PROCEEDINGS OF

2nd NATIONAL CONFERENCE ON

RECENT TRENDS OF ENGINEERING, SCIENCE AND MANAGEMENT

(NCRTESM 2023)   (An initiative of IQAC, GGSESTC, Bokaro)

"Industry 5.0: Towards a Human Centric, Resilient, Digital Twins & Transformative Vision"

03rd – 04th November, 2023

ORGANIZED BY

GURU GOBIND SINGH EDUCATIONAL SOCIETY'S TECHNICAL CAMPUS

Kandra, Chas, Bokaro, Jharkhand 827013

IN ASSOCIATION WITH

JHARKHAND UNIVERSITY OF TECHNOLOGY

Ranchi, Jharkhand

झारखण्ड प्रौद्योगिकी विश्वविद्यालय

JHARKHAND UNIVERSITY OF TECHNOLOGY

Jharkhand, Ranchi

झारखण्ड प्रौद्योगिकी विश्वविद्यालय

विज्ञान एवं प्रावैधिकी परिसर, सिरखाटोली, नामकुम राँची, पिन कोड-834010 (झारखण्ड)

Proceedings
of
2ⁿᵈ National Conference on

Recent Trends of Engineering, Science and Management

(NCRTESM -2023)

Theme

"Industry 5.0: Towards a Human-Centric, Resilient, Digital Twins & Transformative Vision"

03ʳᵈ - 04ᵗʰ November, 2023

Organized by

Guru Gobind Singh Educational Society's Technical Campus
Chas, Bokaro – 827013, Jharkhand, India

in association with

Jharkhand University of Technology
Namkum, Ranchi - 834010, Jharkhand, India

Title: **Proceedings of National Conference on Recent Trends of Engineering, Science and Management (NCRTESM-2023)**

Author: **Dr. Priyadarshi Jaruhar**

JHARKHAND UNIVERSITY OF TECHNOLOGY
Science & Technology Campus, Sirkha Toli, Namkum, Ranchi-834010

Letter No- JUT-910/2022/1323   /Ranchi, Dated: 18/08/2023

To,

Dr. Priyadarshi Jaruhar
Director, GGSESTC, Bokaro

Sub:- Acceptance letter to participate as a "Chief Patron" in National Conference on Recent Trends of Engineering, Science and Management (NCRTESM 2023).

Ref:- GGSESTC/Kandra/JUT, Ranchi/NCETESM 2023/133/2023, Dated:- 11-08-2023

Sir,

With reference to above cited subject, you are hereby informed that the Vice-Chancellor accepts with pleasure your invitation as "Chief Patron" for the National level Conference on Recent Trends of Engineering Science and Management-2023 scheduled on 3rd & 4th November 2023 at GGSESTC, Bokaro.
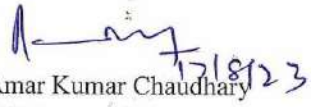
Your Sincerely

Sd/-

Dr. Amar Kumar Chaudhary
Registrar,
Jharkhand University of Technology, Ranchi

Memo No.:- JUT-910/2022/1323   /Ranchi, Dated: 18/08/2023

Copy to:-   1. The Vice-Chancellor, JUT, Ranchi for kind information and needful action.

                2. All Officers and Staff of JUT, Ranchi for kind information.

Dr. Amar Kumar Chaudhary 17/8/23
Registrar,
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Message from VC, JUT Ranchi

Prof. (Dr.) D.K Singh, Honorable VC, JUT, Rnachi

Guru Gobind Singh Educational Society's Technical Campus (GGSESTC), Bokaro in association with Jharkhand University of Technology (JUT), Ranchi is organising second "National Conference on Recent Trends of Engineering, Science and Management (NCRTESM-2023)" on 3rd and 4th November, 2023. This year the topic is "***Industry 5.0: Towards a Human Centric, Resilient, Digital Twins & Transformative Vision***". I welcome academicians, faculty members, scholars, participants and students to this conference for sharing their learning on a single stage. JUT is an autonomous body intended to impart higher, technical education and skill development and other such programs in the state of Jharkhand, India. Through the present conference GGSESTC, Bokaro and JUT, Ranchi, aim to bring together leading scientists, researchers and research scholars to exchange and share their experiences and research results about all aspects of Engineering, Applied Science & Management.

JUT admires GGSESTC for their ongoing dedication to preparing their students for the professional world. The second National Conference, 2nd NCRTESM-2023, stands as a testament to GGSESTC's commitment.

The national conference will provide an interdisciplinary platform in hybrid mode to share latest research and innovation experiences and facilitate the development of cutting-edge applications. This event is poised to enhance collaboration and knowledge exchange for the betterment of all involved. I am looking forward to the conference, 2nd NCRTESM-2023 and I extend my best wishes for all the success to NCRTESM-2023.

Prof. (Dr.) D.K. Singh

Message from Special Secretary, Higher and Technical Education, Govt. of Jharkhand

Shri Anil Kumar Singh, IAS, Special Secretary, Higher and Technical Education, Govt. of Jharkhand

The 2ⁿᵈ National Conference on *"Industry 5.0: Towards a Human Centric, Resilient, Digital Twins & Transformative Vision"* represents a significant milestone in our collective journey to understand and adapt to the transformative era of Industry 5.0. In this age of unprecedented technological advancement, Industry 5.0 marks a paradigm shift. It's not just another step forward in automation and manufacturing; it's a revolution that revolves around the central tenet of human-centricity. It's a recognition that while technology continues to advance at an astounding pace, we must ensure that it aligns with, complements, and enhances the human experience in our industries.

Throughout this conference, we have the unique opportunity to explore, discuss, and learn about the key facets of Industry 5.0. We'll delve into the critical dimensions of human-technology interaction, the integration of AI, the Internet of Things, and advanced robotics. We'll discuss the ethical implications and the responsibilities that come with these advancements. And, most importantly, we'll strive to find the right balance between human expertise and technological prowess.

As we embark on this intellectual journey, let us keep in mind that Industry 5.0 is the future of humanity itself. We must ensure that our technological pursuits remain ethical, inclusive, and sustainable, benefiting not just a privileged few, but society as a whole.

Shri Anil Kumar Singh

Message from President, GGES

Shri Tarsem Singh

Hon'ble President, GGES, Bokaro, Jharkha

It is with great pleasure that I welcome you to the 2nd National Conference on *"Industry 5.0: Towards a Human Centric, Resilient, Digital Twins & Transformative Vision"* organized by GGSESTC, Bokaro in association with Jharkhand University of Technology, Ranchi on 3rd and 4th November, 2023. It is a pivotal event that marks our collective commitment to embracing the future of industry.

Industry 5.0 represents a profound transformation in the way we conceive, create, and conduct business. It is a convergence of cutting-edge technologies and a re-imagined approach to industry that will not only drive economic growth but also enhance the quality of our lives. In this conference, we explore the pivotal role of Artificial Intelligence, Internet of Things, and advanced robotics in shaping our future.

I encourage you all to engage in profound discussions, to challenge the status quo, and to harness the collective wisdom present here to envision an Industry 5.0 that is technical, ethical, equitable, and environmentally responsible. I congratulate the Director, all Faculty members and all students for organizing the 2nd National Conference. I am sure that their endeavours will be widely discussed and the participants will have meaningful interaction and exchange of information and learning during the course of National Conference. I wish the 2nd NCRTESM-2023 a grand success.

Shri Tarsem Singh

Message from Secretary, GGES

Shri Surendra Pal Singh
Hon'ble Secretary, GGES, Bokaro, Jharkhand

It brings me immense joy to extend a warm welcome to all of you for the two-day National Conference on Recent Trends in Engineering and Management-2023 (2nd NCRTSEM-2023). This event is centred on the theme of **"Industry 5.0: Towards a Human-Centric, Resilient, Digital Twins, and Transformative Vision".** It is proudly organized by GGSESTC, Kandra, in collaboration with the Jharkhand University of Technology.

In 2011, Guru Gobind Singh Educational Society's Technical Campus (GGSESTC) embarked on its journey towards academic excellence. This esteemed Technical Campus is a venture of the Guru Gobind Singh Educational Society, which oversees multiple educational institutions across the nation.

The vision and mission of GGSESTC is to provide world class education, training and research opportunities in fields of Technology, Management and other disciplines to students and to became a centre of academic excellence and be an ecosystem vehicle for aspiring technologists and entrepreneurs.

I commend the dedicated efforts and hard work put forth by the organizing committee for this significant second National Conference on "Industry 5.0: Towards a Human-Centric, Resilient, Digital Twins, and Transformative Vision" (2nd NCRTSEM-2023), which promises to bring great benefits to all participants and stakeholders. My heartfelt best wishes for its success.

Shri Surendra Pal Singh

Message from Director, GGSESTC, Bokaro

Prof. (Dr.) Priyadarshi Jaruhar, Director, GGSESTC, Bokaro

It is with great pleasure that I extend a warm and heartfelt welcome to each and every one of you to the second National Conference on *"Industry 5.0: Towards a Human-Centric, Resilient, Digital Twins & Transformative Vision."* We are honoured to host this distinguished gathering of minds, where the legacy of scientific giants merges with the innovative spirit of our times.

From the global stage, we acknowledge luminaries such as Albert Einstein, whose ground breaking theories laid the foundation for modern physics and industry, and Marie Curie, whose pioneering research in radioactivity has applications far beyond the laboratory.

In the digital domain, the visionary ideas of Tim Berners-Lee, the inventor of the World Wide Web; and Sheryl Sandberg, who championed digital transformations at Facebook, illuminate the transformative potential of our connected world.

This conference serves as a platform to harness the wisdom of these eminent figures and infuse it with the energy of the present. The 2nd NCRTESM-2023 has received diverse research papers from across India, including Human-Centric Approaches, Resilience, Digital Twins, Sustainability, Cyber security, AI, Ethics, and more. I extend my gratitude to each of you for being part of this transformative journey. The insights and discoveries that will emerge from this conference have the potential to redefine our industrial landscape and usher in a new era of human-centric, resilient, and digitally transformative innovations.

Prof. (Dr.) Priyadarshi Jaruhar

Contents

Paper Presentation

Agriculture Monitoring System Using Wireless Sensor Network: Iot based

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Abstract- The recent shifts in climate patterns have heightened the significance of monitoring agriculture, making it a timely and vigorously pursued research field. This project aims to gather essential on-field data, including air moisture, air temperature, soil temperature, humidity and soil salinity by utilizing a wireless sensor network system throughout the crop growth period. This data is subsequently transmitted to users via the internet of Things (IoT). It can be updated frequently to a cloud platform, enabling users to monitor field conditions based on sensor readings and motor statuses. We propose an IoT-base monitoring system for continuous field monitoring using specific user addresses. Additionally, users have advantages of remotely controlling the motor through a web-based terminal, with motor operation being contingent on soil moisture levels. Depending on the moisture level, the motor is automatically switched on or off in the agricultural land, and this status is conveyed to the monitoring section. In this way, we present a method for efficiently transmitting data over long distances with minimal energy consumption.

