0.21
R_5C_2	1	0.6	0.16	0.26
R_5C_3	0	0.08	0.006	0.08
R_5C_4	0	0.06	0.003	0.006
R_5C_5	0	0.33	0.108	0.33
Calculate value				**2.344**

$$x^2 = \frac{(Oi - EI)2}{Ei}$$

Degree of freedom (v)	=	(R-1) (C-1) = (5-1) (5-1) = 16
Level of Significance	=	5%
Table value (TV)	=	26.296
Calculated value (CV)	=	2.344
CV < TV	=	Ho is Accepted

Result

Since the calculated value is less than the table value. So, we accept the null hypothesis. There is no relationship between health insurance and accidents benefits to the employees and management solve all your grievances.

TESTING OF HYPOTHESIS

The relationship between improvements in working condition of organization and feel comfortable with work environment.

Improvements in working condition / comfortable with work environment	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total
Strongly agree	4	7	5	2	1	**19**
Agree	11	21	14	6	3	**55**
Neutral	6	9	6	3	1	**25**
Disagree	4	5	3	1	1	**14**
Strongly disagree	1	3	2	1	0	**7**
Total	**26**	**45**	**30**	**13**	**6**	**120**

Source: Primary Data

NULL HYPOTHESIS

HO: There is no significance relationship between improvements in working condition of organization and feel comfortable with work environment.

ALTERNATIVE HYPOTHESIS

H1: There is a significance relationship between improvements in working condition of organization and feel comfortable with work environment.

Particular	Observed Frequency (O)	Expected Frequency (E)	$(O-E)^2$	$(O-E)^2/E$
R_1C_1	4	4.1	0.01	0.002
R_1C_2	7	7.1	0.01	0.001
R_1C_3	5	4.7	0.09	0.019
R_1C_4	2	2.0	0	0
R_1C_5	1	0.9	0.01	0.011
R_2C_1	12	11.5	0.25	0.021
R_2C_2	21	20.6	0.16	0.007
R_2C_3	14	13.7	0.09	0.006
R_2C_4	6	5.9	0.01	0.001
R_2C_5	3	2.7	0.09	0.033
R_3C_1	5	5.4	0.16	0.029
R_3C_2	9	9.3	0.09	0.009
R_3C_3	6	6.2	0.04	0.006
R_3C_4	3	2.7	0.09	0.033
R_3C_5	1	1.2	0.04	0.033
R_4C_1	3	3.0	0	0
R_4C_2	5	5.2	0.04	0.007
R_4C_3	3	3.5	0.25	0.071
R_4C_4	1	1.5	0.25	0.166
R_4C_5	1	0.7	0.09	0.128
R_5C_1	1	1.5	0.25	0.166
R_5C_2	3	2.6	0.16	0.061
R_5C_3	2	1.7	0.09	0.055
R_5C_4	1	0.7	0.09	0.128
R_5C_5	0	0.3	0.09	0.3
Calculate value				**1.293**

$$x^2 = \frac{(Oi-EI)2}{Ei}$$

Degree of freedom (v)	**=**	**(R-1) (C-1) =** (5-1) (5-1) = **16**
Level of Significance	**=**	**5%**
Table value (TV)	**=**	**16.196**
Calculated value (CV)	**=**	**1.293**
CV < TV	**=**	**Ho is Accepted**

Result:

Since the calculated value is less than the table value. So we accept the null hypothesis. There is no relationship between improvements in working condition of organization and feel comfortable with work environment.

Conclusion

In today's highly competitive business environment, everything from sales to recruiting becomes more challenging. One way to make it all easier is by being an organization that people want to do business with and work for. Smart organizations know that a strong, positive Organization culture is one of their most important assets. Culture within an organization is very important, playing a large role in whether or not the organization is a happy and healthy place to work. Through communicating and promoting the organizational vision to subordinates, and in getting their acknowledgement of the vision, it is possible to influence their work Employee behavior and attitudes

REFERENCES

Organizational culture

1. Edited by Peter J. Frost, Larry F. Moore, Meryl Reis Louis, Craig C. Lundberg, and Joanne Martin, this book explores topics like what organizational culture is, why it's studied, and how to know when an organization has organizational culture

2. Rachael Ellison, this book focuses on developing soft skills like communication, collaboration, and trust building. It also highlights uncommon methods for measuring success in the workplace.

3. Organizational Culture and Leadership Edgar H. Schein.

4. Edgar Schein, this book is a classic reference for understanding the relationship between organizational culture and leadership. Schein is known as the "father" of organizational culture.

CHAPTER 56

A STUDY ON IMPACT OF LEADERSHIP STYLES ON IT PROFESSIONALS IN INFORMATION TECHNOLOGY INDUSTRY

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ABSTRACT

In the advanced innovative world objective of any association isn't just to endure, yet in addition to support its reality by improving execution. To address the issues of the exceptionally serious business sectors, associations should ceaselessly build execution (Arslan and Staub 2013). The job of initiative is fundamentally significant for accomplishing the exhibition of associations (for example Boal and Hooijberg 2000; Peterson, Smith, Martorana and Owens 2003). Associations in any area face critical administration challenges in the event that they will stay practical in a continually evolving world. Lamentably, 'how to' lead individuals through change is as yet not a typical subject for the executives learning and improvement programs. The point of the investigation was to discover the effect of initiative styles on authoritative execution. The fundamental goal of the investigation is to discover the sorts of initiative styles in authoritative execution in the chose IT Sector in Chennai city. The authority speculations and various acts of initiative are talked about in the research.

KEYWORDS

IT industry, Professional, Chennai, leadership styles, Autocratic, Authoritarian, democratic, participative, Delegative, Laissez-Faire

INTRODUCTION

Information Technology (IT) industry in India has assumed a vital part in putting India on the worldwide guide. IT industry in India has been perhaps the main development patrons for the Indian economy. The business has assumed a critical part in changing India's

picture from a sluggish regulatory economy to a place that is known for imaginative business people and a worldwide part in giving elite innovation arrangements and business administrations. The business has assisted India with changing a provincial and Agri business based economy to an information based economy. In the IT business dominant part of the populace, around 81.5% are in the age bunch between 20 to 25 years and the mean age of the representatives is 24 years. The prerequisite of night move has been accepting ominous media inclusion, messing social up for the representatives working in this area.

Leadership styles

Leadership is the capacity to move a gathering towards a shared objective that would not be met if a leader had not been there (Graham, 1997). Analysts of this research classified authority styles into three principle styles of leadership, which assisted with getting sorted out the perceptions into more improved on information.

- **Autocratic (Authoritarian) Leadership**

At the point when confronted with the need to give a choice, an absolutist chief is one who might think of an answer for the whole gathering all alone. The autocratic style would by and large settle an issue and settle on choices for the gathering utilizing perceptions and what they feel is required or generally significant for most of the gathering individuals to profit around then (Dessler and Starke, 2004). While recording the exploration, these were the pioneers that would choose for the gathering when they would awaken and withdraw, and precisely how far they should go for that day. On the off chance that the gathering went over any contentions or obstructions inside the endeavor, these pioneers would likewise settle on the choices all alone, asking input from the three employed teachers to guarantee that their choices were alright.

- **Democratic (Participative) Leadership**

The democratic leaders were the individuals who took an extremely loose yet in-charge way to deal with driving the gathering. Participative leaders, usually, would counsel the gathering when moving toward an issue and think about their ideas, yet the leader holds the last say in what specific methodology is taken (Dessler& Starke, 2004). Inside the campaign setting, a large number of the members showed this sort of authority by getting ideas from different individuals from the gathering to go to a gathering agreement when

attempting to take care of an issue or an issue. These pioneers would then talk among themselves and go to a choice regarding what the gathering would do.

- **Delegative (Laissez-Faire) Leadership**

The laissez-faire approach to deal with leadership is the possibility that the members ought to have the option to work issues out and clear their path through an endeavor without an excessive amount of additional direction. These types of leader would furnish almost no direction when managing team issues on the endeavor and would permit team individuals to think of choices all alone. The abdicate leader would take an amazingly "hands-off" way to deal with driving to support bunch critical thinking and basic intuition, without permitting members to rely upon the pioneer for the last word (Dessler& Starke, 2004). This approach was seen when ideas would be made to the pioneer to adopt a specific strategy and the pioneer would simply react with a straightforward "sure, we should do it," and choices were made without a great deal of thought.

Leadership Styles

Table 1 Leadership Styles

S.No	Factors	Range	Minimum	Maximum	Mean	Std. Deviation
1	Authoritarian	36.00	9.00	45.00	27.990	8.251
2	Participative	32.00	8.00	40.00	35.714	7.841
3	Delegative	36.00	9.00	45.00	39.229	8.275
4	Leadership Styles	104.00	26.00	130.00	102.933	23.158

The table 1 sums up the descriptive statistical measures, such as minimum, maximum, mean, standard deviation for the different dimension of leadership styles. The mean scores of the previously mentioned leadership styles classifications with respects authoritarian and delegative has mean score from 27.99 to 39.22 with the most extreme scope of 45.00. It is likewise settled that participative leadership styles which has mean score of 35.71 where it

most extreme reach is 40.00. With regards to the various dimensions of leadership styles delegative styles of leadership has the highest mean score because the leaders are hands-off and allow group members to make the decisions.

INDEPENENT T TEST OF INDEPENDENCE

- **Gender vs Leadership styles**

Ha2: Significant difference of perception persists between male and female employees with regards to Leadership styles exhibited by their leaders.

Table 2 Gender vs Leadership styles

Leadership Styles	Gender	N	Mean	Std. Deviation	t statistic	Significance value
Authoritarian	Male	497	9.19	2.455	5.837	<0.001**
	Female	123	8.59	1.957		
Participative	Male	497	25.52	5.258	5.825	<0.001**
	Female	123	22.18	7.197		
Delegative	Male	497	29.04	4.906	5.626	<0.001**
	Female	123	25.89	7.649		
Leadership Styles	Male	497	83.44	12.649	6.620	<0.001**
	Female	123	73.67	20.902		

Note: 1. ** and * indicates significance value is significant at 99% and 95% confidence level correspondingly.

Table 2 presents the results of the independent test for gender vs leadership styles. The significance values of authoritarian, participative and delegative is significant at 99% confidence level. Therefore, it results that the alternate hypothesis (Ha2) is accepted, which means the significant difference of perception persists between male and female employees

with regards to leadership styles of their leaders. It is also identified that both the gender perceives that most of their leaders follow participative and delegative type of leadership styles rather than Authoritative which is a good sign in any kind of industry. However, male employees perceive participative and delegative leadership styles in better manner with higher mean scores of 25.52 and 29.04 respectively, while compared to the female employees. Henceforth, with regards to the overall perception towards leadership decision-making styles male employees have better perception towards various types of leadership styles exhibited by their leaders rather than female employees.

- **Department vs Leadership Styles**

Ha8: Significant difference of perception persists between technical and non-technical employees with regards to leadership styles of their leaders.

Table 3 Department vs Leadership Styles

Leadership Styles	Department	N	Mean	Std. Deviation	t statistic	Significance value
Authoritarian	Technical	447	25.38	6.287	1.953	0.051
	Non-technical	173	23.82	7.041		
Participative	Technical	447	28.64	6.021	2.693	0.007**
	Non-technical	173	27.50	7.426		
Delegative	Technical	447	28.82	6.097	1.969	0.049*
	Non-technical	173	27.68	7.432		
Leadership Styles	Technical	447	82.85	16.619	2.430	0.015*
	Non-technical	173	79.01	20.021		

Note: ** and * indicates significance value is significant at 99% and 95% confidence level correspondingly.

Table 3 presents the results of the independent test for department vs leadership styles. The significance values of participative leadership style is significant at 99% confidence level, whereas the significance values of delegative leadership style and overall leadership styles are significant at 95% confidence level. Therefore, it results that alternate hypothesis (Ha8) is accepted, which means the significant difference of perception persists between the employee working in technical and non-technical departments with regards to leadership styles of their leaders. However, the significance value of the authoritarian is not significant at 95% confidence level, hence alternate hypothesis (Ha8) is rejected, which is evident that significant difference of perception does not persist between employees working in technical and non-technical departments with regards authoritarian leadership styles. The employees working in technical department perceive higher level of leadership styles towards performance of the subordinates with the overall mean score of 82.85. Both technical and non-technical employees perceive that their leaders mostly exhibit delegative and participative leadership styles.

ANALYSIS OF VARIANCE (ONE-WAY)

- **Test of Homogeneity of Variances**

In order to analyze the primary data using one-way ANOVA, it is must to verify its homogeneity through Levene's test. Therefore, the researcher has applied Levene's test and found all the factors of the chosen constructs are having homogeneity of variances.

Table 4 Test Results of Homogeneity of Variances

S. No	Factors	Levene Statistic	df1	df2	Sig.
1	**Decision Making Styles**	**2.241**	**2**	**617**	**0.059**
2	Feeling of Closeness	1.574	2	617	0.067

3	Shared sentiments	1.089	2	617	0.510
4	Similarities	0.785	2	617	0.820
5	Intimate behaviour	1.363	2	617	0.001

In order to have homogeneity in the groups, the variances of the group should be equal. In the above table 4, the values of Levene's statistic and its significance values are greater than 0.5 which indicates that the null hypothesis is accepted, which means that the sub groups are having equal variances, therefore the research applied One-way ANOVA in order to find out the existence of significant differences based on designations and the chosen factors of the constructs namely decision-making styles, leadership styles, leadership qualities, supervisory support, interpersonal solidarity, and organizational performance.

- **Designation Vs. Leadership Styles**

Ha14: Significant difference of perception exists based on the designations of the employees with regards to their perception towards leadership styles of their leaders.

Table 5 Descriptive– Designation Vs. Leadership styles

Leadership styles	Designation	N	Mean	Std. Deviation
Authoritarian	Junior Level	299	26.505	7.566
	Middle Level	210	25.581	7.261
	Senior Level	111	18.252	8.285
	Total	620	24.714	8.251
Participative	Junior Level	299	29.842	7.353
	Middle Level	210	28.995	7.215

	Senior Level	111	21.099	6.952
	Total	620	27.990	7.841
Delegative	Junior Level	299	30.194	7.731
	Middle Level	210	28.981	7.267
	Senior Level	111	21.513	8.122
	Total	620	28.229	8.275
Leadership Styles	Junior Level	299	86.541	21.407
	Middle Level	210	83.557	20.333
	Senior Level	111	60.864	22.043
	Total	620	80.933	23.158

The one-way analysis of variance (ANOVA) test was conducted to examine the differences in perception between designations of the employees with regards to various types of leadership styles such as authoritarian, participative and delegative where the mean and standard deviations of all the sub groups were presented in Table 5 ANOVA compares the variance between the different groups (predictor variable) with the variability within each of the group. In this hypothesis designation is an independent variable and dependent variables are authoritarian, participative and delegative. The junior level employees perceive delegative and participative leadership styles with the highest mean score of 30.194 and 29.842 respectively, whereas the middle level executives perceive second highest level of satisfaction towards participative and delegative leadership style with the mean score of 28.995 and 28.981 respectively.