Keywords- Soil Moisture, Water Irrigation, IoT, Humidity & Temperature.

1. Introduction- Agriculture currently consumes 85% of the world's available freshwater resources, and this proportion is expected to remain dominant due to population growth and increased demand for food. It is imperative to develop science and technology-based strategies for the sustainable management of water resources, encompassing technical, agronomic, managerial and institutional enhancements.

The primary objective of this research is to minimize unnecessary water usage in agricultural fields. By eliminating unexpected water consumption, a significant amount of water can be conserved. The irrigation system is activated only when soil moisture levels are insufficient, determined by a microcontroller that decided when to turn the pump on or off. This approach not only saves a considerable amount of time and water for farmers but also meets the growing demand for food production more efficiently. Additionally, it provides much-needed relief to farmers, as they no longer have to manually control the pump's operation. In many countries, such as India, where agriculture is widespread, but climatic conditions vary widely, there is still untapped potential in agricultural resources. An Automated Irrigation system offers a significant advantage in that it supplies water only when the soil's moisture falls below a predefined threshold. In contrast, traditional methods rely on labour-intensive control, with farmers manually turning the water pump on and off at regular intervals.

2. BASIC ELEMENTS-

Humidity & Temperature Sensor:- The AM2302 is a humidity and temperature sensor that outputs a calibrated digital signal. It employs exclusive digital signal collecting techniques and humidity sensing technology to ensure reliability and stability in its measurements. Here are some key features and details about the AM2302:
Digital Output: The sensor provides a digital output, making it easy to interface with microcontrollers and other digital devices.
Exclusive Digital Signal Collecting Technique: This technology likely refers to the sensor's method of accurately capturing and processing digital signals from its sensing elements.
Humidity Sensing Technology: The sensor uses advances technology to measure humidity levels accurately.
Connected to 8-bit Single-Chip computer: The sensing element of the AM2302 is connected to an 8-bit single-chip computer, which likely handles the processing and communication of sensor data.
Temperature Compensation: The sensor compensates for temperature variations to provide accurate humidity measurements.
Calibration: Each sensor is calibrated in an accurate calibration chamber, and the calibration coefficients are stored in the OTP (One-Time Programmable) memory. This allows the sensor to adjust its measurements based on the calibration data, ensuring accuracy.
Low power consumption: It consumes minimal power, which is advantageous for battery-powered applications.
Long Transmission Distance: The sensor can transmit data over a distance of up to 100 meters. Making it suitable for applications where the sensor needs to be located remotely form the data collection point.
Four-Pin package: The sensor is typically packaged in a single-row configuration with four pins, making it easy to connect to a circuit or microcontroller.

Overall, the AM2302 is a versatile sensor suitable for a wide range of applications, including those in harsh environments where reliability, stability and accurate humidity and temperature measurements are essential. It is commonly used in weather stations, environmental monitoring, HVAC systems and other applications where humidity and temperature control is critical.
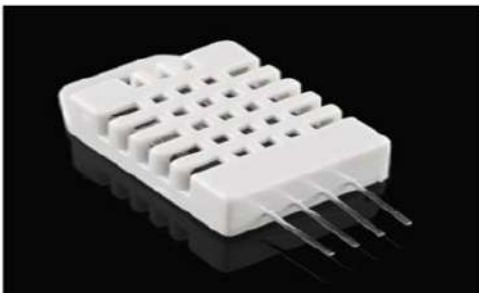
Figure1 displays an image of the AM2302 sensor.

The DHT11 produces a calibrated digital signal output, leveraging an exclusive digital signal collection technique and humidity sensing technology. These features guarantee the sensor's reliability and stability. Its sensing components are integrated with an 8 bit single-chip computer, resulting in a compact size, low power consumption and the ability to transmit data over long distances(up to 20 meters). Furthermore, it comes in a single-row package with four pins, simplifying the connection process for users.

3. Microcontroller ESP-32

The ESP32-WROOM-32D utilizes the ESP32-DOWDQ6 microcontroller, which boasts dual-core Tensilica LX6 processing power. In terms of wirelss connectivity it supports both Wi-Fi (802.11 b/g/n at 2.4 GHz) with robust security features like WPA/WPA2-PSK and WPA3, as well as bluetooth 4.2 and Bluetooth low energy(BLE). This module features dual CPU cores with a clock speed that can reach up to 240MHz. It possesses 4 megabytes of Flash memory (equivalent to 32 megabits) for program and data storage, complemented by 520 kilobytes of SRAM. With 38 GPIO pins that offer diverse functions including digital input/output and analog input, it accommodates a range of external components.
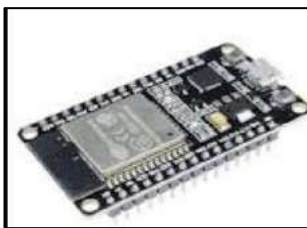
Figure2 displays an image of the ESP32-WROOM-32D

Its interfaces include UART, SPI, I2C, I2S, PWM, ADC and DAC along with a Micro-USB port for programming and debugging. Operating at 3.3V, This module can endure temperatures from -40℃ to +85℃ and its power consumption varies based on workload but can be as low as a few milliwatts in active mode aknd about 10 microamps in deep sleep mode. Security is bolstered by secure Boot, Flash Encryption, Hardware-accelerated cryptography and the secure Hash Algorith (SHA-2). It also ensures wireless coexistence between Wi-Fi and Bluetooth. Moreover, compatible with development environments like the Arduino IDE and ESP-IDF, it supports wireless firmware updates via OTA and it boasts a compact form factor generally measuring around 25.5mm*18mm. It features an internal PCB antenna for Wi-Fi and BLE connectivity.

Soil Moisture Sensor-The moisture sensor serves the purpose of assessing soil moisture levels. When the soil experiences a shortage of water, the module's output is set to a high level, conversely, when the soil is adequately moist, the output is set to a low level. This sensor is particularly useful for automating the watering of plants, such as flower plants, that require consistent moisture levels. The module offers three different output modes: digital output, which is straightforward, analog output, which provides more precise reading; and serial output for obtaining exact data readings. The probe is typically subjected to a frequency excitation to enable the measurement of the dielectric constant.
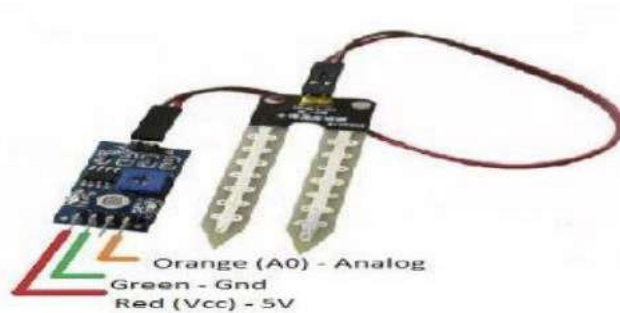
Figure illustrates the moisture sensor

1. Operating voltage: 3.3v-5v
2. Dual output mode with analog output for higher accuracy
3. Equipped with a fixed bolt hole for easy installation
4. Features a power indicator(red) and a digital switching output indicator(green).

pH Sensor- pH levels play a crucial role in various aspects of agriculture, including soil quality, irrigation water and the effectiveness of pesticides in spray tank solutions. Soil and water pH levels significantly impact nutrient availability to crop, and pH levels in spray tanks determine the efficiency of pesticide applications. This versatile meter serves multiple purposes to create an optimal growing environment for all types of plants. It enables testing of soil alkalinity/acidity, soil moisture and sunlight (Figure 1).

Figure: 1 illustrates the pH sensor.
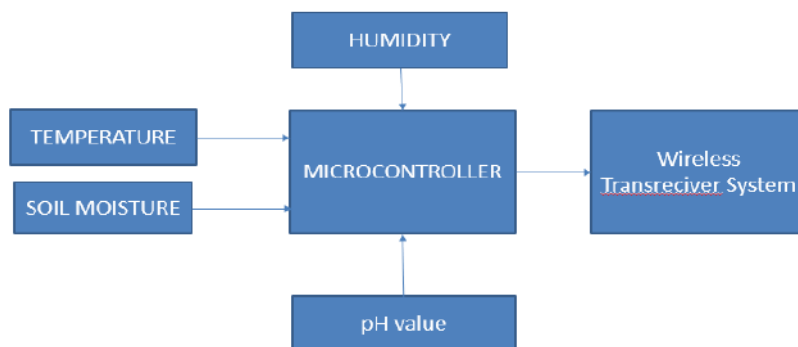
Figure: 2 Block diagram of Wireless Sensor Networks

In our agriculture land monitoring research, we have designed a system that utilizes a variety of sensors to gather essential data about the conditions on the agricultural field. These sensors provide information such as air temperature, humidity, soil temperature, soil moisture pH levels throughout the growing season. The data collected by these sensors sent to a central processing unit, the ESP-32 microcontroller. Simultaneously, based on the moisture value detected by the sensors, the microcontroller controls a relay to turn the motor on or off as needed to manage irrigation (Figure 2).

The microcontroller then facilitates the transmission of this data to a monitoring station using radio communication through a wireless transceiver. In the monitoring station, another microcontroller receives the data from the transceiver and sends it to an IoT platform, which is equipped with preformatted code for efficient data handling and visualization. The IoT platform processes and stores this data, making it accessible for analysis and monitoring. The results, including

information about the agriculture land's parameters such as temperature, humidity, soil conditions as well as the motor's operational status are them displayed on a dedicated display unit. This integrated system offers real-time monitoring and control, enabling farmers to optimize their agricultural practices and ensure the ideal conditions for crop growth.

4. Conclusion-

In conclusion, addressing the pressing issue of water resource management in agriculture is paramount as agriculture currently consumes a significant 85 % of the world's available freshwater resources with this proportion expected to remain high due to population growth and increasing food demands. This research aims to tackle the challenge by minimizing unnecessary water usage in agriculture. By implementing an automated irrigation system that activates only when soil moisture levels fall below a specific level, we can conserve a substantial amount of water. This not only benefits farmers by saving time and resources but also contributes to efficient food production to meet growing demands.

In countries like India, where agriculture is widespread but climatic conditions vary significantly, automated irrigation systems offer a notable advantages over labor-internsive manual control methods. By integrating these components into a comprehensive system, we can monitor and manage essential agricultural parameters such as temperature monitor and manage essential agricultural parameters such as temperature, humidity, soil moisture, pH levels and irrigation enabling farmers to make informed decisions and optimize their farming practices. This integrated approach provides real-time monitoring and control contributing to sustainable and efficient agriculture while conserving vital water resources.

The widespread adoption of the 'Internet of Things' is evident in connecting devices and collecting data and this agriculture monitoring system leverages IoT to provide farmers with vital information about air temperature and humidity in their fields. Importantly, this system is cost-effective and consumes minimal power, making it a practical solution for farmers. It has been designed to be highly efficient and advantageous for agricultural operations including greenhouse cultivation and temperature-sensitive crops. Looking ahead, there is room for improvement by incorporating modern techniques which can further enhance the system's capabilities and sustainability.

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Case Study on Ease of Digital Prototype Using Autodesk Fusion 360 with Special Reference to Handicraft Sector

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Faculty of Management,
Rabindranath Tagore University, Bhopal

Abstract: This paper aims to represent the application and effect of Autodesk Fusion 360 on the digital prototype in terms of ease of CAD designing with special reference to handicraft sector. Analysis has been given on performance of software in terms of time management, productivity, ease of working, cost involved for non-technical design such as handicraft items like lamps, pots etc. A case study is shown on how from 2-Dimensional design got converted into 3-Dimensional model along with conversion of drawing into render image and manufacturing sheet. The strength of Fusion 360 software is shown with various features provided in this platform. The limitations of the software have also been shown.

Keywords : CAD, Software, Autodesk Fusion 360, handicraft, parametric

1. INTRODUCTION:

With explosion of technology in our day-to-day life, no-one can deny the huge role technology is playing our life. When technology is spoken, it cannot be in isolation with the advent of Industry 5.0. It comes with software's which runs the Technology innovation. There is various softwares which is used in industry with special mention of design industry. One area where lot of development can be seen is CAD design Industry which stands for Computer Aided Drafting and Designing. When any product is made in early days, physical small model called prototype was made. With advent of CAD software, digital prototypes are common now-a-days to test the product before actual manufacturing takes place. CAD us used to create virtual model with excellent images from all side views.

Generally, before manufacturing begins, various steps were involved with inclusion of minimum 3-4 different software's.

Step 1 : CAD software used for 2D sketches and 3D model

Step 2: Strength analysis of the product is carried out in some another software.

Step 3: The Final prototype product images are generated and fine-tuned in Photo editing tools such as Photoshop, Corel Draw, Lumion etc

Step 4 : For manufacturing , another set of software tool is used to create the product and verify if that can be physically produced or not like in CNC Lather and milling machine or 3D printing machine etc.

With the advent of Fusion 360 which is a platform developed by Autodesk Inc, and United States of America firm mostly known for its product AutoCAD, these various steps can be done in one single platform. It had huge creativity in designing of all fields from technical engineering sectors to Handicraft, jewellery sector etc. This software allowed cloud storage, team collaboration with minimum constraints and high end features which allow industry to use this software at ease thereby saving valuable time, money and with creative freedom to innovate products as per user or market demand.

As per Deepa Sachin Ghag, CAD has developed drastic creativity in design sector.

2. Literature Review

Deepa Sachin Ghag. Case Study on CAD Technology in Jewellery Industry concluded that CAD software allows designers to simplify the iterative design or to easily change or edit details of the raw sketches, to facilitate sketching of jewellery products in any sizes, and to reduced required time for making models. Matrix software has engineering approached of parametric & non-parametric for producing jewellery 3D CAD models with high-rate productivity, high-rate accuracy, and quick editing in models possible because several specialized jewellery designing tools available, good presentation tool with rendering images & animation tools for Sales & Marketing. This approach will be increased sale as well as reduce the cost of maintaining physical inventory of model. As software can produced real image of product by various rendering tool.

Somlak Wannarumon and Erik L.J. Bohez. Rapid Prototyping and Tooling Technology in Jewelry CAD reported that When CAD and RP are used collaboratively, it is capable of designing and making mold directly without any prototype, they thus can shorten the production time. CAD and RP technologies offer the great benefits to the jewelry industry from the design stage through manufacturing process.

Ms. Palak Kaushal and Dr. Prabhjot Kaur, 2016, Diffusion of CAD/CAM Technology in Inward and Outward-Oriented Hosiery Units of Ludhiana observed that CAD/CAM technology has revolutionized the knitting industry by pervasive use of computer systems to design products, plan production, control operations and execute various business-related functions needed in manufacturing firms.

Md Moniruzzaman, Afroza Akter Rita and Saudia Haque Oishe. An approach to design solutions for garments using a CAD system interfere that Designs are usually created without understanding that certain principles are the basis for the creation. Design analysis will play a vital role in ensuring the project begins and remains on track. This can often help to estimate the performance of a product before it even exists as an integral part of design activities. Analyze the designs and

determine which principles to apply to the developing pattern to ensure that the replica of the design will emerge from the finished pattern shapes.

Musa Adamu Musa, Henry Abanda et.al Assessment of BIM for Managing Scheduling Risks in Construction Project Management study investigates the application of BIM in managing scheduling risk of construction projects. It order to properly minimize the risk of schedule delay in projects; construction sequencing activities need to be adequately digitized and BIM offers the opportunity to integrate vital aspects of project management that considerably improve scheduling risk management.

3. RESEARCH METHODOLOGY

Researcher took reference from various published papers and articles in CAD-CAM technology and manufacturing sector. Thorough study was done from various research techniques used by researchers in this area of study. Based on that theoretical framework along with practical in the Fusion 360 software was done.

Theoretical Framework

Researcher did details study on Fusion 360 software with technical angle to each specification systems applied in various domain of subject matter.

Case Study

The following methodology was applied to test the ease of working in the Fusion 360 software while designing Light Panel-a handicraft bamboo product.

       Step 1: Develop 2-Dimensional sketch of the model
       Step 2: Convert 3-Dimensional sketch into 3-Dimensional model by applying various tools in Fusion 360
       Step 3: Applying Rendering technique on the model.
       Step 4: Testing Strength of model using Simulation
       Step 5: Developing drawing sheets and testing the ease of working

Through these various steps, the strength of software, ease of working in software, reverse engineering possibilities, cloud sharing and control of project in the Fusion 360 was tested.

Analysis

The final phase included the time and ease of working analyses with accuracy, productivity and quality of product being made. Fusion 360 allows the designers to simplify the iterative design, easily modify and adjust the sketches, reverse engineering of product, changes in size or parts relation which help in shorten time required compared to any other multiple software's.

Fusion 360

Fusion 360 Autodesk Fusion 360 combines CAD, CAM, CAE, and PCB into a single, integrated cloud software platform. It includes all the tools that you need to go from design to manufacturing, seamlessly (Wikipedia contributors, 2022b). As per Autodesk Inc. Autodesk Fusion 360 combines CAD, CAM, CAE, and PCB into a single, integrated cloud software platform. It includes all the tools that you need to go from design to manufacturing, seamlessly. It explores design iteration with easy to use 3D modelling tools, produce high-quality CNC machined parts with integrated CAD/CA, gain access to unified electronics design, Test the performance of your design with 3D simulation tools. It explores manufacturing -ready outcomes with generative design, collaborate and manager data seamlessly in the cloud.

       Fusion 360 is capable of:
- ❖ Parametric Modelling
- ❖ Mesh Modelling
- ❖ Surface Modelling
- ❖ CAD & CAM integration
- ❖ Extremely realistic renders
- ❖ Printed Circuit Board (PCB) layout , planning and manufacturing
- ❖ Cooling of electronics
- ❖ Topology & shape optimization

Fusion 360 have following platforms to do multiple task in one space:
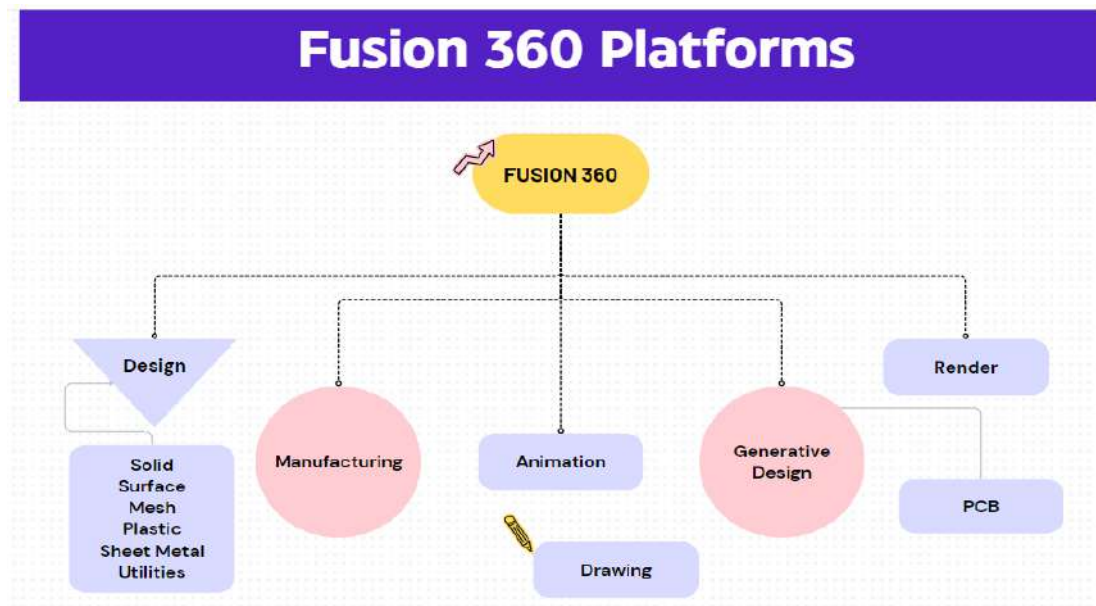
Flow Chart of Fusion 360 Platform

Complex shapes can be modelled with complete range of geometric data in 3Dimensional model. Animation of model can be done which allow to control and maintain accuracy in the design process. Not only that the product protype can be directly manufactured using most commonly used additive technique such as 3D Printing or subtracting manufacturing technique like CNC machine by directly generating G-Code within the software.

4. CASE STUDY ON EASE OF DIGITAL PROTOTYPE ON LIGHT PANEL USING AUTODESK FUSION 360

The case study was done to find out how this software help in designing products from wide array of areas particularly in the field of Handicraft. A Light Panel was created which is the non-parametric model was first created and later on dimensions were put to check whether reverse engineering was possible and with how much ease things can be developed. Fusion 360 is a high end software which generally found to be very good with technical manufacturing related product but aim here was to test the software in non-technical handloom based product which can help artisans to quickly design products so that product life cycle can be reduced and more profit artisan can get with wide variety in the product they are offering.