Table 6 Designation Vs. Leadership Styles

Leadership Styles		Sum of Squares	df	Mean Square	F	Sig.
Authoritarian	Between Groups	6509.425	2	3254.712	56.357	<0.001**
	Within Groups	35632.517	617	57.751		
	Total	42141.942	619			
Participative	Between Groups	5751.666	2	2875.833	54.913	<0.001**
	Within Groups	32312.803	617	52.371		
	Total	38064.469	619			
Delegative	Between Groups	6279.075	2	3139.537	53.644	<0.001**
	Within Groups	36110.403	617	58.526		
	Total	42389.477	619			
Leadership Styles	Between Groups	55555.274	2	27777.637	62.002	<0.001**
	Within Groups	276423.015	617	448.011		
	Total	331978.289	619			

Table 6 encapsulates the results of One-way ANOVA test executed to examine and compare the designation differences with respect to perception of leadership styles such as authoritarian, participative, and delegative. The results adequately exhibited that there is a

significant variation subsists in perception of various types of leadership styles such as authoritarian, participative, and delegative leadership styles, hence alternate hypothesis (Ha14) is accepted and all the above-mentioned variables are significant at 99% confidence level

Table 7 Posthoc test using Tukey HSD Designation Vs. Leadership styles

Dependent Variable	(I) Designation	(J) Designation	Mean Difference (I-J)	Std. Error	Sig.
Authoritarian	Junior Level	Middle Level	.847	0.684	0.648
		Senior Level	8.743*	0.844	<0.001**
	Middle Level	Junior Level	-0.847	0.684	0.648
		Senior Level	7.896*	0.891	<0.001**
	Senior Level	Junior Level	-8.743*	0.844	<0.001**
		Middle Level	-7.896*	0.891	<0.001**
Participative	Junior Level	Middle Level	.924	0.651	0.470
		Senior Level	8.252*	0.804	<0.001**
	Middle Level	Junior Level	-0.924	0.651	0.470
		Senior Level	7.328*	0.849	<0.001**
	Senior Level	Junior Level	-8.252*	0.804	<0.001**
		Middle Level	-7.328*	0.849	<0.001**
Delegative	Junior Level	Middle Level	1.213	0.688	0.236
		Senior Level	8.680*	0.850	<0.001**

	Middle Level	Junior Level	-1.213	0.688	0.236
		Senior Level	7.467*	0.897	<0.001**
	Senior Level	Junior Level	-8.680*	0.850	<0.001**
		Middle Level	-7.467*	0.897	<0.001**
Leadership Styles	Junior Level	Middle Level	2.984	1.905	0.353
		Senior Level	25.676*	2.352	<0.001**
	Middle Level	Junior Level	-2.984	1.905	0.353
		Senior Level	22.692*	2.483	<0.001**
	Senior Level	Junior Level	-25.676*	2.352	<0.001**
		Middle Level	-22.692*	2.483	<0.001**

The results of the Posthoc test performed using Tukey HSD and Multiple Comparisons is presented in table 7 From the results so far, it is understood that there are statistically significant differences between the employees based on their designation. It is understood from the table that there is a statistically significant difference in perception towards leadership styles subsists among the employees working in the various designation in the IT sector. The junior level employees significantly differ from the senior level employees but do not significantly differs from middle level employees with respect to authoritative, participative, and delegative at 99% confidence level. In all the leadership styles juniors perceived it much more than their middle level and seniors, Middle level employees perceived it much more than their seniors.

- **Department Vs. Leadership Styles**

Ha20: There is a significant association between departments of the employees and their level of perception towards leadership styles with regards to IT industries in Chennai city.

Table 8 Department Vs. Leadership Making Styles

Note:

1. The value within ( ) refers to Row Percentage
2. The value within [ ] refers to Column Percentage
3. ** Denotes significant at 1% level

From the table 8 it is identified that the significance value of the chi-square test of association between department of the employees and their level of perception towards leadership styles of their leaders is less than 0.01, so the alternate hypothesis (Ha20) is rejected at one per cent level of significance. Therefore, it is decided that there is an association between departments in which the employees are employed and their level of perception towards leadership styles of the leaders. Based on the column percentage (82.7%), it is found that employees working in the technical department have perceived high level of perception towards leadership styles adopted by their immediate superiors, however the employees working in non-technical departments (56.6%) perceive moderate level of satisfaction towards leadership styles exposed by their leaders at selected IT industries in Chennai city.

DESCRIPTIVE STATISTICS

The study results also explores that the employees' perception towards various dimensions of leadership styles which indicates that delegative styles of leadership has the highest mean score because the leaders are hands-off and allow group members to make the decisions.

- **INDEPENENT T TEST**

With regards to perception subsists between male and female employees with regards to leadership styles of their leaders, from the 't' test it is found that there exist a significant difference opinion among both the gender with regards to different leadership styles possessed by their leaders, where the hypothesis is accepted, however the mean score indicates that the irrespective of the gender they perceive that most of their leaders exhibit participative and delegative leadership styles rather than authoritative leadership styles.

- **CHI-SQUARE TEST**

  With regards to leadership styles there is an relationship found among the style which is adopted by the leader and the department which in the employees are employed, where almost 82% of the opined that there is an association.

- **ONE-WAY ANOVA**

  The One-Way ANOVA analysis of Designation Vs. Leaders Decision making styles explores that there is a difference in perception between designations of the employees with regards to various types of leadership styles, where the junior level employees perceive delegative and participative leadership styles with the highest mean score of 30.194 and 29.842 respectively, whereas the middle level executives perceive second highest level of satisfaction towards participative and delegative leadership style with the mean score of 28.995 and 28.981 respectively. The research results further explores that the there is a significant variation subsists in perception of various types of leadership styles such as authoritarian, participative, and delegative leadership styles. Likewise, the outcome of the Posthoc test also proved that the junior level employees significantly differ from the senior level employees but do not significantly differ from middle level employees with respect to authoritative, participative, and delegative. The junior level employees have been encouraged to participate in decision-making and allowed to share their views, suggestion in order to improve the process, product and services offered by the IT industries, whereas the middle and senior level executives offered the similar kind of atmosphere, however it is not matching with their expectations, hence there is a less satisfaction exposed by them towards leadership styles.

- **Implications related to Leadership Styles**

  The results of the study indicate that the employees are more satisfied towards Participative and Delegative leadership styles and not much happy with the Authoritarian leadership styles. In general, irrespective of nature of industry whether manufacturing or service industry, the employees prefer to work with the leaders who follow Participative and Delegative leadership styles rather than authoritative leaders. The results of the study

indicates that still there are few leaders follow Authoritative leadership styles in the IT industries, which is not a good sign and will not help the organization to develop future leaders. Hence it is suggested that the organization must identify such leaders through employees' attitude survey or some other specific survey and they should be sent to "Leadership Training Programmes", which may include

a) Concept of leadership behaviour - Introduction

b) Group Discussion or brain storming session about leadership

c) Discussion / debate on leadership stereotypes

d) Personal understanding of individual leadership qualities and strengths.

e) Differentiating Leadership from Management.

f) Identifying the impact of leadership on business performance.

g) Pros and Cons of different leadership styles through sharing personal experience.

However, the types of leadership styles to be used may also depends upon the competency and nature of the employees, organization culture, etc.

Conclusion

The consequences of the exploration has given part of bits of knowledge and put a lime light on what degree the effect of leadership practices influences the discernment towards the hierarchical presentation and its builds. This exploration additionally passed on to the outside world about the view of the representatives working in IT ventures in Chennai city what they feel about their nearby bosses' (for example leaders). In view of the consequences of the investigation, it is tracked down that the workers of IT businesses in Chennai city has moderate degree of fulfilment towards the leadership practices embraced their prompt bosses (for example leaders), on account of their initiative styles and characteristics, in light of the fact that the greater part of them are having specialized schooling foundation as opposed to administrative foundation. It is prescribed to the key individuals (or's Leaders) that the "Initiative Training Programs or workshops" might be coordinated for center level and senior level professionals and chiefs, to fabricate their expertise and ability in Leading individuals. This research ends with the note that, "Best Leaders constructs Best Performing Organizations".

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CHAPTER 57

A STUDY ON THE WORK LIFE BALANCE IN CORPORATE IN SPERIDIAN TECHNOLOGYS PVT LTD, THIRUVANANTHAPURAM

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ABSTRACT

Achieving work-life balance is a perennial concern in corporate environments, where the demands of professional responsibilities often encroach upon personal time and well-being. This abstract examines contemporary research and strategies aimed at fostering a harmonious equilibrium between work obligations and personal life within corporate cultures. Drawing upon empirical studies, the abstract elucidates the multifaceted nature of work-life balance, encompassing aspects such as flexible work arrangements, organizational support, and individual coping mechanisms. It explores the impact of work- life imbalance on employee satisfaction, productivity, and overall organizational performance. Furthermore, the abstract delves into the role of corporate policies and initiatives in promoting work-life harmony, including remote work options, parental leave policies, and wellness programs. It highlights the importance of a proactive approach by organizations in recognizing and addressing the diverse needs of their workforce, thereby cultivating a culture that values both professional excellence and personal well- being.

INTRODUCTION

INTRODUCTION OF THE STUDY

Work life balance alludes to the prioritization level in the individual personal and professional existence and the degree to which the business-related exercises that are available at home. In straightforward words it is a proportion of control which individuals hold over how, when and where they work. Balance between fun and serious activities is accomplished when the privileges of the person to a satisfied just inside and outside the paid work space is acknowledged and regarded as the standard, for the common advantage of society, business and people.

Ascend in Attrition rates and increasing interest of balance between work and personal life has constrained associations to look past HR intercessions. Adaptable working hours, Alternate working game plans, leave approaches and advantages for family care and representative help program are the aftereffect of such reason. Such drives are for the most part alluded to as 'family-accommodating strategies' (FFP's) or work life advantages and practices.

Suggestions and meaning of such HR mediations are way many. Finding from research recommends that WLBPs assists the representatives with dealing with their work and family jobs better and furthermore have an incredible effect on worker demeanour and conduct like hierarchical responsibility (Grover and Crooker, 1995), Satisfaction in work (Kossek and Ozeki, 1998), stopping expectation ((Lobel and Kossek1996). WLBPs arrangements likewise add to the authoritative presentation and viability (Sands and Harper, 2007).

Definition

"Work, family, and mental health: Testing different models of work-family fit" (Grzywacz and Bass explore various models of work-family fit and their impact on mental health outcomes, shedding light on the complex relationship between work and family responsibilities.

Importance of work life balance

Working on a job for a company and making a career can be an extremely time consuming duty for any employee. Employees are busy at their offices throughout the day and sometimes even on weekends. This gives them very little time to interact with their family. Because of high pressure of work, often family members get neglected.

The Negative Effects of Work Life Conflict

Long work hours and highly stressful jobs not only hamper employees" ability to harmonize work and family life but also are associated with health risks, such as increased smoking and alcohol consumption, weight gain and depression. Work life conflict has been associated with numerous physical and mental health implications.

Work-life conflict has negative implications on family life. According to the 2007 study by Duxbury and Higgins, 1 in 4 Canadians report that their work responsibilities interfere with their ability to full fill their responsibilities at home. Employees, especially the younger generation who are faced with long hours, the expectations of 24/7 connection and increasing pressure of globalization are beginning to demand changes from their employers. Also, people in the elderly employee segment are working longer now than in the past and are demanding different work arrangements to accommodate their life style needs.

Tips to develop a better work-life balance:
- To ensure you make the best of your time at work and home, good ideas include:
- Analysing the use of your time and deciding what's really important. Set up a new daily regime ensuring the main things remain the main things.
- Leaving work at work. Turn off your cell phone, shut down your laptop and set a clear boundary between work and home. Ask your family to make you accountable to ensure you don't slip back into old habits.

Psychology Theories & Models

Segmentation:

The two domains – work and life – exist separately from each other, and there is no relationship between these two domains. Experiences in one domain do not affect experiences in the other.

Spillover:

Work and life domains are separate, but factors in one domain can affect the other. These effects can be negative or positive. Edwards and Rothbard (2000) provide the following definition: the behaviors, feelings, and values of the two domains become more similar.

Compensation:

Experiences and feelings in one domain can be used to make up or compensate for the gaps in another. A typical example is where dissatisfaction in one domain is negated by

satisfaction in another. The process of compensation is an active and conscious decision (Edwards & Rothbard, 2000).

Resource drain:

Optimal functioning requires the availability of resources such as time, energy, and motivation. These resources, however, are finite. Sometimes, optimal function ingin one domain might require more resources from another. The transfer of resources is not considered an autonomous process, like in the compensation model (Edwards & Rothbard, 2000).

OBJECTIVES OF STUDY

Primary Objective

- A study on work life balance in corporate at speridian technologies trivandrum.

Secondary Objective

- To Study on strategies for flexible work arrangements.
- To identify ways to reduce burnout.
- To improve employee well-being.
- To reduce a stress
- To improve productivity

REVIEW OF LITERATURE:

David A. Smith – (2023) Smith examines the role of organizational culture in shaping perceptions of work-life balance among IT professionals. Drawing on qualitative interviews with employees from various IT companies, the study identifies supportive organizational cultures characterized by flexible work arrangements, open communication channels, and a strong emphasis on employee well-being. Conversely, organizations with rigid hierarchies and a culture of presenteeism are found to hinder employees' ability to achieve work-life balance.

Lew T. – (2020) The Workplace culture is the organizational environment within which working roles are played out and workplace norms are created. The ethos of the organization

can determine whether or not work-life balance and maternity/childcare policies are adopted by the organization.

Byron K. Group –(2018) In their study, Byron K. Group (2018) highlights the pervasive nature of work-related stress and burnout among IT professionals, attributing it to long working hours, tight project deadlines, and the constant pressure to stay updated with rapidly evolving technologies. The study emphasizes the need for organizations to prioritize employee well- being and implement measures to mitigate work-related stressors.

Eikhof . – (2017) suggested that re conceptualization is required to analyze both work-life balance and relationship between work& life. This implies current work-life balance policies are myopic in terms of addressing needs & aspirations of employees.

O'Keeffe – (2017) Workplace culture can be either a supportive or inhibitive environment for implementing work-life balance policies, family friendly working arrangements, and provision and acceptance of maternity and childcare commitments. It is therefore an important factor for those facing unplanned reproductive choices, including those who interpret their pregnancy as a crisis.

RESEARCH METHODOLOGY

- Research methodology is a way to systematically solve the research problem. It may be understood as a science of studying hoe research is done scientifically. The scope of research methodology is wider then that of research methods.

- Research comprises defining and redefining problems, formulating, hypothesis or suggested solutions; collecting, organizing and evaluating data, making deductions and at last carefully testing the conclusions to determine whether they fit the formulating hypothesis or not. Research is an important pre-requisite for a dynamic organization. The research methodology is a written game plan for conducting research. It may be understood as science of studying. In it the various steps are described that are adopted by a researcher in studying his research problems.

RESEARCH DESIGN

"A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure ". "Research Design is the plan, structure and strategy of investigation conceived so as to obtain answer to research question and to control variance ".

DESCRIPTIVE RESEARCH

Descriptive research, also known as statistical research, describes data and characteristics about the population or phenomenon being studied. Descriptive research answers the questions who, what, where, when and how... Although the data description is factual, accurate and systematic, the research cannot describe what caused a situation. Thus, Descriptive research cannot be used to create a causal relationship, where one variable affects another. In other words, descriptive research can be said to have a low requirement for internal validity.

SAMPLE DESIGN

A sample is a subset from the total population. It refers to the techniques or the procedure to the research would adopt in selecting items for the sample (i.e) the size of the sample.

Sample size:

Sample population: 170

Sample size 100

Sample area: speridian technologies, tiruvandrum

TOOLS FOR DATA COLLECTION

- Primary data
- Secondary data

Primary Data

The primary data are those which are collected afresh and for the first time, and thus happen to be original in character. That there are several methods of collecting primary data but in this research the data collected through Questionnaire.

Secondary Data

The secondary data are those which have already been collected by someone else and which have been passed through the statistical process. The secondary data is collected through books, journals, magazines, newspapers, various publications and various associations like business, industry, banks, stock exchanges, etc.

STATISTICAL TOOLS USED

- Percentage analysis
- Chi-Square analysis
- Correlation

PERCENTAGE ANALYSIS

This method is used to compare two or more series of data, to describe the relationship or the distribution of two or more series of data. Percentage analysis test is done to find out the percentage of the response of the response of the respondent. In this tool various percentage are identified in the analysis and they are presented by the way of Bar Diagrams in order to have better understanding of the analysis.

$$\text{Percentage} = \frac{\text{Number of Respondents}}{\text{Total Respondents}} \times 100$$

CHI – SQUARE TEST

Chi-square was done to find out one way analysis between socio demographic variable and various dimensions of the program. A chi-square test is a statistical test used to compare observed results with expected results. The purpose of this test is to determine if a difference between observed data and expected data is due to chance, or if it is due to a relationship between the variables we are studying.

χ2 = ∑ (Oi – Ei) 2/Ei, where Oi = observed value (actual value) and Ei = expected value.

CORRELATION

Correlation is computed into what is known as the correlation coefficient, which ranges between-1and+1. Perfect positive correlation (a correlation co-efficient of +1) implies that as one security moves, either up or down, the other security will move in lock step,in the same direction.

Alternatively, perfect negative correlation means that if one security moves in either direction the security that is perfectly negatively correlated will move in the opposite direction. If the correlation is 0, the movements of the securities are said to have no correlation; they are completely random.

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

Research Hypothesis

Hypothesis 1:

Null Hypothesis (H₀): There is no significant relationship between work disconnection and stress relief outside of work.

Alternative Hypothesis (H₁): There is significant relationship between work disconnection and stress relief outside of work.

Hypothesis 2:

Null Hypothesis (H₀): There is no significant relationship between Work-life balance and job satisfaction.

Alternative Hypothesis (H₁): There is a significant relationship between Work-life balance and job satisfaction

Limitation of the study

- The findings of this study are subject to the bias and prejudice of the respondents. Hence objectivity cannot be ensured.

- The accuracy of finding is limited by the accuracy of the statistical tools used for the analysis

- Employees may wrongly fill the questionnaire on purpose. This study is conducted with a sample size of 100 respondents. Hence the findings of this study cannot be generalized
- Only some factors are taken for the study.
- It's hard to prove cause-and-effect relationships in studies.

DATA ANALYSIS AND INTERPRETATION

Particulars	Frequency	Percent
Yes	64	64
NO	6	6
May Be	30	30
Not at all	0	0
Total	**100**	**100**

SOURCE: Primary data:
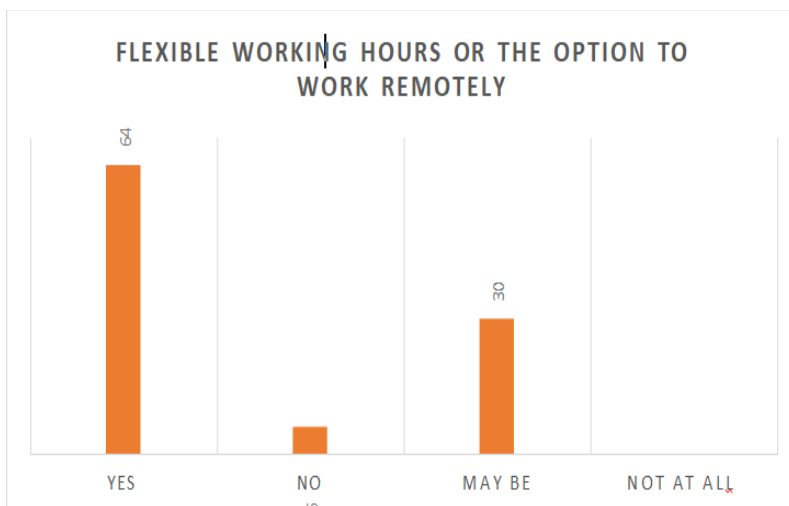
INTERPRETATION

64% of respondents answered "Yes", indicating that they prefer or have access to flexible working hours or remote work options. This suggests a significant majority value the flexibility to choose when and where they work. 30% of respondents selected "May Be", implying some uncertainty or variability in their preference. These individuals might consider flexible arrangements based on specific circumstances. Only 6% responded with "NO", indicating a clear preference against flexible working hours or remote work options. Interestingly, 0% reported "Not at all", suggesting that even those who don't currently have these options might still desire them.

Discussing Work-Life Balance Concerns with Your Manager or Hr

Particulars	Frequency	Percent
Yes, very comfortable	58	58
Yes, somewhat comfortable	36	36
No, not comfortable	6	6
Total	**100**	**100**

DISCUSSING WORK-LIFE BALANCE CONCERNS WITH YOUR MANAGER OR HR
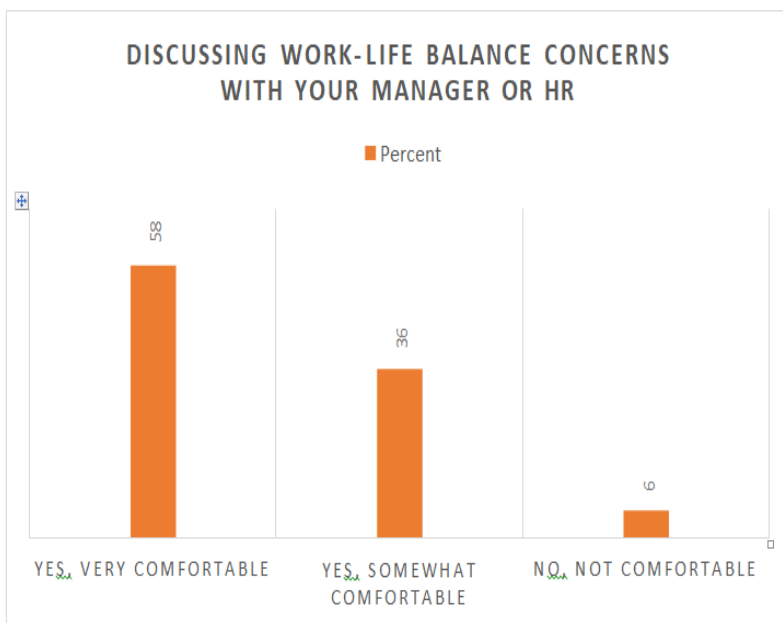
INTERPRETATION

This survey reveals, yes, Very Comfortable: 58 respondents reported feeling very comfortable. Yes, Somewhat Comfortable: 36 individuals indicated a moderate level of comfort. No, Not Comfortable: Surprisingly, 6 participants claimed they are not comfortable.

CHI-SQUARE ANALYSIS 1

Cross tabulation between the disconnect from work / stress relief outside of work:

Disconnect from work / Stress relief outside of work	Always	Often	Rarely	Never	Not at all	Total
Always	10	4	6	6	0	20
Often	4	28	22	4	0	58
Rarely	8	4	8	2	0	22
Never	0	0	0	0	0	0
Not at all	0	0	0	0	0	0
Total	202	38	34	6	0	100

SOURCE: Primary data:

Null Hypothesis (H_0): There is no significant relationship between work disconnection and stress relief outside of work.

Alternative Hypothesis (H_1): There is significant relationship between work disconnection and stress relief outside of work.

Oi	Ei	Oi-Ei	(Oi-Ei)2	(Oi-Ei)2/Ei
10	110	-100	10000	90.90
6	37.93	-31.93	1019.52	26.87

4	100	-96	9216	92.16
0	0	0	0	0
0	0	0	0	0
4	190	-186	34596	182.08
28	65.51	-37.51	1407	21.47
22	172.72	-150.72	22716.52	131.52
4	0	4	16	0
0	0	0	0	0
8	170	-162	26244	154.37
4	58.62	-54.62	2983.34	50.89
8	154.54	-146.54	21473.97	138.95
2	0	2	4	0
0	0	0	0	0
0	30	-30	900	30
0	10.34	-10.34	106.91	10.34
0	27.27	-27.27	743.65	27.27
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
TOTAL				956.82

CALCULATION

DEGREE OF FREEDOM (D.F) = (c-1) (r-1)

= (5-1) (5-1)

= 4*4

= 16

The table value 0.05 = 26.30 The Calculated value = 956.82

Tabulated value is less than the calculated value.

INFERENCE:

Since the Tabulated value is less than the calculated value the H0 is rejected where accepted H1. Hence it is concluded that there is significant relationship between the working environment of the organization and the hygienic conditions around working place.

CORRELATION ANALYSIS

Table showing the comparison between achieving a healthy work-life balance stress due to work demands:

Achieving a healthy work-life balance	38	54	6	2	100
Stress due to work demands	24	48	28	0	100

CALCULATION

X	Y	X2	Y2	XY
38	24	1444	576	912
54	48	2916	2304	2592
6	28	36	784	168
2	0	4	0	0
$\sum$X=100	$\sum$Y=100	$\sum$X2 =4400	$\sum$Y2=3664	$\sum$XY=3672

$$N = 4 \sum X = 100 \sum Y = 100 \sum X2 = 4400 \sum Y2 = 3664 \sum XY = 3672$$

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

r = 4(3672) - (100) (100) / (4(4400) - (100) ^ 2) * (4(3664)- (100) ^2)

= 0.1922

r = 0.1922<1

INFERENCE

There is high positive correlation between the employees satisfied with the OHC (firstaid) (x) and the level of work-related benefits are satisfactory (y).

FINDINGS

- About 50% of respondents expressed dissatisfaction with their current work-life balance.
- The majority of respondents approximately 58% experience stress occasionally.

SUGGESTION

- Implement wellness initiatives such as yoga sessions, meditation workshops, or fitness challenges. A healthy mind and body contribute to work-life balance.
- Host workshops on stress management, time management, and work-life harmony.

CONCLUSION

Employees who recharge outside of work perform better during working hours, and time spent with loved ones fosters stronger family bonds and social connections. Employers can promote work-life balance by offering flexible work arrangements (such as telecommuting or flexible hours), implementing wellness programs, and ensuring clear communication about work expectations. Individual responsibility also plays a role— employees must actively prioritize their well-being through effective time management and boundary-setting.

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CHAPTER 58

A STUDY ON EMPLOYEES JOB EVALUATION IN JAYEM AUTOMOTIVES PVT LTD IN SINGANALLUR, COIMBATORE

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ABSTRACT

Job evaluation is an essential procedure for improving organizational performance. The research aims to determine the effect of job assessment methods on employee motivation, performance, and responsibility. A standardized questionnaire was used to collect data from a convenience sample of 120 respondents, and methods such as percentage analyses, Correlation and Chi-square analysis were used. According to the study's results, job assessment techniques significantly impacted employee motivation and performance. Furthermore, it has been shown that job assessment methods are significantly related to employee motivation and performance. The study's findings indicate significant variations in job evaluation techniques, employee motivation and performance, and staff responsibilities between the industries.

KEYWORDS

Motivation and Performance, Job evaluations

INTRODUCTION

A job evaluation is a systematic way of determining the value/worth of a job in relation to other jobs in an organization. It tries to make a systematic comparison between jobs to assess their relative worth for the purpose of establishing a rational pay structure. Job evaluation needs to be differentiated from job analysis. Job analysis is a systematic way of gathering information about a job. Every job evaluation method requires at least some basic job analysis in order to provide factual information about the jobs concerned. Thus, job

evaluation begins with job analysis and ends at that point where the worth of a job is ascertained for achieving pay equity between jobs and different roles.

Job Evaluation is a systematic process of determining the worth of one job in relation to another job in the organisation. During job evaluation, the relative worth of various jobs are assessed so that wages can be paid depending upon the worth of the job.

Job evaluation is defined as the systematic process of assessing the value of each job in relation to other jobs in an organisation. It is intended to provide a rational, orderly hierarchy of jobs based on their worth to the company by analysing the difficulty of the work performed and the importance of the work to the organisation. The factors used to assess a job's worth are identified, defined, and weighted in the company's job evaluation plan.

Meaning

Job evaluation – which is an accepted tool in the hands of the personnel management for avoiding any inconsistency in job rates and for achieving uniformity in the entire wage structure – is done through certain processes. The process – elements are its components.

Definitions - Defined by Wendell French and Kimball:

The focus of job evaluation is typically on the duties and responsibilities assigned to a job, not on the credentials or characteristics of the person who occupies the job, nor the quality or quantity of the incumbent's performances. This approach assumes that a true sense of job's elements and demands can be ascertained, measured, and valued only through separating jobs from incumbent employees.

Job Evaluation – 7 Important Characteristics

- The main characteristics of job evaluation may be summed up as:
- It is a method with a systematic approach.
- It is an analysis of the work involved in its starting point.
- It is an attempt to determine the requirements of the work involved for any incumbent.
- It is a process by which jobs in an organisation are appraised.

- It is a process of analysing and describing positions, grouping them, and determining their relative value by comparing the duties of different positions in terms of their different responsibilities and other requirements.

1. It is a system to deal exclusively with assessment of the job and not concerned with employees assigned to the job.

2. It is designed only to establish wage differentials and is not concerned with the absolute wage level.

Job Evaluation – 4 Important Steps Involved:

Job evaluation typically, involves four steps:

- Job analysis;

- Job documentation;

- Job rating using the organization's job evaluation plan; and

- Creating the job hierarchy.

Job Analysis:

Job analysis is the process of collecting and evaluating relevant information about jobs. The data collected should clarify the nature of the work being performed (principal tasks, duties, and responsibilities) as well as the level of the work being performed. Information should include the types and extent of knowledge, skill, mental and physical efforts required, as well as the conditions under which the work is typically performed.

Job Documentation:

Job documentation is the process of recording job content information, usually in the form of a written job description, one of the most important products of job analysis. Most job description of the duties, examples of work typically performed, and a statement identifying the knowledge, abilities, skills, and other characteristics (KASOCs) that are required to satisfactorily perform the duties.

Rating the Job:

In the third step, a job's assigned duties are assessed using the job evaluation plan, or instrument selected by the organisation.

Discussions about job evaluation approaches focus attention on three basic models:

- Job ranking,

- Job classification, and

- Point factor plans

- Each of these methods is described and explained below:

OBJECTIVES OF THE STUDY:

Primary Objective

A Study on employee job evaluation towards Jayem Automotive Pvt Ltd with reference to Coimbatore

Secondary Objectives:

- To study the job evaluation of primary welfare facilities, provide by the firm.

- To study the suggestion and recommendation of job evaluation and growth in the organisation.

REVIEW OF LITERATURE

Henderson, Richard (2022) This section highlights that empirical studies carried out in the field of job evaluation and employee job evaluation as they are related to the current study. A studied-on Bangladesh non-governmental organizations in which out of registered ones, only ad ever performed the job evaluation exercise citing many cultural hindrances that made it not possible to work on the results of the job evaluation exercise.

Saif et al (2022) The aim of job evaluation is to provide a systematic and consistent approach to defining the relative worth of jobs within a workplace, single plant or multiple site organization. It is a process whereby jobs are placed in a rank order according to overall demands placed upon the job holder. It therefore provides a basis for a fair and orderly grading structure. Job evaluation does not determine actual pay.

Pritchard, Kenneth (2021) Employee job evaluation is influenced by very many factors which can be controlled or discussed amicably if the environment is set right at the working place. Key among the factors is monetary benefits in which no matter how much one loves their job, the monetary compensation is always there specifically if one is highly qualified or perceived to be appropriately qualified for the same

Saif et al (2021) Job evaluation consists of collecting data and applying it by preparing job descriptions, job specification and job standards. Different types of information are collected during a job evaluation, and a variety of methods can be used.

Suthar et al (2019) The evaluation of a job is different from its evaluation; however, both have shared many of the same data functions which have precluded their involvement in the establishment and recruitment of individuals within a company.

Siddique (2020) Job evaluation is a tool for human resource management in designing and evaluating job. It has received considerable attention in Western countries as a useful HR planning tool, affects organizational evaluation in a developing country.

Andree Mercier (2020) To remain competitive and successful, employees require to have a very conducive working environment. This means that the working conditions should be designed to encourage employee commitment and willingness to work at all times in order to have a positive impact on the employee satisfaction.

Balaji (2019) operationally, organizational commitment has been defined as acceptance of organization's goals and values, willingness to exert considerable effort on behalf of the organization and a strong desire to retain the membership in the organization, by way of training. Meta-Analysis and Revision of Learning Effort Model', pointed out that Indian organizations have mostly restricted themselves to the reaction of trainees towards various features of the programme.

RESEARCH METHODOLOGY

Research Methodology is a systematic way to solve a research problem; It includes various steps that are generally adopted by a researcher in studying the problem along with the logic behind them. The present study job evaluation towards Jayem Automotive Pvt Ltd at Coimbatore

RESEARCH DESIGN

A Research Design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with the economy in procedure". The research design adopted for the studies is descriptive design. The researcher has to describe the present situation in order to know the behaviour of the

consumers. Hence descriptive research study is used. Descriptive research can only report what has happened and what is happening.

SAMPLE DESIGN

Convenience sampling techniques were used for the study.

POPULATION

The aggregate elementary units in the survey are referred to as the population.

Here it covers the entire employees of Jayem Automotive Pvt Ltd industry.

Sample Size

The study based only on the employee engage. Total number of samples taken for the study is 120 respondents.

METHOD OF COLLECTION

It has two types

1.Primary data

2.Secondary data

Primary data

Primary data means data which is fresh collected data. Primary data mainly been collected through personal interviews, surveys etc

Secondary data

Secondary data means the data that are already available. Generally speaking, secondary data is collected by some organizations or agencies which have already been processed when the researcher utilizes secondary data; the process of secondary data collection and analysis is called desk research.