The given sketch how we can transform two- dimensional sketch into three dimension and apply modification tools to generate the design. This software is compatible with almost all design, rendering, CAD software. IGES (Initial Graphics, Exchange specification) is a standard that defines a neutral form for the exchange of information amongst dissimilar computer -aided design (CAD) and with computer-aided manufacturing (CAM) and computer visualization systems. (Deepa Sachin Garg, 2019). All the rendering plug-ins like V-Ray , Autodesk rendering can be used with Fusion 360.

The study statistics are as follows:

Software Cost	Rs.22,000/year
Total Invested Year for Study	3 year approximately
CAD Proficiency	1 year
Time Required for completing Design	1 hour required to complete CAD model. So, in eight hours, around 7 models can be designed keeping 1 hours for drafting of design. (As on average 8 hours of work duration is kept by government standard)
CAD Software model per month	7 x 26 = 182 models per month, depending on complexity of CAD model. It complex model is to be designed it can take more time. So, complex model can take maximum 3 hours to complete, still in a month 67.5 models in a month can be easily made by one person.
CAD model cost	Rs.200/ - Rs.300/ model

Fusion 360 has seven platforms which can do wide array of works starting from Design in Solid, Mesh, Plastic, Surface to Render, Animation, Manufacturing, Drawing. It is parametric software where easily reverse engineering can be applied along with going to timeline to see the model progress. The in-build library items enable to develop 2D model into 3D model quickly and easily.

It can be used to design 2D and 3D PCB circuit design so make in India start-ups can use this software for chip making. Government of India is giving support and guidance in making these chips which was largely dominated by China in past. Generative design of this software help us preserve geometry and apply relevant study condition like material used, manufacturing technique, load applied and give multiple options to design and create the model.

The case study concludes that Fusion 360 can be used by artisans, handicraft manufacturing people also to create faster and easy design which will help in reducing the product cost, quickly supplying demand of market and generating more revenue. As huge cloud space is provided in this software, it fits into industry 4.0. Working in team stationed at different locations can be easily done as it has cloud data access with high security available.

5.   LIMITATION OF FUSION 360

Although this software is great for designing of any sector or field, but it has few limitation or drawbacks. They are :

1. Dependency on Internet: Biggest drawback of this software is user need to have good Internet facility while working in this software as everything stores in cloud and many advance features like advanced Rendering, Generative design and drawing is processed in cloud.

2. Frequent Updates: The software Pop-ups with lots of updates on regular basis which can be irritating for users sometimes.

3. Malware Risks: Many a time, software crash due to Malware attacks which need to be addresses.

6.   CONCLUSION

The research based on case study on how Autodesk Fusion 360 can be used in handicraft industry although is a technical software. It was evaluated on productivity, investment, approached, accuracy, ease of working, flexibility, cloud - computing. This software allows designer to simplify the design and change it anytime, thereby reducing the product to market time duration. Not only that this software allows changes in dimension, shape and size anywhere during the process of designing. This software being a parametric in nature has high rate of productivity, accuracy and reverse engineering process.

The ability to generate G-Code within the software helps user to produce handcrafted design using 3D printing tools which can give impetus to their product. This will help in increasing the sale as well as reducing the cost of making physical prototype as within the software various iteration can be produced. This software can help those who are not from technical field and wants to continue the legacy of historical design their community is making by giving it a contemporary touch with very less time.

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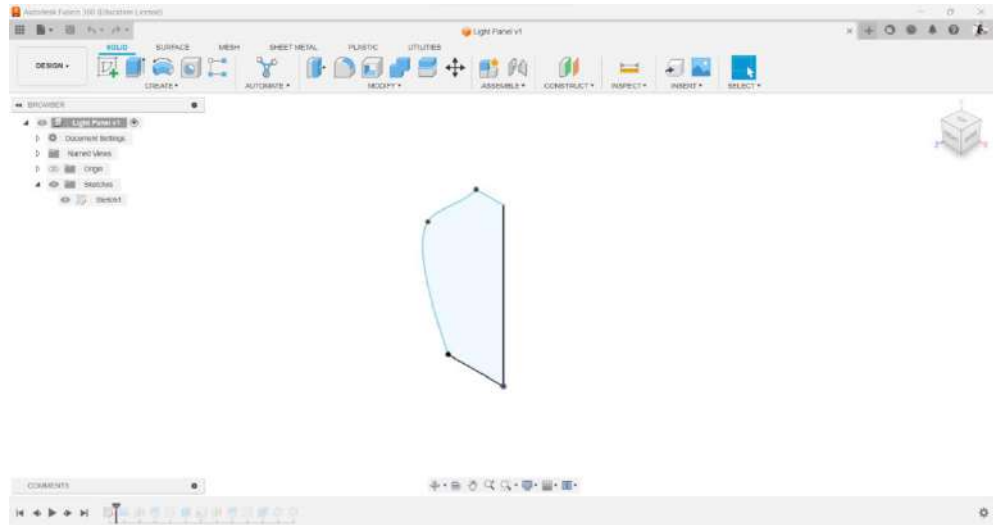12. Prem Chandra , 2021. AutoCAD and Computer. DOI: 10.17148/IARJSET.2021.8956
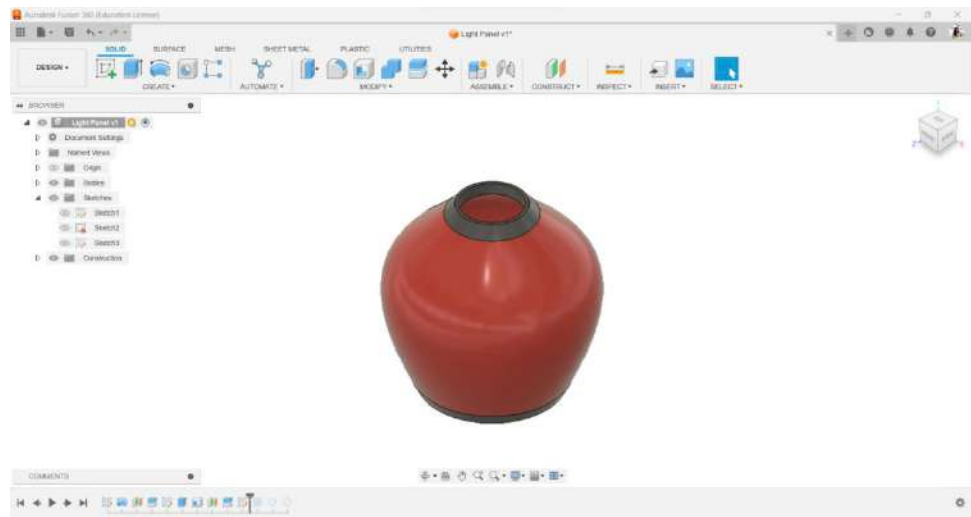
Figure 1: 2D Model in Fusion 360

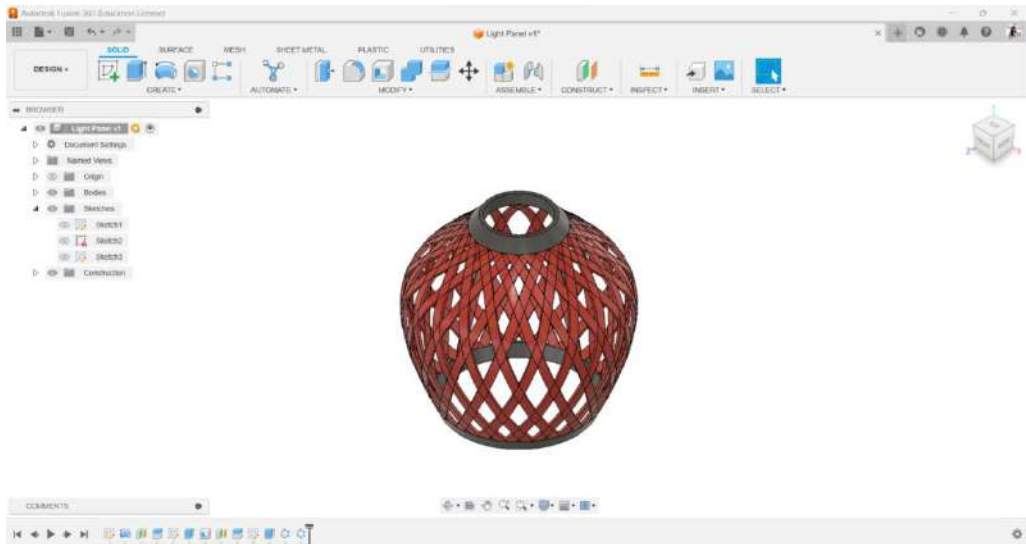Figure 2: 3D Model in Fusion 360

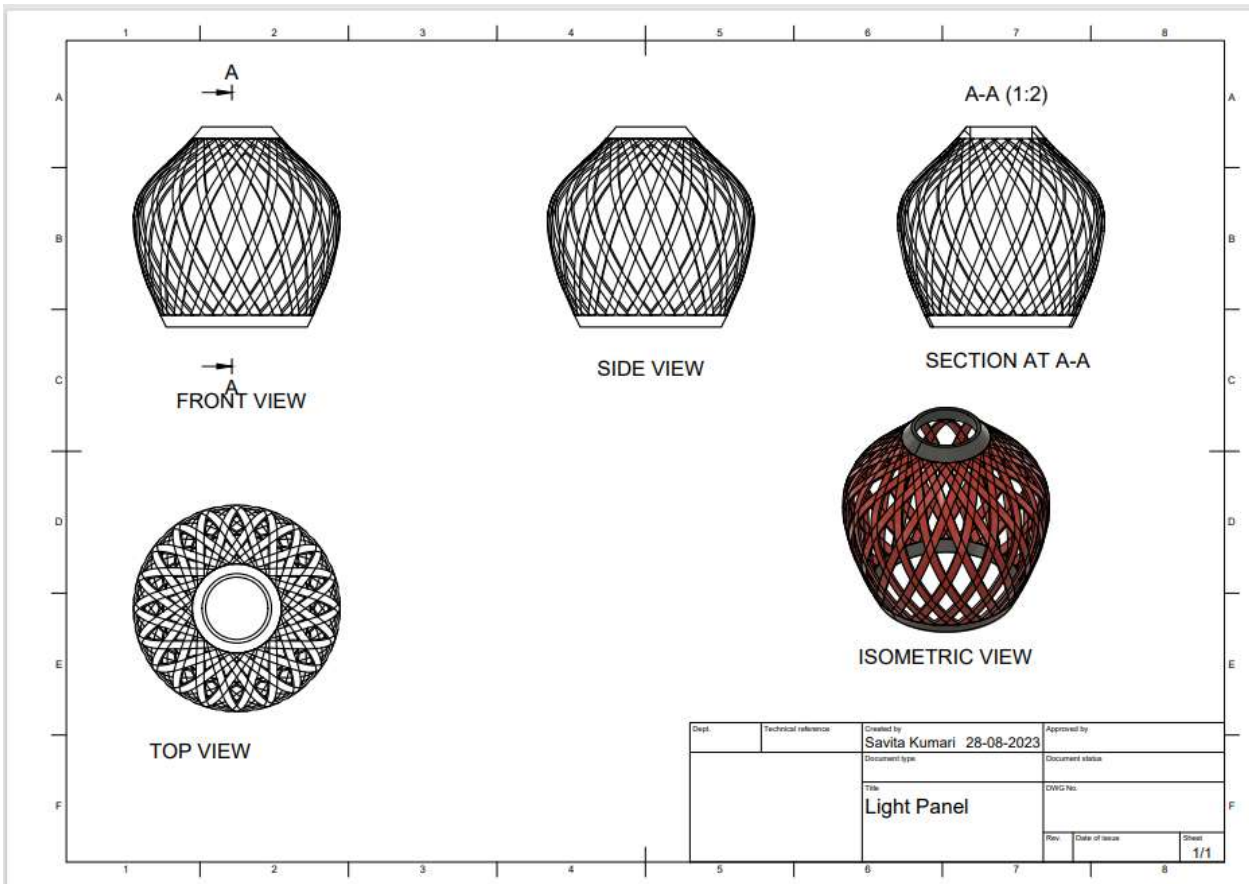
Figure 3: 3D altered design in Fusion 360