STATISTICAL TOOLS USED

The commonly used statistical tools for analysis of collected data are:

- Simple Percentage analysis
- Chi-square Analysis

- Correlation

SIMPLE PERCENTAGE ANALYSIS

This method is used to compare two or more series of data, to describe the relationship or the distribution of two or more series of data. Percentage analysis test is done to find out the percentage of the response of the response of the respondent. In this tool various percentage are identified in the analysis and they are presented by the way of Bar Diagrams in order to have better understanding of the analysis.

$$\text{Simple Percentage} = (\frac{\text{Number of Respondents}}{\text{Total Number of Respondents}}) \times 100$$

CHI- SQUARE ANALYSIS

Chi-square was done to find out one way analysis between socio demographic variable and various dimensions of the programme.

$$\chi^2 = \frac{(O - E)^2}{E}$$

where

O – Observed value, E – Expected value

In general, the expected frequency for any call can be calculated from the following equation.

$$E = RT \times CT / N$$

The calculated value of chi-square is compared with the table value of $x2$ given degrees of freedom of a certain specified level of significance. It at the stated level of the calculated value of $x2$ the difference between theory and observation is considered to be significant. Otherwise, it is in significant.

CORRELATION

Correlation is computed into what is known as the correlation coefficient, which ranges between -1 and +1. Perfect positive correlation (a correlation co-efficient of +1) implies that as one security moves, either up or down, the other security will move in lockstep, in the same direction. Alternatively, perfect negative correlation means that if one security moves in either direction the security that is perfectly negatively correlated will move in the

opposite direction. If the correlation is 0, the movements of the securities are said to have no correlation; they are completely random.

Research Hypothesis

According to Goode and Hutt, "Hypothesis is a proposition, which can be put to test to determine validity".

A Hypothesis can be defined as a logically conjectured relationship between two or more variables expressed in the form of testable statement.

Null Hypothesis (Ho)

Null Hypothesis (Ho) is formulated only to test whether there is any relationship between variables related to the problem being studied. Usually, the null hypothesis is formed as a negative statement.

Ho There is no significant relation between employee's satisfaction of the respondent and promotion.

Alternate Hypothesis (H1)

Alternate Hypothesis (H1) is a statement, which is accepted after the null hypothesis is reacted based on the test result. The alternate hypothesis usually is formed as a positive statement.

H1 There is significant relation between employee satisfaction of the respondent and promotion.

LIMITATIONS OF THE STUDY

- Lack of time and other resources as it was not possible to conduct survey at large level.
- More complex system, such as point factor, may be difficult to explain to manager or employees.
- Different job evaluators may reach different result, requiring validation last
- Job evaluation takes a long time to install, requires specialised technical personnel, and may be costly.

- A large number of jobs are called red circle jobs. Some of these may be getting more and others less than the rate determined by job evaluation.

DATA ANALYSIS AND INTERPRETATION:

SATISFIED THE WELFARE MEASURES:

WELFARE MEASURES	NO. OF RESPONDENTS	PERCENTAGE (%)
Strongly agree	51	42.5%
Agree	24	20.0%
Neutral	19	15.8%
Disagree	14	11.7%
Strongly Disagree	12	10.0%
Total	120	100.0%

Source: Primary Data

SATISFIED THE WELFARE MEASURE
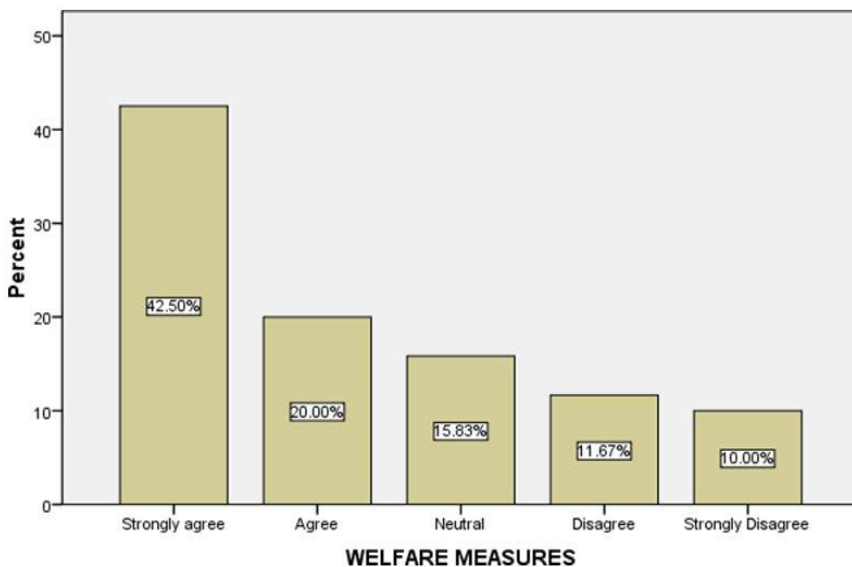
INTERPRETATION

The above table depicts that 42.5% of the respondents are Strongly agree about the welfare measures, 20.0% of the respondents are Agree about the welfare measures, 15.8% of the

respondents are Neutral about the welfare measures, 11.7% of the respondents are Disagree about the welfare measures and 10.0% of the respondents ar Strongly Disagree about the satisfied welfare measures

JOB IMPROVE YOUR INTERPERSONAL SKILL

JOB IMPROVE YOUR INTERPERSONAL SKILL	RESPONDENTS	PERCENTAGE
Strongly agree	28	23.3%
Agree	36	30.0%
Neutral	33	27.5%
bDisagree	12	10.0%
Strongly Disagree	11	9.2%
Total	120	100.0%

Source: Primary Data

JOB IMPROVE YOUR INTERPERSONAL SKILL

JOB IMPROVE YOUR INTERPERSONAL SKILL
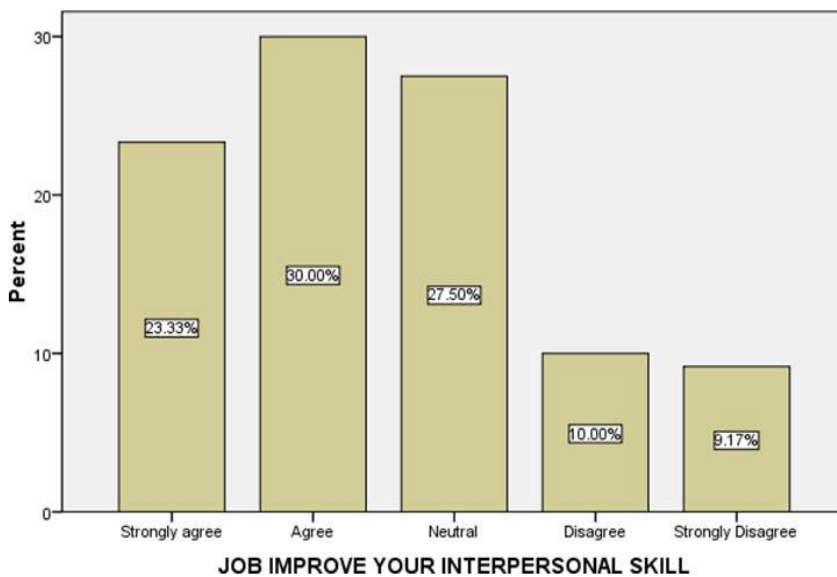
INTERPRETATION

The above table depicts that 23.3% of the respondents are Strongly agree about job improve your interpersonal skill, 30.0% of the respondents are Agree about job improve your interpersonal skill, 27.5% of the respondents are Neutral about job improve your interpersonal skill, 10.0% of the respondents are Disagree about job improve your interpersonal skill and 9.2% of the respondents are Strongly Disagree about job improve your interpersonal ski

CHI-SQUARE ANALYSIS

NULL HYPOTHESIS

HO: There is no significance between the educational qualification and job improve your interpersonal skill.

ALTERNATIVE HYPOTHESIS

H1: There is significance between the educational qualification and job improve your interpersonal skill.

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
EDUCATIONAL QUALIFICATION * JOB IMPROVE YOUR INTERPERSONAL SKILL	12.0	100.0%	0	0%	120	100.0%

EDUCATIONAL QUALIFICATION * JOB IMPROVE YOUR INTERPERSONAL

SKILL Crosstabulation

Count		Job Improve Your Interpersonal Skill					Total
		Strongly Agree	Agree	Neutral	Dis Agree	Strongly Disagree	
Educational Qualification	SSLC	28	1	0	0	0	29
	Diploma	0	10	0	0	0	10
	Degree	0	25	16	0	0	41
	Post Graduate	0	0	17	12	9	38
	Above PG	0	0	0	0	2	2
Total		28	36	33	12	11	120

Chi-Square Tests:

	Value	df	Asymp. Sig. (2-Sided)
Pearson Chi-Square	2.135E2[a]	16	.000
Likelihood Ratio	216.735	16	.000
No. of Valid cases	120		

a. 16 cells (64.0%) have expected count less than 5. The minimum expected count is

Symmetric Measures

		Value	Asymp. Std Error[a]	Approx T[b]	Apprx. Sig
Measurement of Agreement	Kappa	.452	.053	10.325	.000
No. of Valid Cases		120			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

RESULT

Since the calculated value is greater than the table value. So we reject the null hypothesis. There is no significance between the Educational Qualification and Job Improve Your Interpersonal Skill.

FINDINGS

30.0% of the respondents are agree about job improve your interpersonal skill.

42.5% of the respondents are strongly agree about the welfare measures

SUGGESTIONS

While framing the parameters in the ranking method the job evaluation technique and group discussion can be made among and with various authorities. Secondly, the techniques used for job evaluation are very traditional which is to be modernized in future for good prospect of the employees.

Separate rating committee to be fixed during the evaluation period. So that there is no rating biases and personal prejudice will occur. The evaluation rating is very helpful for management to provide employee counselling during the job evaluation.

Job evaluation is purely based on evaluation system and the rating helps to fix increment for workers make them retained in the organization. Supervisors should maintain cordial relationship with workers and offers recognitions of the employee's efforts and provide guidance to workers.

CONCLUSION

Job evaluations are the vital source of every organization. Every employee in an organization increases the productivity and goodwill in the firm. An employee, being an individual is treated as assets in the organization. So the company should mainly emphasis job evaluation techniques and its development programme. Both the evaluator and

evaluation should realize the principle and use the tool of evaluation system in a constructive way for the prosperity of the organization.

Finally the report concludes that the Job evaluation technique prevailing in the organization is fair. Employees are satisfied with the present performance appraisal system that is a traditional one. As many new evaluation techniques are emerged, the organization can implement modern technique which would be more effective. The welfare measure of organization is at par with the company policies and has brought a great sense of involvement in work among the employees of the organization. If the suggested measures are taken into consideration it will help to increase the effectiveness of job evaluation system.

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CHAPTER 59

AN ASSESSMENT ON LABOUR WELFARE MEASURE AT CHETTINAD CEMENT WITH REFERENCE TO ARIYALUR

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ABSTRACT

This study delivers into an examination of labor welfare measures at Chettinad Cement within the context of Ariyalur, aiming to elucidate their significance, effectiveness, and areas for improvement. With a focus on understanding the needs and importance of such measures, the research endeavors to provide valuable insights into the current state of employee welfare practices within the cement industry. Through a mixed-method approach combining qualitative and quantitative analyses, the study explores various facets of labor welfare initiatives, including healthcare benefits, housing facilities, skill development programs, and inclusivity initiatives. By reviewing existing literature, analyzing primary data collected through surveys, and considering secondary data sources, the study seeks to identify key challenges faced by Chettinad Cement in implementing labor welfare measures and opportunities for enhancement. The findings of this research not only contribute to academia by addressing a gap in the literature but also offer practical implications for Chettinad Cement and similar companies striving to foster a supportive and inclusive work environment. Overall, this study aims to serve as a roadmap for improving labor welfare practices, driving organizational excellence, and promoting sustainable development within the cement industry in Ariyalur and beyond.

INTRODUCTION

MEANING

The term "Welfare" refers to a staff of living of an individual or a group in the context of his physical, social and psychic environment. The concept of labour welfare has undergone considerable change. Social and economic development of the country has to be towards the

enactment of labour welfare and labour protective legislations. An individual's adjustment to his environment is required for his existence in the industrial world.

A workers is paid for the types of his services but payment depends on nature of work, his efficiency, capacity of the industry to pay and significance of his work in that particular industry. A worker has to maintain balance at workplace. He has to adjust with the physical working conditions as well as with type of supervision, co- workers, etc.

DEFINITION

Labour welfare is a flexible and elastic concept. Its meaning and implications differ widely with times, regions, industries, countries, social values and customs, the general economic development of the people and the political ideologies prevailing at particular moments. As such, a precise definition is rather difficult.

EXPLANATION

Labour welfare relates to taking care of the well-being of workers by employers, trade unions, governmental and non-governmental institutions and agencies. Welfare includes anything that is done for the comfort and improvement of employees and is provided over and above the wages.

IMPORTANCE OF LABOUR WELFARE SERVICES

The basic objective of labour welfare is to make personal, social and work life of the workers good and satisfying.

Improving worker's health – Labour welfare provides healthcare benefits, security against work hazards. Different welfare facilities provide better physical and mental health of the workers.

Increase in efficiency – Different welfare programme creates a better workplace and improves the physical and mental health of the workers enabling them to improve their performance and efficiency.

Reduction in labour turnover – Labour welfare programme provides satisfaction to the workers. Satisfied workers are more enthusiastic at work. This reduces labour turnover and absenteeism.

Promotion of industrial peace – Welfare services helps to maintain industrial peace. It avoids conflict with trade unions relating to issues like unhealthy work environment, accidents at work place, hazardous working conditions and so on.

Providing satisfaction to workers – Welfare facilities like housing, medical benefits, education and recreation facilities for the worker's and their families help to create contented workers. Health and safety measures, improvement in working conditions, prevention of accidents creates satisfaction among the workers.

Reducing social evils –Improvement in material, intellectual, social and cultural conditions of worker's life protect workers from social evils like drinking, gambling etc.

BENEFITS OF LABOUR WELFARE

Improved Industrial Relations:

These measures provide great satisfaction to the workers and also help in maintaining industrial peace.

Increase in the General Efficiency and Income:

Welfare facilities make the workers happy and contented both at home and the factory and it brings improvement in their general efficiency. Their efficiency and productivity may not be up to the mark, if they are not relieved of their domestic worries like poor housing, insanitary conditions etc.

Once they are relieved of these worries, they work with full zeal and enthusiasm.

High Morale:

The welfare measures shall also help in securing the willing cooperation of the workers. Once satisfied they will be less tempted to destructive and anti-social activities. Thus, a high degree of employee morale is ensured.

OBJECTIVES OF THE STUDY

The study was conducted in order to achieve the following individual.

Objectives:

- To understand the extent to which the welfare measures provided by Chettinad Cement Corp Pvt Ltd, towards their employees.

- To know the level of awareness of labour about the various welfare measures provided to them.

- To study how the welfare facilities provided helps in increasing the Productivity and job satisfaction.

- To learn how welfare services provided to labour help organization to build up a stable work force by reducing absenteeism and labor turnover.

- To offer useful suggestions for improving the effectiveness of welfare measures.

REVIEW OF LITERATURE

Patel and Gupta (2023): Conducted a study examining the effectiveness of health and safety measures in cement plants, providing valuable insights into the relationship between workplace safety and employee well-being.

Arms (2023): Emphasized the importance of employee recognition in organizational settings, particularly within the context of the cement industry. Arms highlighted the simplicity yet effectiveness of acknowledging employees' efforts through everyday interactions, such as expressing gratitude with a simple "thank you." Furthermore, the author underscored the significance of recognizing the stress and dedication of employees working on important projects, emphasizing the need for timely acknowledgment from employers.

Yadav, R., & Jain, P. (2022): "Impact of Labor Welfare Measures on Employee Retention: Evidence from Cement Plants in Asia." Yadav and Jain investigated the impact of labor welfare measures on employee retention, drawing evidence from cement plants in Asia.

Sharma, V., & Pandey, D. (2022): "Assessment of Training and Development Practices in Cement Manufacturing Companies: A Review of Literature." Sharma and Pandey conducted a comprehensive review of literature to assess training and development practices in cement manufacturing companies.

Arms, 2021: Employee recognition is largely important, it is said to be quite simple to deal with. He added that it is just a matter of an everyday interaction by saying a simple "thank you" to the staff that has gone out of their way. Also, he stated that an employer must often

acknowledge the stress and effort of the employees working on an important and timely project.

Patel, K., & Mehta, S. (2021):"Examining the Relationship between Work- Life Balance and Employee Well-Being: A Study of Cement Factory Workers." Patel and Mehta's study examined the relationship between work- life balance and employee well-being among cement factory workers.

Zhao And Zhou, 2020: Therefore, opportunities such as promotions and Retention should be made available to employees in an organization. Since job status may play an important role in reducing turnover, organizations should use it as a career reward and incentive to retain qualified employees.

RESEARCH METHODOLOGY

RESEARCH DESIGN

It encompasses the methodology and procedure, employed to conduct scientific research. It is a detailed outline of how an investigation will take place. A research design will typically include how data is to be collected, what method will be employed, how the methods will be used and the intended means for analyzing data collected. It constitutes the blue print for the collection, measurement and analysis of data.

SAMPLE DESIGN

The technique used here is convenience sampling. It is a non - probability sampling technique where subjects are selected because of their convenient accessibility. The subjects are selected just because they are easier to recruit for the study.

SAMPLE SIZE

The randomized samples in our boundary approximately 250, in this study we looking out sample size is 190 as probably.

SAMPLE UNIT

The sample unit is Chettinad cement, Ariyalur

TOOLS FOR DATA COLLECTION

Research uses the data to collect the information for their research. The type of data depends upon the nature of research. The two types of data are;

- Primary Data.
- Secondary Data.

1) Primary Data

The primary data are those, which are collected freshly and for the first time, from the labour directly. It is collected through the following methods.

Questionnaire: A structure of questionnaire was prepared and distributed among the labour.

Interview: Personal interviews and interaction with the labours.

1. Observation: By observing the working environment.
2. It is specific to the research objectives and gathered firsthand by the researcher or research team.
3. Unlike secondary data, primary data is tailored to address specific research questions and hypotheses.
4. It offers unique insights and allows researchers to control the data collection process, ensuring relevance and accuracy.

DATA ANALYSIS AND INTERPRETATION

AGREE THAT STRESS MANAGEMENT IS ESSENTIAL FOR ENHANCING EMPLOYEE SATISFACTION:

Employee Satifaction	No of Respondents	Percentage
Strongly Agree	37	34.9%
Agree	47	44.3%
Neutral	19	17.9%
Dis Agree	1	0.9%
Strongly Neutral	2	1.9%
TOTAL	**106**	**100%**

SOURCE: Primary data

Stress management is essential for enhancing employee satisfaction:

INTERPRETATION

The above table shows that the 34.5% of employees strongly agree, 44.3% of employees agree, 17.9% of employees are neutral, 0.9% of employees are disagree, 1.9% of employees are strongly disagree.

INFERENCE – Majority of the employees 44.3% are agree.

How would you rate the level of strees among airport authority of India employees?

LEVEL OF STREES	NO OF RESPONDENTS	PERCENTAGE
1	36	28.3%
2	23	21.7%
3	24	22.6%
4	13	12.3%
5	16	15.1%
TOTAL	106	100%

SOURCE: Primary data

Level of strees among airport authority of India employees

INTREPRETATION

The above table shows that the 28.3% of employees gave rating of 1, 21.7% of employees gave rating of 2, 22.6% of employees gave rating of 3, 12.3% of employees gave rating of 4, 15.1% of employees gave rating of 5.

INFERENCE – The majority of the employees 28.3% are gave rating of 1.

CHI SQUARE ANALYSIS

Are You Statisfied with the Current Stress Management And Stressors Is The First Step In The Stress Management Process

CURRENT STRESS MANAGEMENT/ STRESS MANAGEMENT PROCESS	1	2	3	4	5	TOTAL
1	0	13	20	5	15	52
2	1	5	10	5	3	27
3	1	4	5	3	2	15
4	0	2	2	3	0	7
5	3	2	0	0	0	5

| TOTAL | 6 | 26 | 37 | 16 | 21 | 106 |

SOURCE: Primary data

H0: There is no significant difference between the satisfied with the current stress management

H1: There is significant difference between the stressors is the first step in the stress management process

Observed frequency (Oi)	Expected frequency (Ei)	Oi-Ei	(Oi-Ei)2	(Oi-Ei)2/Ei
0	2.94	2.94	8.64	2.93
13	6.13	6.87	47.19	6.86
20	18.15	1.85	3.42	1.84
5	7.84	-2.84	8.06	-2.83
15	10.30	4.7	22.09	4.7
1	1.52	-0.52	0.27	0.51
5	6.62	1.62	2.62	1.61
10	9.42	0.58	0.33	0.56
5	4.07	0.93	0.86	0.92
3	5.34	-2.34	5.47	-2.33
1	0.84	0.16	0.02	0.12
4	3.67	0.33	0.10	0.30
5	5.23	-0.23	0.05	0.21
3	2.26	0.74	0.54	0.72
2	2.97	-0.97	0.94	0.96
0	0.39	0.39	0.15	0.38
2	1.71	0.29	0.08	0.27
2	2.44	-0.44	0.19	-0.43
3	1.06	1.94	3.76	1.93
0	1.38	1.38	1.90	1.37
3	0.28	2.72	7.39	2.71

2	1.22	0.78	0.60	0.76
0	1.74	1.74	3.02	1.73
0	0.75	0.75	0.56	0.74
0	0.99	0.99	0.98	0.98
TOTAL				**27.5**

CALCULATION

DEGREE OF FREEDOM (D.F) = (c-1) (r-1)

= (5-1) (5-1)

= 4*4

= 16

The table value 0.05 = 26.30 The calculated value = 27.5

Tabulated values are greater than the calculated value.

INFERENCE

Since the tabulated values is greater than the calculated value the H0 is accepted where rejected H1. Hence it is concluded that there is significant relationship between the statisfied with the current stress management and stressors is the first step in the stress management process

FINDINGS

46.2% of the respondents are responds frequent shift changes causes stress.

44.3% of the respondents are agree for enhancing employee satisfaction.

SUGGESTION

In airport management, stress is a constant companion due to the complex nature of operations, tight schedules, and high stakes involved. To effectively manage stress in this dynamic environment, several strategies can be employed. Firstly, establishing clear communication channels and fostering a culture of open dialogue among staff and stakeholders can help alleviate misunderstandings and reduce anxiety stemming from uncertainty. Delegating tasks according to team members' strengths and capabilities not

only distributes the workload but also empowers individuals, promoting a sense of ownership and collaboration

CONCLUSION

In conclusion, stress management within AI Airport Service Limited is not just a necessity but a strategic imperative. As a key player in the aviation industry, AI Airport Service Limited faces multifaceted challenges, from ensuring the seamless flow of passengers to maintaining stringent safety protocols. To address these challenges effectively, it's essential to prioritize the well-being of employees through robust stress management initiatives. Furthermore, implementing flexible work arrangements and recognizing achievements help to promote work-life balance and boost morale.

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CHAPTER 60

AN ASSESSMENT ON STRESS MANAGEMENT ACTIVITIES TAKEN OVER IN AI AIRPORT SERVICES LIMITED CHENNAI

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ABSTRACT

In the fast-paced environment of AI Airport Service Limited, managing employee stress is critical for maintaining high performance, safety, and overall job satisfaction. This paper explores various stress management strategies tailored to the unique challenges faced by employees in the airport services sector. Given the high-stakes nature of airport operations, employees often encounter stressors such as irregular working hours, high passenger volumes, security concerns, and the need for swift, accurate decision-making. These stressors can lead to burnout, decreased productivity, and compromised safety if not effectively managed. Structured interview schedule was used for primary data collection.

The secondary data was collected from earlier research work various published journals, magazines, websites and online articles. Organizational strategies include the implementation of flexible scheduling, provision of comprehensive mental health support services, and the creation of a supportive work environment through effective communication and leadership. Through a combination of these strategies, AI Airport Service Limited can enhance employee well-being, leading to improved job performance, lower turnover rates, and a safer, more efficient airport environment

INTRODUCTION

INTRODUCTION OF THE STUDY

Stress is defined as a person's physical, mental, and emotional reaction to a certain stimulus, often known as a "stressor." Stress is our bodies' way of responding to any type of demand. An agent or stimulus that creates stress is referred to as a stressor. Noises, disagreeable people, a speeding car, a job, finances, and family difficulties are some of the stressors. Any situation might cause stress.

The feeling is first affected by stress, which leads to psychological disorders. Anxiety, distracting anxiety, excessive worry, changes in sleep patterns, impatience, anger, sadness, intolerance, thoughts of harming oneself or others, palpitation, stress headache, and internal pressure are all early signs of stress. Headaches, severe fatigue, nausea and vomiting, diarrhoea, tachycardia, chest discomfort, elevated blood pressure, flushing or disorientation, shortness of breath, restlessness, choking sensation, or hyperventilation are some of the other symptoms Eustress, distress, acute stress, and chronic stress are some of the several types of stress.

Stress is a feeling of emotional or physical tension. It can come from any event or thought that makes you feel frustrated, angry, or nervous. Stress is your body's reaction to a challenge or demand. In short bursts, stress can be positive, such as when it helps you avoid danger or meet a deadline. But when stress lasts for a long time, it may harm your health. Stress management is a "set of techniques and programs intended to help people deal more effectively with stress in their lives by analysing the specific stressors and taking positive actions to minimize their effects." Stress is the "psychological, physiological and behavioural response by an individual when they perceive a lack of equilibrium between the demands placed upon them and their ability to meet those demands, which, over a period of time, leads to ill-health" (Palmer, 1989). Stress is a normal feeling.

TYPES OF STRESS

Stress is four types,

1.Eustress

2.Distress

3.Acute stress

4.Chronic stress

MEANING

Meaning in stress management refers to finding purpose, significance, or value in one's experiences, actions, or challenges, which can help individual scope with and navigate stressful situations more effectively. This can involve identifying personal values, setting meaningful goals, fostering positive relationships, and engaging in activities that bring

fulfilment and satisfaction. When individuals perceive their stressors as meaningful or aligned with their values, they may be better equipped to manage stress and maintain overall well- being.

DEFINITION

Stress management is the process of employing techniques, strategies, and practices to effectively cope with, reduce, or alleviate the physical, emotional, and psychological strain caused by stressors. It involves recognizing stress triggers, implementing proactive measures to mitigate their impact, and adopting healthy coping mechanisms to promote resilience and overall well-being. Stress management techniques may include relaxation exercises, time management, problem-solving skills, mindfulness practices, and seeking social support. The goal of stress management is to enhance an individual's ability to adapt to stress, maintain balance, and lead a healthier, more fulfilling life.

COMPONENTS OR ELEMENTS

Stress management among employees can involve various components or elements, including:

Clear Communication: Ensuring transparent communication about expectations, goals, and changes within the organization can reduce uncertainty and stress.

Workload Management: Proper workload distribution, setting realistic deadlines, and providing adequate resources can prevent employees from feeling overwhelmed.

Supportive Work Environment: Cultivating a supportive workplace culture where employees feel valued, respected, and supported by their peers and supervisors can significantly reduce stress levels

Work-Life Balance: Encouraging a healthy balance between work and personal life by offering flexible schedules, remote work options, and time-off policies can help employees manage stress more effectively.

Training and Development: Providing training and development opportunities that enhance employees' skills and competencies can increase their confidence and reduce stress associated with job performance.

Recognition and Reward: Recognizing and rewarding employees for their hard work and achievements can boost morale and reduce stress by fostering a sense of appreciation and accomplishment.

Wellness Programs: Implementing wellness programs that promote physical, mental, and emotional well-being, such as yoga classes, mindfulness sessions, or access to counselling services, can help employees cope with stress more effectively.

Conflict Resolution: Establishing effective conflict resolution processes and providing mediation support when needed can prevent workplace conflicts from escalating and causing undue stress.

METHODS

Here are various methods of stress management that individuals can employ to cope with and reduce stress. Some common methods include:

Relaxation techniques: This includes deep breathing exercises, progressive muscle relaxation, guided imagery, and meditation, which can help calm the mind and body.

Physical activity: Regular exercise, such as walking, jogging, yoga, or dancing, can help reduce stress levels by releasing endorphins and promoting relaxation.

Time management: Organizing tasks, prioritizing responsibilities, and setting realistic goals can help individuals feel more in control and less overwhelmed by their workload.

Healthy lifestyle choices: Eating a balanced diet, getting enough sleep, avoiding excessive alcohol and caffeine consumption, and staying hydrated can support overall well-being and resilience to stress

PROCESS

1. Identification of stressors: The first step is to recognize and identify the sources of stress in your life. This could include work pressures, relationship conflicts, financial concerns, health issues, or other life events.

Assessment of stress levels: Once you've identified stressors, assess how they are impacting you physically, emotionally, and mentally. Recognize signs of stress such as tension, anxiety, irritability, fatigue, or changes in sleep patterns.

OBJECTIVES OF THE STUDY

Primary Objective:

- To assess the prevalence and sources of stress among airport personnel.

   Secondary Objectives:

- To explore the relationship between stress levels and job performance, safety, and overall well-being among airport staff.
- To evaluate the effectiveness of existing stress management programs or interventions in mitigating stress among airport employees.
- To identify specific stress ors experienced by different job roles within the airport environment.

REVIEW OF LITERATURE

Afnan khan, (2023) The researcher found that the Lack of good working atmosphere, Undue restriction on part of boss, Lacking of provision of leisure time for employees, Unavailability of basic facilities of recreational activities, Improper arrangement for recreational activities for employees are the basics causes of stress among the employees.

Anila.K. P, DR. V. Krishnaveni (2022) There are various factors which are responsible for job stress they can be broadly classified into external factors relating to organization and work- family conflicts, and internal factors. Certain occupations are more stressful, especially those in which there is high emotional involvement. Job stress has become a real challenge for a worker and their employing organization.

Rena Repetti and Shoo-Wen Wang (2021) This research paper evaluated on how work stressors affect family relationships paints a nuanced picture that may include coping processes and positive outcomes for families. Although we do see echoes of job-related negative mood finding direct expression at home, they also observed other behaviors, like social withdrawal, that may serve to protect the family from the direct display of stress.

Bharathi T, DR. KS Gupta (2020) Researchers have made their comments on variables that affects job stress and productivity. The variables for this study on job stress are workload, role ambiguity, gender discrimination, interpersonal relationship.

Vemuri Swathi, M. Sudhir Reddy (2018) Study evaluated that the Stress is a growing problem in the workplaces and a particular magnitude for working women. The problems due to high levels of stress can be exhibited physically, psychologically and behaviourally by an individual.

DR. Hannah Orwa Bula (2017) This study highlighted three aspects as a source that play an important role in determining stress among employees they are: work stress among employees, the effects of work stress on employee performance, and stress management techniques being employed.

Viljoen and Rothman (2014), Have investigated the relationship between occupational stress, ill health and organizational commitment. They found that organizational stressors contributed significantly to ill health and low organizational commitment.

RESEARCH METHODOLOGY

Research methodology is a structured and scientific approach used to collect, analyse, and interpret quantitative or qualitative data to answer research questions or test hypotheses.

The research methodology section in a scientific paper describes the different methodological choices made, such as the data collection and analysis methods, and why these choices were selected.

RESEARCH DESIGN:

Research design is the framework of research methods and techniques chosen by a researcher to conduct a study.

A research design is defined as the overall plan or structure that guides the process of conducting research.

DESCRIPTIVE RESEARCH:

Descriptive research for stress management in airport services would focus on identifying and describing the various stressors faced by employees in this sector, as well as the coping mechanisms and interventions used to manage stress. This type of research would involve

collecting data through surveys, interviews, or observations to provide a comprehensive overview of the stress landscape within airport services

SAMPLE DESIGN

Research had made use of simple random sampling technique to collect data. A simple random sample is a randomly selected subset of a population, and the sample is collected from the different departments of employees of AI AIRPORT SERVICES LTD, CHENNAI.

In this sampling method, each member has getting an equal chance of being selected in the population. Since simple random sampling uses the technique of randomization, any research performed on simple random sampling should have highest internal and exter

SAMPLE SIZE

The study based only on the opinion and expectation of employees in the management.

Total number of samples taken for the study is 300 respondents out of 106 employees.

TOOLS FOR DATA COLLECTION

- Primary data
- Secondary data

PRIMARY DATA

Primary data means data which is fresh collected data. Primary data mainly been collected through personal interviews, surveys etc.

SECONDARY DATA

Secondary data means the data that are already available. It was used in the introduction part of the company profile and was collected from the website.