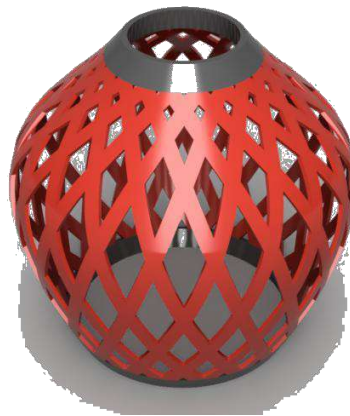Figure 4: Ready to Use Drawing sheet with Title Box

Figure 5: Rendered Image in Perspective View in Fusion 360

Generation of High Aspect Ratio Micro-features by Electrochemical Micromachining

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Abstract- Electrochemical micro-micromachining (EMM) is one of the significant micromachining technologies for manufacturing of high aspect ratio micro-features with high quality surface finish. Experimental research was carried out to identify the effect of pulsed frequency of voltage, microtool shape and thickness of workpiece on high aspect ratio micro-features. This paper deals with the micro manufacture of high aspect ratio micro-features on stainless steel sheet of thickness of 200 µm to 900 µm. Average aspect ratio of 700 µm deep micro hole and microchannel are 5:1 and 4.83:1 respectively. Average aspect ratio of 900 µm deep micro hole and microchannel are 5.75:1 and 5.1:1 respectively.

Keywords: High aspect ratio, Microchannels, Micro hole, Micro-features, Microtool

1. Introduction

It is widely agreed that the development of micromachining technologies are necessary to meet the demand of micro-technology based products like micro sensors, switches, chemical micro-reactors, microchip, printed circuit board, micro fuel injection nozzles in automobile engines for fine spray of fuels, stress free cooling micro holes in aerospace industry, biomedical systems, micro-fluidic systems and micro-electromechanical systems (MEMS) etc. Micromachining technology has become popular due to recent trend in societies to have micro products in narrow space to accommodate huge human populations. Micromachining technologies are also useful in saving material, energy catering to the needs of micro products with enhanced functionalities. High aspect ratio micro features may have application in high volume flow in micro reactors, micro-fluidic devices, high capacity microelectronic cooling, inkjet printers etc. Fabrication of high aspect ratio micro-features have been reported by electro discharge machining (EDM), electron beam machining (EBM), and laser beam machining (LBM) but these are based on thermal energy and hence, heat affected zone, micro cracks, residual stresses in the work piece are common disadvantages in addition to process specific limitations. Electrochemical micromachining (EMM) is gaining importance as a micromachining technology due to specific advantages like no residual stress, no heat affected zone, no tool wear, ability to machine complex shapes irrespective of hardness, better surface finish etc.

Sinking and milling method of microchannel generation in EMM is better in terms of reduced overcut, taper angle and time of machining [1]. In this method, initial sinking is done vertically to final depth or required depth followed by milling. A metal microstructure was fabricated based on electroplated copper with channels of width 15 µm and aspect ratio up to 5:1 in a single electroplating step using a modified ultra violate lithography (UV-LIGA) process [2]. An investigation was carried out on shape, size, surface quality and elemental characterization of high aspect-ratio blind micro holes in die sinking micro EDM [3]. Micro grooves of width of less than 50 µm with an aspect ratio of 3 on brass and micro grooves of width 100 µm on stainless steel with an aspect ratio of 1 have been machined by micro end mills [4]. Breaking of microtools during the grinding process was the major difficulty in addition to poor surface finish. Subsequent electrochemical polishing was required to remove burrs. A micro column of 20 µm width, 40 µm length and 85 µm height was fabricated on SS-304 sheet with a WC disk-type electrode of disk diameter 54 µm and 22 µm neck diameter made by micro EDM. Aspect ratio of the column was about 4.25 [5]. A nickel based microchannel cooling plate with channels of width 20 µm and aspect ratio 3.6 was fabricated using a modified UV-LIGA technique in a single electroplating step. An electroplated copper with channels of width 15 µm and aspect ratio up to 5 was also fabricated [6]. Through hole of φ 13.6 µm entry and φ 10.5 µm exit was drilled on 100 µm thick stainless steel sheet using ultra-short pulses with tens of nanosecond duration. Thus, aspect ratio of 8.29 was achieved for one dimensional i.e. vertical movement of microtool [7].

EMM of microproducts of high aspect ratio is a challenging task before the researchers. Investigation has been carried out to perform micro fabrication of high aspect ratio micro-features on high strength stainless steel by EMM for the possibility of wide application in the area of surgery, micro reactors, microelectronic cooling, biotechnology etc. In this paper, mathematical modeling for high aspect ratio micro-hole and micro-channel has been done for in depth analysis of requirements. SS-304 stainless steel sheets of thickness 200 µm to 900 µm have been used for experimentation. Suitable shape of microtool has also been selected for generation of high aspect ratio micro-features. Proper methodology of EMM has been planned to overcome the difficulties in EMM of high aspect ratio micro-features.

2 Principle of EMM for high aspect ratio micro-feature

EMM is an anodic dissolution of metal by electrochemical reaction where, anodic work piece and cathode tool are separated by an appropriate electrolyte and pulsed power is applied for better localization of current. Current passes through the narrow gap of 5-20 µm between microtool and workpiece. At the interface of electrode and electrolyte, the metal goes to the electrolyte as ions, but applied voltage greater than activation potential is needed for ions to cross energy barrier. A potential is applied between anode and cathode for anodic dissolution. The machining rate is not only controlled by electrolyte resistance but also influenced by pulse duration and pulse frequency. The charging time constant (τ) for the double layer of specific capacity (C_{dl}) is $\tau = \rho_s\, C_{dl}\, g$. Where inter-electrode gap distance is denoted by g and the specific

electrolyte resistivity is ρ_s. Aspect ratio of a micro-feature is defined as the ratio of depth of machining, h to the width of machining, b. In the case of hole, b equals to hole diameter. Aspect ratio is expressed as given below:

$$\text{Aspect Ratio} = h/b \qquad (1)$$

Again, width of machining is given by $b = d + 2y$ (2)

Where, d is the maximum diameter of microtool actively involved in machining and y is the overcut. Overcut in the case of hole is defined as half of the difference between diameter of machined hole and maximum diameter of microtool actively involved in EMM. Overcut in the case of microchannel is defined as half of the difference between the width of microchannel and maximum diameter of microtool participating in EMM. Hence, to increase aspect ratio of micro-feature, it is obvious from Eq. 1 that depth of machining should be higher. For a fixed depth of machining, width of machining is to be minimized to achieve higher aspect ratio. To minimize the width of machining, active diameter of microtool has to be reduced as far as possible and also, overcut is to be minimized by controlling the machining parameters. Mathematically according to Faraday's two laws of electrolysis, amount of material dissolved per unit time is given by

$$\frac{dm}{dt} = \frac{iM}{zF} \qquad (3)$$

Where, m = mass dissolved, t = dissolution time in s, i = current in Amperes, M = molecular mass, z = valency of anodic metal, F = Faraday constant. From Eq. 3, MRR per pulse can be calculated as follows:

$$m_{pulse} = \int_{\tau}^{T_{on}} \frac{AE^{*}Mdt}{\rho_S \, g \, z \, F} \qquad (4)$$

Where, T_{on} is pulse on time, A is active tool area involved in EMM and E* is the flat voltage acquired by pulse power after the charging of double layer during the charging time, τ. E* can be read from oscilloscope as shown in Fig. 1 [8]. Eq. 4 can be written as follows:

$$m_{pulse} = \frac{AE^{*}M(T_{on} - \tau)}{\rho_S \, gz \, F} \qquad (5)$$

Where $(T_{on} - \tau)$ is the Faradaic time or dissolution time per pulse.
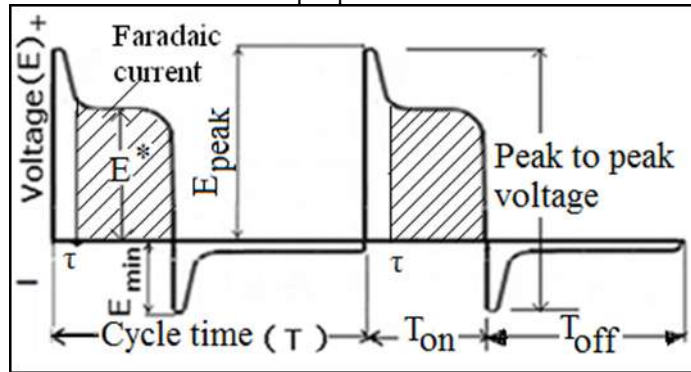
Fig. 1 Pulse shape during EMM

After appropriate charging of double layer, dissolution of metal takes place during Faradaic time of pulse on time during which voltage is flat and called Faradaic voltage. Hence, MRR (material removal rate) can be expressed as follows:

$$MRR = \frac{AE^{*}M(fT_{on} - f\tau)}{\rho_S \, g \, z \, F} \qquad (6)$$

Where f is pulse frequency. For EMM of high aspect ratio hole, Eq. (6) can be written as given below:

$$b \times h = \frac{AE^{*}M(fT_{on} - f\tau)}{\rho_S \, g \, z \, F\rho} \times t$$

or, aspect ratio for microhole, $\dfrac{h}{b} = \dfrac{AE^{*}M(fT_{on} - f\tau)}{\rho_S \, g \, z \, F\rho b^{2}} \times t$ \qquad (7)

Where, t is machining time (sec) and ρ is density of material. For EMM of high aspect ratio microchannel, Eq. (6) can be written as given below:

$$b \times L \times h = \frac{AE^{*}M(fT_{on} - f\tau)}{\rho_S \, g \, z \, F\rho} \times t$$

$$\text{or, aspect ratio for microchannel,} \quad \frac{h}{b} = \frac{AE^{*}M(fT_{on} - f\tau)}{\rho_S \, g \, z \, F\rho b^2 L} \times t \qquad (8)$$

Where, L is length of microchannel. At high pulse frequency, total charging time per second increases i.e. fτ increases and hence, MRR decreases. As a result, precision of EMM increases i.e. overcut decreases and thereby, aspect ratio increases. Other option of decreasing overcut may be selection of microtool with proper end shape. Specific electrolyte resistance, ρ_s is to be higher to minimize overcut i.e. electrolyte of lower concentration is to be used. Aspect ratio is proportional to time of machining (t) and inversely proportional to square of width (b). Overcut must be restricted as far as possible to limit width, b. With increase in machining time, h is supposed to increase but due to long time of stay of microtool in machining, the overcut increases. Therefore, optimum tool feed rate both in horizontal and vertical directions should be used to minimize time of machining.

3   Experimental details

The experimental set up developed as shown in Fig. 2 was used for the micro-fabrication of microtools by reversed ECM and EMM of high aspect ratio micro-features. Stainless steel sheet (SS 304) of size 1 cm by 3 cm of 200 μm, 330 μm, 700 μm and 900 μm thicknesses were used as workpieces. 0.2 M H_2SO_4 electrolyte was used during experimentation as sludge is fully dissolved in H_2SO_4 electrolyte. 0.2 M concentration was found to be suitable from the point of view of least overcut and time of machining [1]. Micro-tools of different end shapes and sizes were fabricated from tungsten rod φ 300 μm. Experimental investigations were carried out to know the effect of straight microtool, reversed taper microtool, conical microtool, thickness of workpieces, frequency of pulsed voltage on aspect ratio and overcut of micro-features like micro hole and microchannels. Initial vertical microtool feed rate was higher due to easy electrolyte flow up to 150 μm depth followed by decreased tool feed rate to avoid micro spark and to achieve stable machining for improved surface finish. Digital storage oscilloscope, DL 750 (YOKOGAWA, JAPAN) was used for continuous observing of the EMM processes. Microscope of LEICA S6D was also focused on the machining zone. Taylor Hobson Talysurf CCI sunstar, a noncontact 3D profiler was used to obtain the cross sectional profiles of machined micro-features. Lengths and widths of microchannels were measured by microscopic image analysis software. SEM images of holes and channels were used for analysis. Low voltage of 3 V (average) was applied for the experiments. Higher than this voltage produces higher overcut and lower than this voltage generates passive oxide layer in stainless steel thereby, continuous dissolution of metal is inhibited. Duty ratio is defined as the ratio of on time, T_{on} to the cycle time, T during a single pulse. Duty ratio of 34 % was chosen considering the fact that higher duty ratio or pulse width results in higher overcut as explained by Eq. 6 where, f $T_{on} = T_{on}/T$ is duty ratio. Applied voltage considered during EMM was of pulsed AC obtained by utilizing Agilent, USA made function generator having maximum 80 MHz frequency.

4.   Experimental results and discussions

Major difficulty is the flow of electrolyte through extremely narrow gap in the machining zone. Maximum depth of natural electrolyte flow has been observed to be 260 μm as the stable machining continued up to this depth while high aspect ratio microchannels were being generated on SS-304 stainless steel by EMM. Afterwards, difficulty arises in EMM due to non-availability of electrolyte and also, removal of machining products becomes a major hurdle. Results are shown in various graphs and analyzed keeping in view of generation of high aspect ratio micro-features.

4.1 Selection of suitable shape of microtool for machining high aspect ratio micro-features

Microtools with different end shapes were fabricated by reversed ECM with the application of vibration of microtool [9]. These microtools were used for machining of high aspect ratio micro-feature with the aim of reduced overcut leading to higher aspect ratio. A reversed taper microtool of taper angle 1.54⁰ with front tip of φ125 μm and diameter of φ 100 μm at 330 μm length from the tip was used. A conical microtool of taper angle 2.2⁰ with diameter of φ 63 μm at 906 μm length from the tip of microtool as shown in Fig. 3 was used. Another
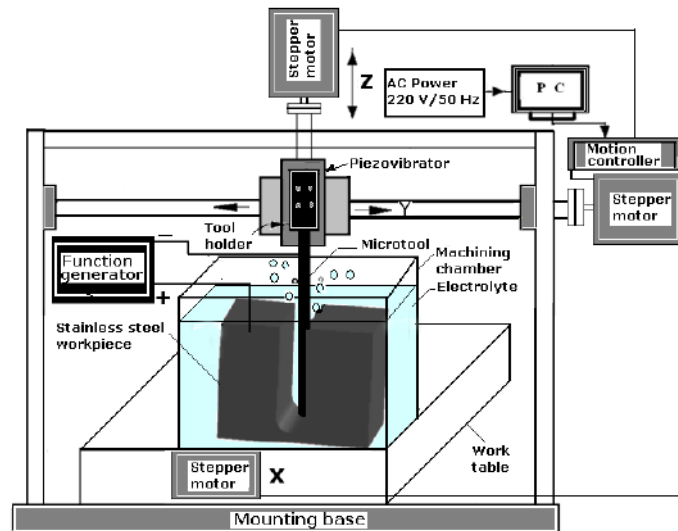
Fig. 2 Experimental set up for EMM
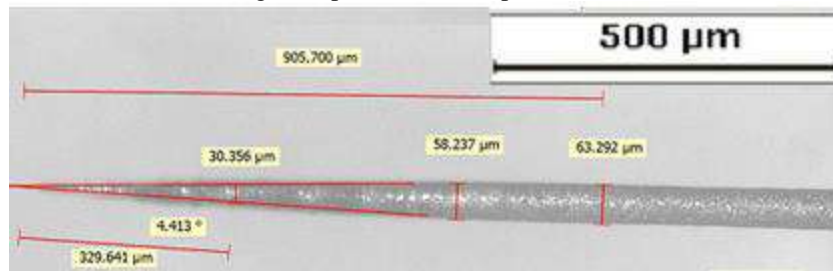
Fig. 3 Sharp taper microtool of taper angle 4.4°

straight cylindrical microtool of φ 110 µm was also used for drilling of through micro holes on 330 µm thick SS-304 stainless steel sheet at pulse frequency of 1 MHz , 3 MHz and 5 MHz. Near optimum feed rate of 0.687 µm/s, 0.344 µm/s and 0.305 µm/s for 1 MHz , 3 MHz and 5 MHz pulse frequency respectively were applied. Optimum feed rate means maximum possible feed rate of microtool without causing short circuit. Machining times for through holes were 8 minutes, 16 minutes and 18 minutes at pulsed frequency of 1 MHz , 3 MHz and 5 MHz respectively. Fig. 4 shows that both entry and exit overcuts of microholes generated by straight microtool are higher than any overcuts of micro holes generated by either conical microtool or reversed taper microtool over the whole range of pulse frequencies. It also exhibits that both entry and exit overcuts of micro holes generated by the reversed taper microtool are larger than entry and exit overcuts of micro holes generated by the conical microtool. Eq. 6 explains that larger the active surface area, A involved in machining, higher the MRR and thereby, higher overcut. Largest active surface area is involved in EMM with straight cylindrical microtool followed by reversed taper microtool where, large surface area at the front tip remains active. Least surface area is actively involved with conical microtool. Machining starts with very small surface area and with vertical feed, higher surface area gets involved in machining. Fig. 4 also explains the fact that overcut decreases with increase in pulse frequency and least overcut was observed at 5 MHz pulse frequency. Difficulty in flow of electrolyte was observed after 250 µm depth of machining due to unstable machining. The vertical feed rate was decreased to allow time for electrolyte flow and disposal of reaction products from the narrow zone of machining.

Fig. 5 shows the mico holes generated on 330 µm thick workpiece of SS-304 at 5 MHz pulse frequency. Fig. 5 (a) shows perspective view with entry diameter of 203 µm and exit diameter of 179 µm generated by reversed taper microtool. Thus, entry overcut is 39 µm i.e. (203-125)/2 and exit overcut is 27 µm i.e. (179-125)/2. Average aspect ratio of micro hole is 1.73:1. Fig. 5(b) exhibits entry diameter of 82 µm and exit diameter of 77 µm generated by conical microtool. Thus, entry overcut is 26 µm and exit overcut is 23.5 µm. Average diameter of micro hole is 79.5 considering entry and exit diameter. Therefore, average aspect ratio of the micro hole is 4.15:1. Thus, for high aspect ratio micro-features, conical microtool is most suitable considering least overcut.
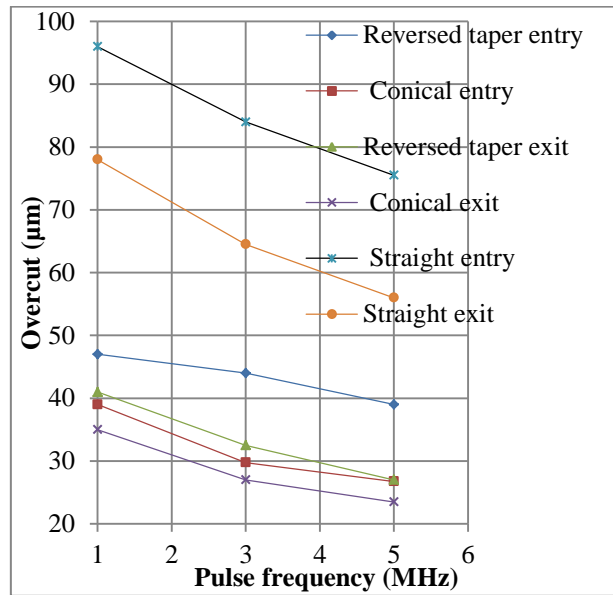
Fig. 4 Overcut versus pulse frequency for 330 μm depth drilling
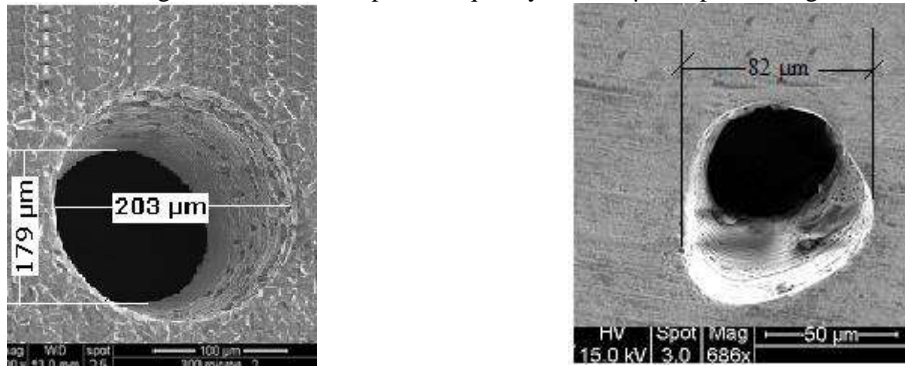
(a) Hole generated by reversed taper microtool, AR 1.73   (b) Hole generated by conical microtool, AR 4.15
Fig. 5 Holes produced at 5 MHz pulse frequency