STATISTICAL TOOLS USED

PERCENTAGE ANALYSIS

This method is used to compare two or more series of data, to describe the relationship or the distribution of two or more series of data. Percentage analysis test is done to find out the percentage of the response of the response of the respondent. In this tool various percentage are identified in the analysis.

$$\text{Percentage Analysis} = \frac{\text{Number of Respondents}}{\text{Total Respondents}} \times 100$$

CHI SQUARE TEST:

A chi-square test is a statistical test used to compare observed results with expected results.

$$CHI\ SQUARE\ TEST\ \chi^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

CORRELATION ANALYSIS:

There are several different correlation techniques. The survey systems optional statistics module includes the most common type, called the person or product moment correlation. The module also includes a variation on this type called partial correlation.

$$Correction\ r = \frac{\Sigma(XY) - \frac{(\Sigma X)(\Sigma Y)}{n}}{\sqrt{[n\Sigma X^2 - (\Sigma X)^2][n\Sigma Y^2 - (\Sigma Y)^2]}}$$

RESEARCH HYPOTHESIS

NULL HYPOTHESIS - There is no significant difference in perceived stress levels between individuals who participate in a structured stress management program and those who do not.

ALTERNATE HYPOTHESIS - There is a significant difference in perceived stress levels between individuals who participate in a structured stress management program and those who do not.

LIMITATATIONS OF THE STUDY

Individual Differences:

Stress management techniques may not be equally effective for all employees due to individual differences in personality, coping styles, and resilience.

External Stressors:

Workplace stress is often influenced by external factors beyond an organization's control, such as economic conditions, industry trends, and personal life stressors.

Short-term Focus:

Stress management programs often focus on addressing immediate stressors and providing short-term relief.

Lack of Evaluation and Feedback:

Without proper evaluation and feedback mechanisms, it can be challenging to assess the effectiveness of stress management interventions and make necessary adjustments.

DATA ANALYSIS AND INTERPRETATION

Agree That Stress Management Is Essential for Enhancing EMPLOYEE SATISFACTION:

SOURCE: Primary data

Stress management is essential for enhancing employee satisfaction:

Employee Satisfaction	No of Respondents	Percentage
Strongly Agree	37	34.9%
Agree	47	44.3%
Neutral	19	17.9%
Dis Agree	1	0.9%
Strongly Neutral	2	1.9%
TOTAL	**106**	**100%**

INTERPRETATION

The above table shows that the 34.5% of employees strongly agree, 44.3% of employees agree, 17.9% of employees are neutral, 0.9% of employees are disagree, 1.9% of employees are strongly disagree.

INFERENCE – Majority of the employees 44.3% are agree.

HOW WOULD YOU RATE THE LEVEL OF STREES AMONG AIRPORT AUTHORITY OF INDIA EMPLOYEES?

LEVEL OF STREES	NO OF RESPONDENTS	PERCENTAGE
1	36	28.3%
2	23	21.7%
3	24	22.6%
4	13	12.3%
5	16	15.1%
TOTAL	106	100%

SOURCE: Primary data

LEVEL OF STREES AMONG AIRPORT AUTHORITY OF INDIA EMPLOYEES

INTREPRETATION

The above table shows that the 28.3% of employees gave rating of 1, 21.7% of employees gave rating of 2, 22.6% of employees gave rating of 3, 12.3% of employees gave rating of 4, 15.1% of employees gave rating of 5.

INFERENCE – The majority of the employees 28.3% are gave rating of 1.

CHI SQUARE ANALYSIS

Are You Satisfied with the Current Stress Management and Stressors Is the First Step In The Stress Management Process

CURRENT STRESS MANAGEMENT/ STRESS MANAGEMENT PROCESS	1	2	3	4	5	TOTAL
1	0	13	20	5	15	52
2	1	5	10	5	3	27
3	1	4	5	3	2	15
4	0	2	2	3	0	7
5	3	2	0	0	0	5
TOTAL	6	26	37	16	21	106

SOURCE: Primary data

H0: There is no significant difference between the satisfied with the current stress management

H1: There is significant difference between the stressors is the first step in the stress management process

FORMULA

$$\text{Expected Frequency} = \frac{\text{Row Total} \times \text{Column Total}}{\text{Grand Total}}$$

Observed frequency (Oi)	Expected frequency (Ei)	Oi-Ei	(Oi-Ei)2	(Oi-Ei)2/Ei
0	2.94	2.94	8.64	2.93
13	6.13	6.87	47.19	6.86
20	18.15	1.85	3.42	1.84
5	7.84	-2.84	8.06	-2.83
15	10.30	4.7	22.09	4.7
1	1.52	-0.52	0.27	0.51
5	6.62	1.62	2.62	1.61
10	9.42	0.58	0.33	0.56
5	4.07	0.93	0.86	0.92
3	5.34	-2.34	5.47	-2.33
1	0.84	0.16	0.02	0.12
4	3.67	0.33	0.10	0.30
5	5.23	-0.23	0.05	0.21
3	2.26	0.74	0.54	0.72
2	2.97	-0.97	0.94	0.96
0	0.39	0.39	0.15	0.38
2	1.71	0.29	0.08	0.27
2	2.44	-0.44	0.19	-0.43
3	1.06	1.94	3.76	1.93
0	1.38	1.38	1.90	1.37
3	0.28	2.72	7.39	2.71
2	1.22	0.78	0.60	0.76
0	1.74	1.74	3.02	1.73
0	0.75	0.75	0.56	0.74
0	0.99	0.99	0.98	0.98
TOTAL				27.5

CALCULATION:

DEGREE OF FREEDOM (D.F) = (c-1) (r-1)

$$= (5-1) (5-1)$$

$$= 4*4$$

$$= 16$$

The table value 0.05 = 26.30 The calculated value = 27.5

Tabulated values is greater than the calculated value.

INFERENCE:

Since the tabulated values is greater than the calculated value the H0 is accepted where rejected H1. Hence it is concluded that there is significant relationship between the satisfied with the current stress management and stressors is the first step in the stress management process

FINDINGS:

- 46.2% of the respondents are responds frequent shift changes causes stress.
- 44.3% of the respondents are agree for enhancing employee satisfaction.

SUGGESTION

In airport management, stress is a constant companion due to the complex nature of operations, tight schedules, and high stakes a involved. To effectively manage stress in this dynamic environment, several strategies can be employed. Firstly, establishing clear communication channels and fostering a culture of open dialogue among staff and stakeholders can help alleviate misunderstandings and reduce anxiety stemming from uncertainty. Delegating tasks according to team members' strengths and capabilities not only distributes the workload but also empowers individuals, promoting a sense of ownership and collaboration

CONCLUSION

In conclusion, stress management within AI Airport Service Limited is not just a necessity but a strategic imperative. As a key player in the aviation industry, AI Airport Service Limited faces multifaceted challenges, from ensuring the seamless flow of passengers to maintaining stringent safety protocols. To address these challenges effectively, it's essential to prioritize the well-being of employees through robust stress management initiatives. Furthermore, implementing flexible work arrangements and recognizing achievements help to promote work-life balance and boost morale.

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CHAPTER 61

AN ASSESMENT ON CUSTOMER SATISFACTION TOWARDS TWISSTER SOLUTIONS, COIMBATORE

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ABSTRACT

The project report titled "customer satisfaction towards twisster solutions", Coimbatore. Customer satisfaction levers the strength of organizations, which are the most essential part of growth and development of the organization. In this context, Twisster solutions is in the stage of strengthening up its marketing functions, thereby creating a need to embrace the impact of its policies on their clients. The project aims at finding the satisfaction of customer towards twisster solutions in Coimbatore which would act as a stepping stone for the company to spread the activity to the entire country. A study of company documents was initiated to understand the customer satisfaction on towards the products and services of Twisster solutions which are generic to the organization as a whole. The questionnaire was framed to find out their satisfaction and preference for the products and services of twister solutions.110 respondents were taken as sample for this study and questionnaires were distributed to obtain their response. The collected questionnaires were put under the simple percentage.

Keywords

Customer satisfaction, stepping stone, clients.

INTRODUCTION

Customer satisfaction Phys a pivotal role in success of every business organization whether it is meant for a product or a service. Customers should be managed as assets, and that customers very in their needs, preferences, and buying behaviour. Customer satisfaction (often abbreviated as CSAT) is a term frequently used in marketing. It is a measure of how

products and services supplied by a company meet or surpass customer expectation. Customer satisfaction is defined as "the number of customers, or percentage of total customers, whose reported experience with a firm, its products, or its services (ratings) exceeds specified satisfaction goals." Customers play an important role and are essential in keeping a product or service relevant; it is, therefore, in the best interest of the business to ensure customer satisfaction and build customer loyalty.

Customer satisfaction is viewed as a key performance indicator within business and is often part of a Balanced Scorecard. In a competitive marketplace where businesses compete for customers, customer satisfaction is seen as a major differentiator and increasingly has become an important element of business strategy. In business the term customer satisfaction refers to how well a customer's expectations have been met by the product or service provided by a particular company. Customers experience satisfaction (or dissatisfaction) in response to not only the quality of a product but also the quality of service they receive, the atmosphere of the business in which they make the purchase, and various other intangible factors.

Business owners are increasingly aware that the success of their companies may depend to a significant extent upon whether they are able to attract and retain loyal customers. According to one estimate, the cost of attracting a new customer is five to seven times greater than the cost of retaining an established customer. Customer satisfaction is a key factor—some experts even argue that it is more important than price—in determining whether a customer will return to a business after his or her initial experience and whether the customer will be inclined to recommend the business to others.

Customer satisfaction is an abstract concept, and it is difficult to track. It is hard to know when a customer's expectations have been met after he or she has walked out the door of your business, and it is also difficult to know when he or she has been disappointed. Research indicates that less than 5 percent of customers express their dissatisfaction directly to the company, but that the average dissatisfied customer does express his or her dissatisfaction to approximately nine other people, such as friends, family, and coworkers. In contrast, customers do not broadcast their satisfaction as widely as their complaints: it is estimated that satisfied customers tell approximately five other people about the excellent service they received or the terrific product they purchased. A business must give serious

consideration to the way such word-of-mouth recommendations and criticisms will affect its financial performance. In general, it is widely believed that a company must figure out how to achieve a high level of customer satisfaction in order to be competitive in the marketplace.

REVIEW OF LITERATURE

S. Cecily (2022) Customer satisfaction is the overall happiness customers feel when interacting with a company's products and services as well as in comparison to what they have heard or seen about other firms or organizations. It is the basic entry point for a good business to start with. Customer loyalty, on the other hand is actually the result of an organization creating a benefit for a customer so that they will maintain their purchases from the organization. True customer loyalty is created when the customer becomes an advocate for the organization, without incentive. The objective of the study entitled 'Factors influencing customer satisfaction as well as internal processes' is to ascertain as to what extent the product related factors, customer related factors and firm related factors influence the customer satisfaction and internal processes.

Gomez and Gould (2022) observed in his study " The cool factor of public access to ICT user's perception of trust in libraries, telecaster, and cyber cafes in developing countries" that users are satisfied with the services offered in the centres, because it links them and their communities to wider audiences, facilitates external communication and promote knowledge of computer technology among local community.

Ramzeena Azeez (2022) asserts in their study " A study on E-governance and user satisfaction through Akshaya centres in Kerala; with special reference to Marangattupilli Panchayath in Kottayam District " that most of the people in the district of kottayam are not aware about the various services provided by Akshaya centres. Akshaya is only for the citizen to provide e- governance services and provide computer education to the people especially those from rural areas. The lack of awareness of Akshaya centre creates a gap between this initiative and public. There by they are unaware of the people friendly services provided through Akshaya centers. However, the study also identifies that majority of the users are satisfied with the Akshaya centre and its services.

Gronroos (2021) "A service is a process consisting of a series of more or less intangible activities that normally, but not necessarily always, take place in interactions between the customer and service employees and/or physical resources or goods and/or systems of the service provider, which are provided as solutions to customer problems".

Looy, Gemmel &Dierdonck (2021) "Customer behavior characterized by a positive buying pattern during an extended period (measured by means of repeat purchase, frequency of purchase, wallet share or other indicators) and driven by a positive attitude towards the company and its products or services. When the service quality exceeds the expectations, the service provider has won a delighted customer. Dissatisfaction will occur when the perceived overall service quality does not meet expectations"(Keiningham et al. 2003) "Customer satisfaction affects share-of-wallet positively"

Goran Svensson (2021)"Argued that most of the research has been done on the service receiver's perspective rather than service provider's perspective side. The author felt that an extended penetration of service encounters, and an extended abstraction of the service quality construct, taken together, provides great potential for future research opportunities in services marketing"

OBJECTIVES

- To know the consumer satisfaction towards the after sales services offers by packaging.
- To provide suggestions, knowledgeable about the services and the company sales and profitability.
- To know the consumer perception about the safety and comfort provided by packaging.

RESEARCH METHODOLOGY

Research Design

"Descriptive research has been applied, which is also known as statistical research, describes data and characteristics about the population or phenomenon being studied. Once

the theoretical framework was developed, the data collection procedure was planned and executed as research design.

Sample Design

A sample design is a definite plan for obtaining sample from a given population. Sample design method is used in selected samples. 110 respondents were selected for the study.

Statistical Tools used for Analysis

- Percentage Analysis
- Chi-Square Test Analysis
- Correlation

ANALYSIS

OBJECTIVE 1:

Table 1 Shows the Services Satisfaction of Consumers

PARTICULARS	RESPONDENTS	PERCENTAGE (%)
Strongly Agree	41	37
Agree	38	35
Neutral	23	21
Disagree	8	7
Strongly Disagree	0	0
TOTAL	**110**	**100**

Chart 1 To Shows the Service Satisfaction of Consumers

SERVICE SATISFACTION
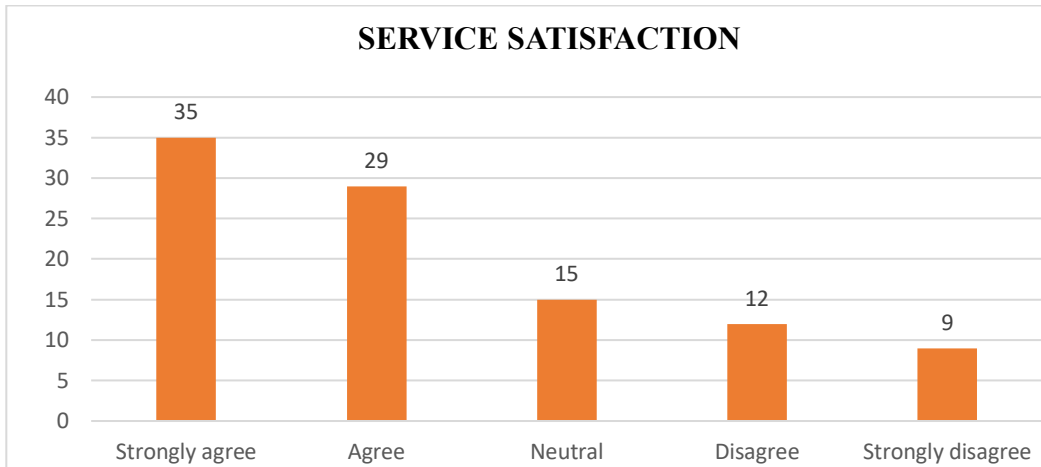
INTERPRETATION

From the above table 17 it is inferred that 37% of the respondents are strongly agree, 35% of the respondents are agree, 21% of the respondents are neutral, 0% of the respondents are strongly disagree, 7% of the respondents are disagree.

OBJECTIVE 2:

Table 2 Table Shows Knowledgeable About the Services

PARTICULARS	RESPONDENTS	PERCENTAGE (%)
Strongly Agree	38	35
Agree	32	29
Neutral	17	15
Disagree	13	12
Strongly Disagree	10	9
TOTAL	**110**	**100**

SOURCES: Primary Data

Chart 2 Chart Shows Knowledgeable About the Services
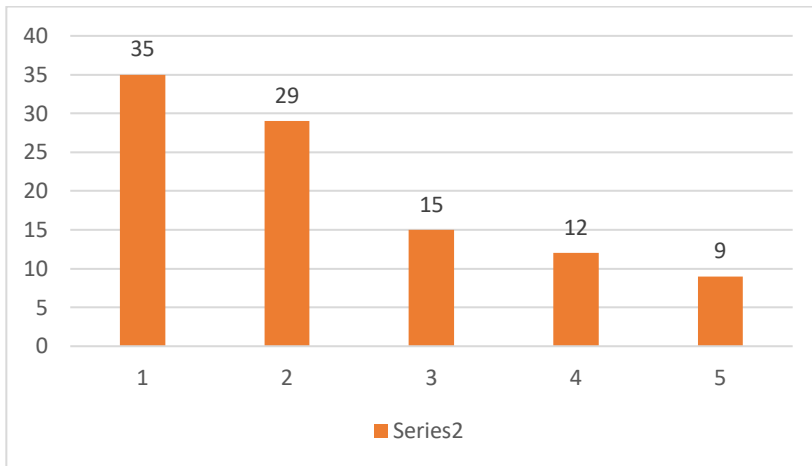
INTERPRETATION

From the above table 13 it is inferred that 35% of the respondents are strongly agree, 29% of the respondents are agree, 9% of the respondents are strongly disagree, 12% of the respondents are disagree, 15% of the respondents are neutral.