Fig. 6 (a) exhibits 3D surface of blind microchannel generated by sinking and milling method with the help of same sharp conical microtool of taper angle 2.2° shown in Fig. 3. Fig. 6 (b) exhibits the cross sectional profile of this blind microchannel. Vertical feed rate was 0.196 μm /s during sinking operation up to depth of 250 μm and horizontal feed rate was 0.125 μm /s during milling for a total length of 500 μm. Total machining time of microchannel was 1h 36 min. Overcut of microchannel at the entry width of 80 μm is 25 μm i.e. (80-30)/2. Average aspect ratio of microchannel is 4.33 with entry width 80 μm, bottom width 40 μm and depth between these two dimensions is 260 μm. Thus, sharp conical microtool with lower taper angle is most suitable bare microtool for the generation of high aspect ratio micro-feature.
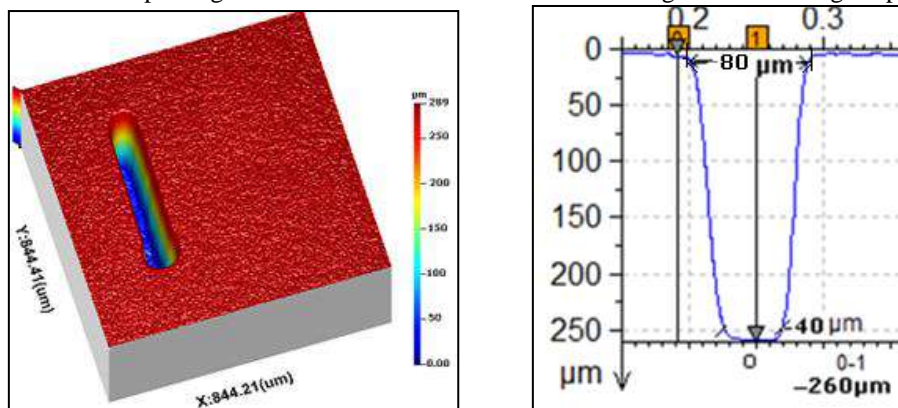
Fig. 6 (a) 3D surface, AR 4.33   **(b) Cross sectional profile, AR 4.33**

4.2   Strategy for generation of high aspect ratio micro-feature of higher depth

The machining may be achieved to generate high aspect ratio micro-feature if the availability of fresh electrolyte in the actual machining depth can be assured during EMM. Frequency of pulse power was decreased to allow more off time per pulse for disposal of dissolved metal ions to avoid sludge deposition on microtool. The same microtool of 2.2° sharp taper angle was used for machining after removal of deposited sludge by dipping in acetone. High aspect ratio micro hole and microchannels were generated on 700 μm and 900 μm thick sheets also. Optimum vertical tool feed rate was 0.288 μm/s was used as the pulse frequency was decreased from 5 MHz to 3 MHz, higher feed rate was possible. Microchannels were generated by sinking 720 μm vertically downward followed by horizontal milling along the path of 500 μm length. Optimum feed rate was 0.139 μm /s for the horizontal milling. Average feed rate for sinking was 0.288 μm/ s. Time for sinking of 720 μm depth was 42 min.

4.3   Variation of aspect ratio with thickness

Aspect ratio increases with the increase in thickness of workpieces as shown in Fig. 7. Conical microtool of taper angle 2.2° was used for generation of micro holes and microchannels on workpieces of different thicknesses. Rate of increase in aspect ratio for micro holes and microchannels gradually decreases with increase in thickness of workpiece due to the fact that flow of electrolyte becomes difficult with the increase in depth of machining. As a result, tool feed rate is decreased and machining time increases resulting in further increase in stray current effect on the width. With the depth of machining, width of machining also increases. Aspect ratio increases steeply at lower thickness of micro-feature. Moreover, larger active area of microtool gets involved in micromachining with higher depth in the case of conical microtool. Hence, rate of increase in aspect ratio gradually decreases with increase in thickness. The figure also explains the fact that aspect ratio of micro hole is always greater than aspect ratio of microchannel. This occurs due to the fact that after sinking a hole to a particular depth, horizontal motion of microtool is given along the path of desired microchannel to be generated. As the microtool feed rate is very small, same surface of microhole i.e. pilot hole is again micromachined resulting in higher width of microchannel. Aspect ratio at 200 μm thickness, are 3.11 and 3.39 for microchannel and micro hole respectively. Aspect ratio at 900 μm thickness, are 5.1 and 5.75 for microchannel and micro hole respectively. Pulse frequency of 5 MHz was applied up to 260 μm thickness of work piece and then, pulse frequency of 3 MHz was chosen up to 900 μm thickness to avoid sludge deposition on the microtool.
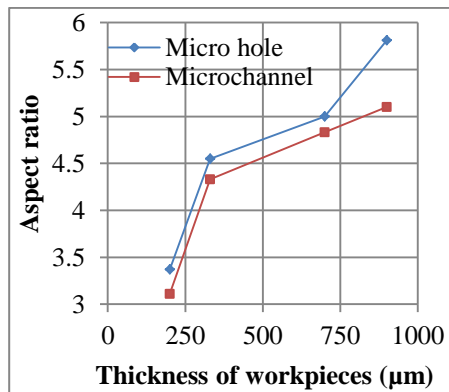
Fig. 7 Aspect ratio versus thickness of workpiece

5.   Conclusions

Micro-features were produced by EMM on SS-304 sheet of high thicknesses to examine the influence of various process parameters such as vibration of microtool, frequency of pulsed voltage, microtool tip shape and thickness of work piece on high aspect ratio micro-features. From the mathematical analysis and results of experiments the following conclusions can be drawn:

(i)   Mathematical expression relating aspect ratio with other parameters is derived to explore the prospect of generation of higher aspect ratio micro features. The expression indicates that f T_{on} = T_{on}/T (duty ratio) remaining fixed at 34 %, MRR decreases with increase in pulse frequency and thereby, overcut decreases. Decrease in overcut means increase in aspect ratio. It can also be concluded that specific electrolyte resistance, ρ_s is to be higher i.e. lower concentration of electrolyte will be useful to minimize the overcut.

(ii)   As predicted by the mathematical expression that microtool with minimum active area may reduce overcut and thereby increase aspect ratio, straight microtool of φ 110 μm, reversed taper microtool of taper angle 1.54° and conical microtool of taper angle 4.4° were used for drilling of through micro holes on 330 μm thick sheet with pulsed frequency of 1 MHz , 3 MHz and 5 MHz. Least entry overcut of 26.75 μm and least exit overcut of 23.5 μm were observed in the case of conical microtool. Thus, sharp conical microtool with lower taper angle is most suitable microtool for the generation of high aspect ratio micro-feature over the whole range of pulse frequencies.

(iii) Aspect ratio increased with the increase in thickness of workpieces when micro holes and microchannels were generated with the same microtool of sharp taper angle 4.4°. Rate of increase in aspect ratio for micro holes and microchannels gradually decreases with increase in thickness due to the fact that flow of electrolyte becomes difficult with the increase in depth of machining. Aspect ratio of micro hole is always greater than aspect ratio of microchannel. Aspect ratio at 200 μm thickness, are 3.11 and 3.39 for microchannel and micro hole respectively. Aspect ratio at 900 μm thickness, are 5.1 and 5.75 for microchannel and micro hole respectively.

Micro-fabrication of high aspect ratio micro-features with better surface quality on high strength stainless steel by EMM has prospective engineering applications in microsurgery, biotechnology, effective microelectronic cooling by increased area of heat exchange.

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Challenges in Memristive Circuit Based Brain Inspired In-Memory Computing

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Abstract: In order to build effective, low-power, & responsive computing systems, In-memory computing (IMC) or neuromorphic computing (NC) takes its cues from the brain in an effort to replicate the information-processing techniques of biological neural systems. Neuromorphic devices, which mirror the operations and behaviour of both synapses & neurons, which are fundamental to NC because they allow artificial neural networks (ANN) to be implemented in hardware. Current progress and future directions for computing inspired by the human brain using memristors are discussed in this article. We summarize the current state of memristive spiking and ANN, as well as discuss the processes behind a variety of memristive devices that may imitate synaptic and neuronal capabilities. Spiking neural networks (SNN), fully connected ANN, and convolutional neural networks (CNN) are few of the designs that are compared.

Keywords: Neuromorphic Computing, Human Brain, Memristor, Synapse/Neuron

1. Introduction

The increasing need for AI in the age of big data is at odds with the limitations of current computer technology. When it comes to intelligent computing and the partitioning of storage and processing, the existing von Neumann (VN) architecture has two major flaws [1]:

(a) The memory-wall occurs when the memory's access rate lags behind the CPU's calculation rate, resulting in a significant decrease in CPU utilization [2,3];

(b) The power-wall occurs when the reduction of consumption of power brought about by the transfer of data seriously damages the design of the chip [4,5].