CALCULATION

Knowledgeable About the Services/Service Satisfaction	STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE	TOTAL
STRONGLY AGREE	10	15	6	10	0	**41**
AGREE	10	10	9	1	8	**38**
NEUTRAL	14	6	1	1	1	**23**
DISAGREE	4	1	1	1	1	**8**
STRONGLY DISAGREE	0	0	0	0	0	**0**
TOTAL	**38**	**32**	**17**	**13**	**10**	**110**

SOURCE: PRIMARYDATA

H0: There is no significant relationship between the Satisfied about service of twisster solution and Customer care executive knowledge about the service.

H1: There is significant relationship between the Satisfied about service of twisster solution and Customer care executive knowledge about the service.

Oi	Ei	Oi - Ei	(Oi - Ei)2	(Oi - Ei)2 / Ei
10	14.16	-4.16	17.30	1.22
15	11.9	3.1	9.61	0.80
6	6.33	-0.33	0.10	0.01
10	4.84	5.16	26.62	5.5
0	3.72	-3.72	13.83	3.71
10	13.12	-3.12	9.73	0.74
10	11.05	-1.05	1.10	0.09
9	5.87	3.13	9.79	1.66
1	4.49	-3.49	12.18	2.71
8	3.45	4.55	20.70	6
14	7.94	6.06	36.72	4.62
6	6.69	-0.69	0.47	0.07
1	3.55	-2.55	6.50	1.83
1	2.71	-1.71	2.92	1.07
1	2.09	-1.09	1.88	0.89
4	2.76	1.24	1.53	0.55
1	2.32	-1.32	1.74	0.75
1	1.23	-0.23	0.05	0.04
1	0.94	0.06	0.003	0.03
1	0.72	0.28	0.078	0.10
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

0	0	0	0	0
0	0	0	0	0
TOTAL				**32.39**

Degree of Freedom = (R-1) (C-1)

$\qquad$ = (5-1) (5-1)

$\qquad$ = 4x 4

$\qquad$ = 16

Degree of freedom 9 of 0.05% or 5% of significance level. The table value =26.30

The calculated value of 0.05 is 32.39 Since Tabulated value < Total calculated value.

INFERENCE:

Since the tabulated value is less than the calculated value the H0 is rejected where accepted H1. Hence it is concluded that there is significant relationship between the satisfaction of twister solution service and serve better service.

FINDINGS & SUGGESTIONS

- Majority of the respondents have stated that consumer satisfaction should be effective. To develop company infrastructure and modified indoor structure.

- Increases employees and encourage the employee for their performance. Accept customer complaints and request, to improve the service.

CONCLUSION

Customer satisfaction is one of the key issues being monitored by every service provider. Thus, customer satisfaction and loyalty survey the managing level of a business can ensure a way of knowing what the customer thinks about their service and what needs to be changed to gain positive customer satisfaction. Either thus a questionnaire, a mail-in survey, an internet survey or a poll, it is very important for a business to know what their customers think about their service, how satisfied are they with what the company offers, or how loyal are the customers to their company.

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CHAPTER 62

AN ASSESMENT ON EMPLOYEE ENGAGEMENT IN GOMUKI PACKAGED DRINKING WATER PVT LTD

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ABSTRACT

Employee Engagement is a vast construct that touches almost all parts of human resource management facts. If every part of human resources is not addressed in appropriate manner, employees fail to fully engage themselves in their job in the response to such kind of mismanagement. The construct employee engagement is built on the foundation of earlier concepts like job satisfaction, employee commitment and organizational citizenship behavior. Though it is related to and encompasses these concepts, employee engagement is broader in scope. Employee Engagement is stronger predictor of positive organizational performance clearly showing the two-way relationship between employer and employee, employee and employee compared to the three earlier constructs: job satisfaction, employee commitment and organizational citizenship behavior. Engaged employees are emotionally attached to their organization and highly involved in their job with a great enthusiasm for the success of their employer, going extra mile beyond the employment contractual agreement.

KEYWORDS

Job satisfaction, Employee commitment and organizational citizenship behavior, Employee Engagement.

INTRODUCTION

Employee Engagement also called worker engagement, a business management concept. An "Engaged employee is one who is fully insisted in enthusiastic about their work and this a part of employee retention.

Managers unequivocally agree that the century demands more efficiency and productivity than any other times in history. Business is striving to increase their performance angers have been grappling with many challenges to succeed putting their company ahead of competitors.

Among those suggested techniques, concepts like Total Quality Management (TQM) and Business Process Reengineering (BPR) earned recognition from many authors in the second half of twentieth century and were found helpful in increasing organizational performance by focusing on operational and process improvements. They were still being used as tool fie management in their efforts to plan, execute and control of the desired changes in the operational quality.

Numerous, often inconsistent, definitions of engagement exist in the literature. It is variously conceived as a psychological or affective state, a performance construct or an attitude Company based models view engagement as an outcome- engaged employees show commitment. Loyalty, exert discretionary effort, use their talents to the fullest and are enthusiastic advocates of their organization's values and goals.

Many see engagement as a step higher than satisfaction or motivation. Academic definitions focus on outcomes of engagement (advocacy, dedication, discretionary effort, fostering changes), the psychological state (employees fully involve themselves in work, are absorbed, focused and energized); and the two-way beneficial relationship between employer and employee.

Commitment: Commitment means the degree to which individuals associate themselves with the job, the responsibilities and the organizational objectives. Engaged employees are those are fascinated by their work and committed to face every challenge to attain their goals. They are dependable and highly productive and therefore, are accountable for what they do.

Motivation: Up till recently it was believed that the biggest motivation is achievement. The reverse is also true, which means achievement results in more motivation. If employees put in their 100 percent efforts to take their organization to the next level, this attained status motivates them more than anything. Proper rewards and recognitions can further motivate them more and more for their organization Motivation and achievement go hand and act as the burning fuels for the success of any organization.

Loyalty: Employees who are actively engaged in their work show more loyalty towards the organization. The best part is that they need less focus and attention of managers to perform their task as they themselves feel accountable for their job responsibilities and results attained.

However, it doesn't take much time for actively engaged employees to turn into disengaged employees if the organization doesn't have a well-established reward system. Recognition is a basic necessity of individuals to remain steered up towards their job.

REVIEW OF LITERATURE

Knight (2024), using a non randomized, matched control group, pre-test, post-test design showed that a participatory action intervention increased work engagement in nursing staff. As noted above, several other studies have shown the efficacy of job crafting interventions for increasing employee engagement. In practice, organizations typically define engagement as being a part of the organization, having pride and loyalty in the company, being committed, and going "above and beyond. In engagement, people employee and express themselves physically, cognitively, and emotionally during role performances. The cognitive aspect of employee engagement concerns employees beliefs about the organization, its leaders and working conditions. The emotional aspect concerns how employees feel about each of those three factors and whether they have positive or negative attitudes toward the organization and its leaders. The physical of employee concerns the physical energies exerted by individuals to accomplish their roles.

Wingerden (2023), This means that job crafting is an effective bottom up strategy to improve work engagement, because it increases the meaning of work and the fit between person and organization. One of the most important trends in the engagement literature centres on the increased number of intervention studies that has been published in recent years. Employee engagement is a complex, broad construct that subsumes many well searched ideas such as commitment, satisfaction, loyalty and extra role behavior. An engaged employee extends themselves to meet the organization's needs, takes initiative, reinforces and supports the organization's culture and values, stays focused and vigilant, and believe he can make a difference.

Albrecht (2022), there is a clear trend toward recognizing that HRM practitioners need to over beyond the routine administration of annual engagement surveys and need to embed engagement in HRM policies and practices such personnel selection, socialization, performance management, and training and development.

Kang (2021), engaged employees strengthen the organizations' competitive advantage and generate favourable business environment. Neeti and have reported that engagement is one of the important and powerful strategy to attract, nurture, retain, respect and manage the man power of the organization. They have also pointed out that married employees tend to have a higher level of engagement than those who are unmarried. Employee engagement is very important for any industry including healthcare and hospital because it has a diversity of workforce and greater number of employees works in a single organization.

OBJECTIVES

- To find the level of employee's satisfaction in the organization.
- To analyze the employee decision-making process in the organization.
- To measure the connection employees, have toward their work, team, organization.

RESEARCH METHODOLOGY

Research Design

"A Research Design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with the economy in procedure". The Research Design adopted for the studies is descriptive design. The researcher has to describe the present situation in order to know the behavior of the consumer. Hence descriptive research study is used. Descriptive Research can only report what has happened and what is happening.

Sample Design

A sample of 160 employees as respondents they are chosen in Gomuki Packaged Drinking Water. For the purpose of present study, a related sample of population was selected on the basis of Random Sampling Method. Finally, 110 employees as Respondents.

Statistical Tools used for Analysis

- Simple Percentage Analysis
- Chi-Square Test Analysis
- Correlation

ANALYSIS

OBJECTIVE 1:

Table 1 Shows the Satisfaction of Employees

PARTICULARS	RESPONDENTS	PERCENTAGE (%)
Strongly Agree	41	37
Agree	50	44
Neutral	15	14
Disagree	4	5
TOTAL	**110**	**100**

Chart 1 To Shows the Satisfaction of Employees
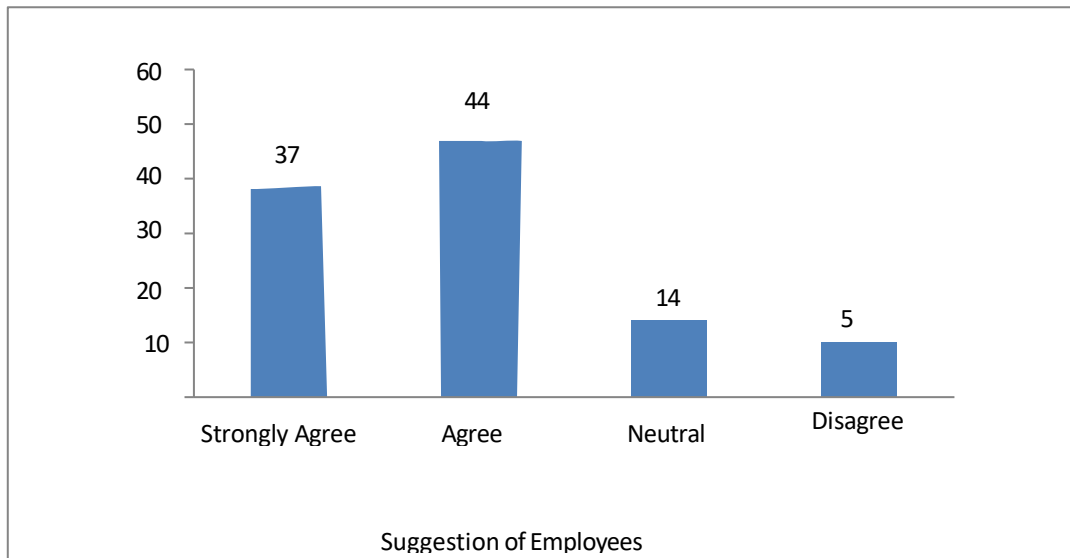
INTERPRETATION

From the above table inferred that, 26% employee are strongly agree, 50% of employee are agree, 14% of employee are neutral, 10% of employee disagree that they are informed about employee are allowed to suggest their views and ideas.

OBJECTIVE 2

Table 2 Table Shows Employee Decision-Making Process

PARTICULARS	RESPONDENTS	PERCENTAGE (%)
Strongly Agree	35	33
Agree	51	46
Neutral	16	14
Disagree	8	7
TOTAL	**110**	**100**

SOURCES: Primary Data

Chart 2 Chart Shows Employee Decision-Making Proces

Employee Engagement of organization
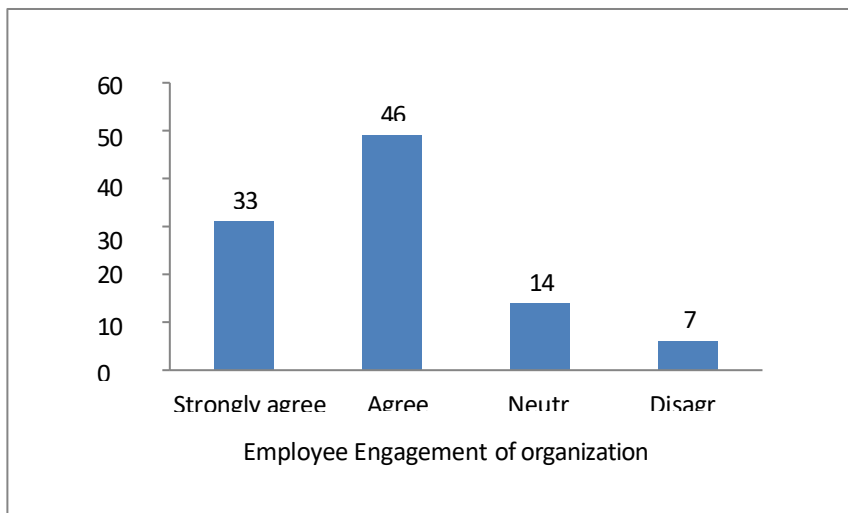
INTERPRETATION

From the above table inferred that, 31% employee are strongly agree, 49% of employee are agree, 14% of employee are neutral, 6% of employee disagree that they are informed rewards recognition improve the employee engagement.

CALCULATION

Knowledgeable About the Services/Service Satisfaction	STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE	TOTAL
STRONGLY AGREE	18	8	6	3	35	18
AGREE	15	32	4	0	51	15
NEUTRAL	7	7	2	0	16	7
DISAGREE	1	3	3	1	8	1
Total	**41**	**50**	**15**	**4**	**110**	**41**

NULL HYPOTHESIS HO

There is No significant association between the decision-making process and self-satisfaction improving on your company.

ALTERNATIVE HYPOTHESIS H1

Hypothesis there is significant association between decision making process and self-satisfaction improving on your company.

Oi	Ei	Oi - Ei	(Oi - Ei)2	(Oi - Ei)2 / Ei
18	13.045	4.955	24.552	1.882
8	15.909	-7.909	62.552	3.931
6	4.772	1.228	1.5079	0.315
3	1.272	1.728	2.985	2.346

15	19.636	-4.636	21.492	1.094
32	23.181	8.819	77.774	3.355
4	2.181	1.819	3.308	1.516
0	1.854	-1.854	3.437	1.853
7	5.963	1.037	1.075	0.180
7	7.272	-0.272	0.073	0.010
2	2.181	-0.181	0.032	0.014
0	0.581	-0.581	0.337	0.580
1	2.981	-1.981	3.924	1.316
3	3.636	-0.636	0.404	0.111
3	1.090	1.91	3.648	1.909
1	0.290	0.71	0.504	1.737
TOTAL				**22.149**

Degree of Freedom = (R-1) (C-1)

$$= (4-1)\ (4-1)$$

$$= 3x\ 3$$

$$= 9$$

Degree of freedom 9 of 0.05% or 5% of significance level. The table value =16.919

The calculated value of 0.05 is 22.419 Since Total value < Total calculated value.

INFERENCE:

Calculated value is greater than table value, so Ho is rejected.

H1 Alternative hypothesis there is sign association between the decision-making process and self-satisfaction improving on your company.

FINDINGS & SUGGESTIONS

- Majority of the respondents have stated that employee Engagement should be effective. Make the employees to participate in various activities that would help them to grow and engage better.

- Conduct more of employee engagement activities like mentorship programs, collaborations, cross trainings. Employees need more opportunities to learn and grow in the organization and also appreciation towards their work success.

CONCLUSION

Employee Engagement leads to increase the performance of the organization and it improves the relationship among the employees. It also improves the relationship between employer and employee. The study entitled "A Study on Employee Engagement", which deals about analyzing the employee engagement towards working environment and working practices. This study deals with the importance of employee engagement in the working environment and the way to improve the employee engagement. The employee engagement is analyzed based on working environment, relationship with workers and management, rewards and recognition, personnel and career growth opportunities and workers participation in management. From the study it is found that majority of respondents shows satisfaction towards working environment.

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CHAPTER 63

A STUDY ON EMPLOYEE JOB SATISFACTION IN ELGi EQUIPMENT'S LTD, COIMBATORE

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ABSTRACT

The aim of the study is to analyze the Employee job satisfaction in Elgi equipment's Ltd, Coimbatore and to give remedial measures to overcome the present situation and to implement the Job satisfaction is among the stringent challenge faced by managers, in particular to manage employees. Previous studies have demonstrated unusually large impact on job satisfaction especially on the motivation of workers. As the level of motivation has an impact on productivity, it will affect the performance of business organizations. Thus, the goal of this study is to determine the significance difference in job satisfaction between male and female, single and married, ages and experiences in group of respondents. The result showed that there is a significance difference between male and female worker, and between single and married workers. The finding shows significance different when ages of groups of respondents were considered and no significance different in a group of workers that is based on experience. This article aims to provide medium among employers and employees to find common ground for the satisfaction level to ensure a harmony environment of working.

OBJECTIVES OF THE STUDY

Primary Objective:

- To study on Employees job satisfaction in ELGi Equipment's Ltd, Coimbatore.

Secondary Objective:

- To analyze the working environment in ELGi Equipment's Ltd.

- To know the satisfaction level towards salary package of ELGi Equipment's Ltd.

- To know the level of satisfaction towards employee welfare measures in the ELGi Equipment's Ltd.

REVIEW OF LITERATURE

Hoppock (2022)

Hoppock defined job satisfaction as any combination of psychological, physiological and environmental circumstances that cause a person truthfully to say I am satisfied with my job According to this approach although job satisfaction is under the influence of many external factors, it remains something internal that has to do with the way how the employee feels. That is job satisfaction presents a set of factors that cause a feeling of satisfaction.

Vroom (2022)

Vroom in his definition on job satisfaction focuses on the role of the employee in the workplace. Thus, the he defines job satisfaction as affective orientations on the part of individuals toward work roles which they are presently occupying.

Table Shows Friendly Work Environment Can Relive Stress

SI. No	Parameters	No. of Responses	Percentage
1	yes	117	98
2	no	3	2
Total		120	100

Source: Primary Data

Chart Shows Friendly Work Environment Can Relive Stress
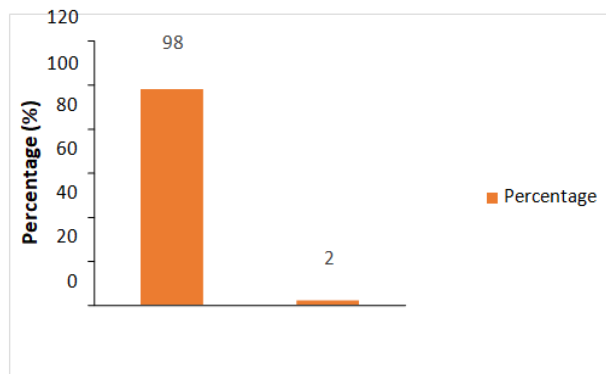
INFERENCE

It is clear from the above Chart identified that out of 120 respondents, 98% of the respondents are Yes and 2% of the respondents are No.

CHI - SQUARE TEST

Comparison Of Relive Stress and Good Working Relationship with Your Colleagues.

NULL HYPOTHESIS (H0):

There is no Significant relationship between relive stress and good working relationship with your colleagues

ALTERNATIVE HYPOTHESIS (H1):

There is significant relationship between relive stress and good working relationship with your colleagues.

Relive stress/ Good working relationship with colleagues	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total
Yes	61	42	13	2	0	117
No	0	1	2	0	0	3
Total	61	42	15	2	0	120

FORMULA

$$\text{Expected Frequency} = \frac{\text{Row Total} \times \text{Column Total}}{\text{Grand Total}}$$

CALCULATION

Degrees of freedom = (r-1) * (c-1)

= (2-1) * (5-1)

= 1 * 4

= 4

Degree of freedom 4 of 5% significance level

Calculation value = 9.039

Table value = 9.488

Tabulated value is greater than the calculated value.

INFERENCE

Since the Tabulated value is greater than the calculated value the H1 is rejected where accepted H0. Hence it is concluded that there is no significant relationship between relive stress and good working relationship with your colleagues.

Correlation Test Correlation of Compensation Package and Current Rewards and Recognition Process Is Well Managed.

Compensation Package(X)	6	52	32	24	6
Current rewards and recognition process is well managed (Y)	20	62	32	6	0

The table for requisite calculation is as follows:

X	Y	X2	Y2	XY
6	20	36	400	120
52	62	2704	3844	3224
32	32	1024	1024	1024
24	6	576	36	144
6	0	35	0	0
$\sum X=120$	$\sum Y=120$	$\sum X2=4376$	$\sum Y2=5304$	$\sum XY=4512$

FORMULA

$$n = 5$$

$$\mathbf{r} = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{\sqrt{[n\Sigma x^2 - (\Sigma x)^2][n\Sigma y^2 - (\Sigma y)^2]}}$$

$$r = 0.8570$$

INFERENCE

This is high positive correlation between compensation package (X) and current rewards and recognition process is well managed (Y).

FINDINGS

- 98% of the respondents are friendly work environment can relieve stress.
- 50% of the respondents are good working relationship with your colleagues.
- 42% of the respondents are manager treats all of your team members equally.
- 43% of the respondents are satisfied the compensation package.

SUGGESTION

- The compensation package will be improved in the organization.
- The reward and recognition process does not satisfy employees, so improve it for well-managed employees.
- The employee welfare facilities that the organization improved
- The organization's insurance policy can be modified.

CONCLISION

The project entitled a study on employee's job satisfaction in elgi equipment's ltd, Coimbatore was undertaken to know about the employee job satisfaction in the organization. The, result of the study indicates the compensation package, food quality and taste, reward and organisation for job dissatisfaction of employees. On the other hand, secure job environment, welfare policies and safety measures and job stability increase the job satisfaction of employees. Efficient human resource management and maintaining

higher job satisfaction level not only the performance also professional and personal career development. If they are satisfied, they will work with commitment and project a positive image of the organization.

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CHAPTER 64

A STUDY ON EMPLOYEES PERFORMANCE APPRAISAL IN KOTHARI SUGARS AND CHEMICALS LTD, KATTUR

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ABSTRACT

The aim of the study is to analyze the Performance appraisal at Kothari Sugars and Chemicals Ltd, Kattur and to give remedial measures to overcome the present situation and to implement the performance appraisal in an effective manner. So, the main objective of the study is to analyze the non functioning of the present system and to make it effective for all levels of employees. Thus, this study will help the company to know the importance of performance appraisal and also how it will be helpful in motivating the employees to perform in a better manner. Appraisal is a continuous process done annually as a formal exercise before completion of the financial year. Appraisal has tremendous motivational impact on people through meaningful feedback and is a powerful tool for recognition. This project explains performance appraisal system and tries to find out how efficiently performance appraisal is conducted. And if performance appraisal doesn't meet its objective, then, what are the factors causing failure.

OBJECTIVES OF THE STUDY

PRIMARY OBJECTIVES

- A study on Employees performance appraisal in Kothari Sugars and Chemicals Limited, Kattur.

SECONDARY OBJECTIVES

- To find the satisfaction of the employees with the existing performance appraisal system.
- To analyze the promotion is purely based on performance appraisal.

- To analyze the performance appraisal helps in individual goals and organizational goals.

REVIEW OF LITERATURE

Review of literature is said to be a previous study conducted by a person on the topic. In that he/she analyses about a problem and he/she may suggest some solution to solve the problem. From collecting studies, the researchers may get some ideas about the concept and it helps the researchers in preparing the questionnaire and it also enhance the researchers to know more about the topic and latest information's related the study.

Okoth and Florah (2021) The aimed to establish the influence of performance appraisal on motivation of public secondary school teachers in Gem Sub- County. The findings of the study revealed that fairness and impartiality in performance appraisal system, performance appraisal feedback, performance rewards and performance goal setting had a positive and significant effect on teacher motivation in Gem sub-country

Ramila Ram Sign & S. Vadivelu (2020) The mentioned in their paper about the performance appraisal in India. Retention of' the employees in the organization is a difficult task for the management. Motivation plays a key role in this aspect. Performance appraisal is a tool to know the employee performance in various aspects, It is useful for salary increment, promotion, staff retention and to reinforce staff behaviour. above referred literature shows that Performance Appraisal is only tool in assessing the employee's tasks and responsibilities matching their capability. A comparison has been done in public and private sector enterprises where private sector appraisals have been more effective.

STATISTICAL TOOL USED

- Percentage analysis
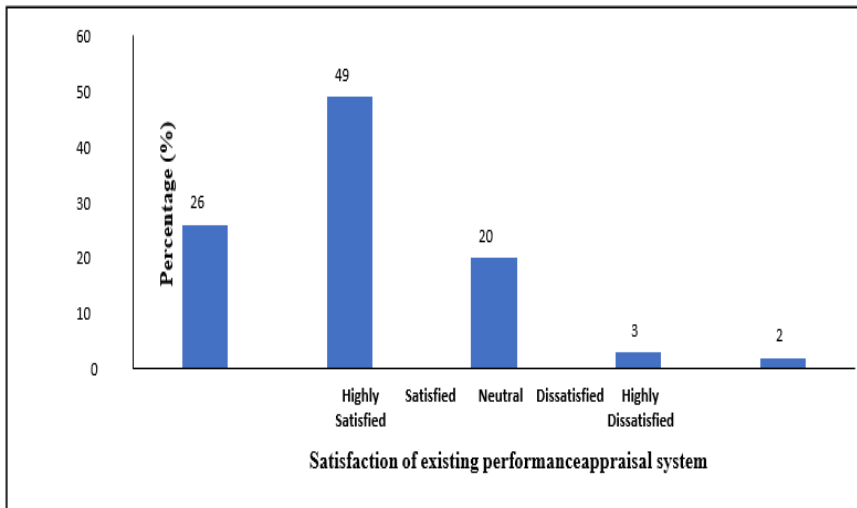- Chi – square test
- Correlation test

PERCENTAGE ANALYSIS

Table Showing the Satisfaction of Existing Performance Appraisal System

Satisfaction of existing performanceappraisal system	No. of Respondents	Percentage (%)
Highly Satisfied	32	26
Satisfied	59	49
Neutral	24	20
Dissatisfied	3	3
Highly Dissatisfied	2	2
Total	**120**	**100**

Source: Primary Data

Chart Showing the Satifiacation of Existing Performance Appraisal System:

INFERENCE

From the above table it is inferred that 49% of the respondents are satisfied with the existing performance appraisal system. 26% of the respondents are highly satisfied. 20% of

the respondents are neutral. 3% of the respondents are dissatisfied. 2% of the respondents are highly dissatisfied with the existing performance appraisal system.

CHI - SQUARE ANALYSIS

Table showing the comparison of work experience of the employees and satisfaction of existing performance appraisal system

Null Hypothesis:

H0 = There is no significant relationship between experience and satisfaction of existing performance appraisal system.

Alternative Hypothesis:

H1 = There is significant relationship between experience and satisfaction of existing performance appraisal system.

Work Experience / Satisfaction of existing performance appraisal system	Below 2yrs	3-6yrs	7-10yrs	Above 11yrs	Total
Highly Satisfied	5	12	9	6	32
Satisfied	8	25	19	7	59
Neutral	4	14	6	0	24
Dissatisfied	2	1	0	0	3
Highly Dissatisfied	1	1	0	0	2
Total	20	53	34	13	120

$$\text{Expected Frequency} = \frac{\text{Row Total} * \text{Column Total}}{\text{Grand Total}}$$

Oi	Ei	Oi – Ei	(Oi – Ei)²	(Oi – Ei)² /Ei
5	5.333	-0.333	0.1089	0.020
12	14.133	-2.133	4.536	0.321
9	9.0667	-0.067	0.0044	0.0004
6	3.4667	2.54	6.4516	1.864
8	9.8333	-1.83	3.348	0.340
25	26.0583	-1.05	1.1025	0.042
19	16.716	2.29	5.244	0.313
7	6.3917	0.61	0.372	0.058
4	4	0.0	0.0	0.0
14	10.6	3.4	11.56	1.090
6	6.8	-0.8	0.64	0.094
0	2.6	-2.6	6.76	2.6
2	0.5	1.5	2.25	4.5
1	1.325	-0.32	0.1024	0.077
0	0.85	-0.85	0.7225	0.85
0	0.325	-0.325	0.1056	0.324
1	0.333	0.67	0.4489	1.360
1	0.883	0.12	0.0144	0.016
0	0.57	-0.57	0.3249	0.57

0	0.217	-0.217	0.0470	0.216
			TOTAL	**14.6554**

CALCULATION

Degrees of freedom = (r-1) * (c-1)

$\qquad$ = (5-1) * (4-1)

$\qquad$ = 4 * 3

$\qquad$ = 12

Level of significance = 5% Calculation value = **14.6554** Table value = **21.03**

Tabulated value is greater than the calculated value.

INFERENCE

Since the Tabulated value is greater than the calculated value the H1 is rejected where accepted H0. Hence it is concluded that there is no significant relationship between experience and satisfaction of existing performance appraisal system.

CORRELATION TEST ANALYSIS

Table showing the comparison of promotion is purely based on performance appraisal and management fixes salary through the performance appraisal

Promotion ispurely based on performance appraisal (X)	42	46	29	2	1
Managementfixes salary through the performanceappraisal (Y)	46	64	9	1	0

The table for requisite calculation is asfollows:

X	Y	X^2	Y^2	XY
42	46	1764	2116	1932
46	64	2116	4096	2944
29	9	841	81	261
2	1	4	1	2
1	0	1	0	0
120	120	4726	6294	5139

$\sum X = 120,$ $\qquad \sum Y = 120,$ $\qquad \sum X^2 = 4726,$

$\sum Y^2 = 6294,$ $\quad \sum XY = 5139,$ $\quad n = 5$

FORMULA

$$r = \frac{n \sum XY - (\sum X)(\sum Y)}{\sqrt{n (\sum X^2) - (\sum X)^2} \; \sqrt{n (\sum Y^2) - (\sum Y)^2}}$$

$$r = \frac{5 (5139) - (120)(120)}{\sqrt{5 (4726) - (120)^2} \; \sqrt{5 (6294) - (120)^2}}$$

$$r = 0.8998$$

INFERENCE

This is high positive correlation between promotion is purely based on performance (X) and management fixes salary through the performance ratings (Y).

FINDINGS

- Majority 49% of the respondents are satisfied with the existing performance appraisal system.

- Majority 44% of the respondents are having 3- 6 years of work experience

- Majority 38% of the respondents are agree with the promotion is purely based on performance appraisal.

- Majority 48% of the respondents are agree with the appraisal helps in individual goals and organizational goals.

SUGGESTION

According to this survey you already giving the great appraisal system that will reduce the employee's grievances. So, keep continued this appraisal system that will helpful for the future improvement of the organization.

The respondents are having negative opinion towards the performance appraisal increases employees motivation. So, the organization has to improve the Performance appraisal system should motivate the employees and increase their performance level in their work.

CONCLUSION

The project entitled "A STUDY ON EMPLOYEES PERFORMANCE APPRAISAL IN KOTHARI SUGARS AND CHEMICALS LTD, KATTUR" was undertaken to know about the performance appraisal system in the organization. The result observed and achieved in this project clearly indicates that there exists a proper performance appraisal system in the organisation. Performance appraisal is an important part of an organization but the performance appraisal process is incomplete without the feedback given to the employee about his appraisal and his performance. The way performance appraisal is conducted will lead to employee's satisfaction and will ultimately help the organisation in achieving its goals. The employee training and development programs, target-based appraisal, performance related pay for employees, feedback of the employees all these to improve their performance. The appraisal system is made on the aim to improve the employee

performance the positive effect on employee's performance. Business environment condition affect on or anization overall performance and employee performance as well. In addition, it is concluded that the performance appraisal plays key role in any organization success.

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