Moore's law has come true, increasing computing power by consistently shrinking device size, thus reducing the impact of the VN bottleneck [5,6]. But these methods still have their origins in the VN architecture, as data processing as well as storage are still two distinct processes that make it impossible to come up with long-term remedies. Thus, the scientists look into newly systems for computers with non-von Neumann (NVN) architectures [7, 8]. Among the NVN architectures is in-memory computing (IMC), which is embodied by brain-inspired computing (BIC) [9,10]. But over the last several years, its progress has stagnated, mostly because there is not a physical device that can really actualize the design of an integrated computing and storage platform. The invention of the memristor was necessary to remedy the issue. In 1971, L. O. Chua suggested the conceptual memristor as the 4th fundamental circuit component [11], while in 2008, Strukov et al. at Hewlett-Packard (HP) Labs proved its first practical realization via experimentation [12]. Memristors are advantageous because to their cheap cost, low power consumption, rapid read/write rates, high density, compatibility with CMOS manufacturing, and ease of use. Memristor represents as the potential prospects of next-generation large-capacity, non-volatile memory, low-power that is also energy-efficient, dense, low-latency and ultra-fast. As a result, several corporations (including Panasonic, Samsung, Micron, YMTC, HP, Sony etc.) are investing resources into memristor R&D. A large number of electronics components and capacitors are needed for the conventional approach to neuron and synapse modelling [7].

One of the universe's most intricate things is the human brain. High-level cognitive activities including abstraction, recognition, generalisation, prediction, decision making, etc in a constantly changing world may be carried out by it. A brain with this level of cognitive capacity must sacrifice its incredibly low 20 W power usage. Structure of synapse/neuron link in a human brain as shown in figure 1. The brain's remarkable energy efficiency is mostly due to two factors [11-13]:

(a) Since data processing and sharing are occurrence focused, energy spikes only occur whenever and wherever they are required.

(b) Synapses as well as neurons reside together inside a single, strongly connected neural network (NN), with an average of 10^4 links between every neuron. Process of excitation of synapse and firing of neuron, which are involved in processing and sharing, which are involved in memory, are said to have a same location in the brain, which is known as neuron-synapse-colocation.
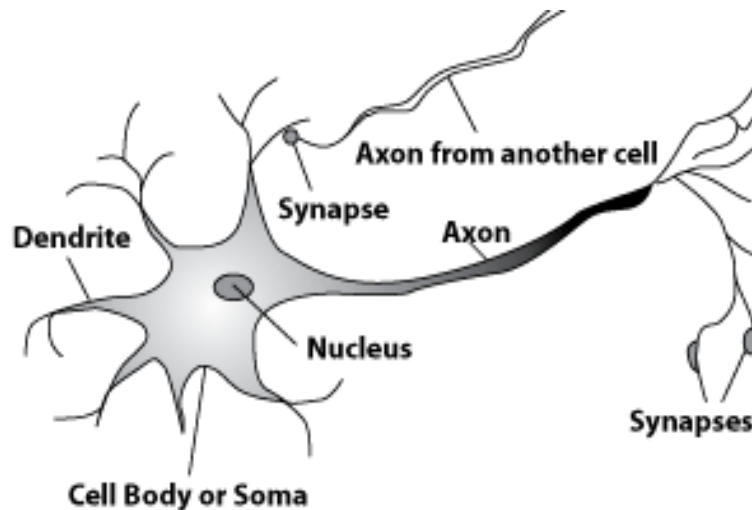
Fig. 1: Structure of neuron/synapse in a human brain [11]

Many difficulties remain with respect to of integration and power usage, despite recent advances in BIC systems depending on conventional CMOS [13]. In addition, the memristor arrays may be used to construct more complex NN architectures, such as ANN, CNNs, DNNs, RNNs, and SNNs. By using Ohm's law both for addition and for multiplication, memristor arrays make it possible for NNs to perform the concurrent multiplication-accumulation (MAC) processes necessary for their computations, greatly improving their rate and energy efficiency [14]. Figure 2 shows the numerous resistive switching (RS) materials of the memristor that are described in this study. These materials include specific materials for electrodes including perovskites, organics, binary oxides, and 2D materials.
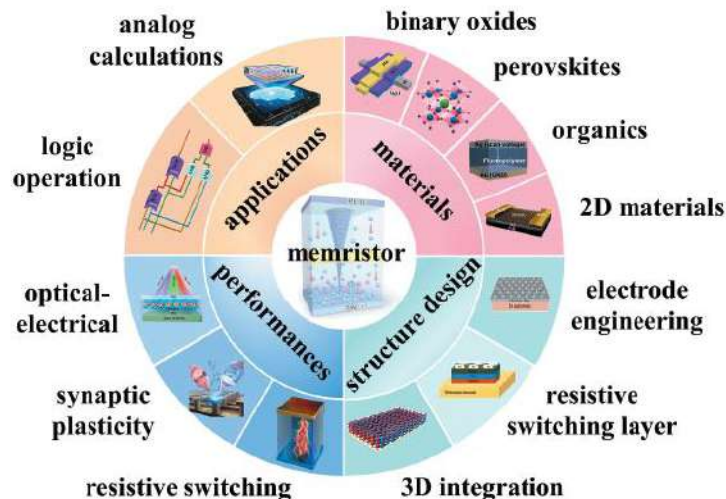
Fig. 2: Memristor: materials, performance, design, and apps.

2. Different Materials for Memristor

The metal-insulator-metal (MIM) sandwiched design of the memristor is primarily composed of 2 regions of electrodes and a center resistive region made of an insulating material or semiconductor. On/off ratio, switching rate, reset/set voltage, on/off ratio, durability, retention, power usage, etc. are all intimately tied to the materials used to construct the devices [15,16].

(a) Electrode Materials: It may not only serve as conductors of electricity, but also as contributors to the resistive response. Noble metals, alloys, materials made from carbon like carbon nanotubes and graphene, nitrides like TiN and TaN, conductive flexible-oxides like ITO and doped ITO, FTO etc.

(b) Perovskites: It has a structural formula of ABX_3. Vacancies of oxygen are introduced into the material when low-valence metal ions are used to dope the A-site. It is possible to produce a broad range of chemical and physical features by partly doping the A-site as well as B-site with cations of varying valence. The most basis perovskites are MAPbBr3, MAPbI3, LaFeO3 etc. As a result of its advantageous optoelectronic features, such as an adjustable bandwidth, excellent absorption factor, short absorbing wavelength, high diffusion size, and cheap cost, perovskite materials are gaining popularity.

(c) Binary oxides: The standard CMOS approach is appropriate with binary oxides, and because the structure is simple, they are very stable, cheap, and easy to prepare. ZrOx, SnOx, CuOx, ZnOx, HfOx and TaOx etc. are examples. Due to their high operating speed and ultimate durability, these material are the most common kind of resistive material and have great resistive features including ultra-high on/off ratio, fast switching rates, and good durability.

(d) 2D Materials: Good electrical characteristics as well as unique qualities, have contributed to the increased interest in these materials. Due to low Vander-Waals pressures between neighboring layers, a single layer or many layers may be scrubbed from the main 2D crystal. These features position these materials as a potential replacement for others in applications requiring atomic-scale width, high-performance electrical qualities, and unique traits. Due to these considerations, studies on planer as well as vertical 2D memristors have been conducted.

3. Memristor based Brain-Inspired Computing (BIC)

The concept of BIC is not new, having appeared in academic journals for around 20 years [11], but its meaning is still unknown. Actually, the terms NC & BIC are not synonymous. They shouldn't be considered interchangeable. Memristor-based BIC, also known as NC, is a new discipline that uses memristor to develop computing systems influenced by the design and behaviour of the human brain. Its strategies have gotten a lot of interest in current years because they provide novel ways to reach the objective of broad intelligence [17-20]. Memristors are one of the electrical elements that can hold and analyse information, which makes them perfect for simulating synapses in ANNs. Explanation about function of neuron and synapse using memristor is below:

(a) Memristive Neuron

In the subject of NC, which seeks to create ANNs that resemble the composition and operation of the human brain, a memristive neuron is a notion. Inspired by the structure and behaviour of the human brain, scientists are investigating creative approaches to creating computing systems that can carry out tasks like recognising patterns, learning, and making decisions more effectively [21]. Memristive neurons provide a novel means of achieving this objective through the use of memristor, which may pave the way for the creation of even more BIC systems. The combination of the both integration and threshold activation of potentials of membranes through communication in nervous system is a neuron's essential activity. To provide this basic neurological activity without the gradual potential of membrane decline, Integrate-Fire (IF) models are primarily utilised. Since this design requires less computing power than the others and is the most basic of all the neuronal designs, the expense of the hardware is comparatively modest. Using newly developed memristor, which have excellent scalability, excellent performance, and plentiful internal dynamics, is one innovative method for creating an IF model. A dramatic nonlinear transitioning in memristors, similar to the sudden rise in conductivity in memristors, mimics the IF behaviour [22].

(b) Memristive Synapse

In the subject of NC, it is synapse-type connectivity in ANNs that use memristors to establish them. Because of this unique characteristic, memristors are ideal for simulating synapses, which are the links among neurons in the brain. Synapses are important in ANNs because they convey messages from a neuron to other. According to the sequences of behaviour between linked neurons, the magnitude of such synapses can be altered over time. Memristive synapses, which are created using memristor, replicate this behaviour by varying their conductivity, reflecting the weights of synaptic in ANNs [23].

Brain-inspired computing simulates biological modelling like SNNs and ANNs using circuitry. ANN neurons are distinguished by their single, static, continuous-valued behaviour. Biological neurons calculate and convey data using discrete spikes. Therefore, compared to ANNs, SNNs appear more physiologically relevant. Although SNNs are not as accurate as ANNs, they are more suitable for analysing information that is spatiotemporal since they usually require less operations. ANNs, SNNs, CNN and RNN models are the main categories of brain-inspired based computer models as shown in table 1 [18-22]. ANNs are mostly utilised in machine learning amongst them.

4. Brief Preliminaries and Challenges

In the term of materials, many memristors have less than ideal conductance linearity & power usage, device-to-device features, its efficiencies must be further improved. Furthermore, the human sensory system combines many senses. Thus, creating its circuits with various processing capacities as well as multi-sensory fusion is a potential path for upcoming purposes. In order to maximize the efficiency of specific devices, optimization for memristor-based NC requires the development of specialized algorithms as well as circuits [24].

Table 1: Comparation between different memristive brain-inspired architectures.

Architecture	Device Needs	Advantages	Limitations	Usage
CNN	Long retention, low power, & analog conductance	Solve very complex task	Power dissipation issue	Handwritten digit recognition
ANN (1 Layer)	Analog conductance	Ultra-high speed	Limited to simple tasks	Face recognition and handwritten digit recognition
ANN (2 Layer)	Analog conductance	Solve very complex task	Difficult to be implemented on-chip	Simple digit recognition
RNN	Long retention, low power, & analog conductance	Associative memory	Require more sources for solving tasks	Associative learning
SNN	Synaptic Plasticity	Highly bio-realistic and energy efficient	Lack of Spike based data	Handwritten digit recognition
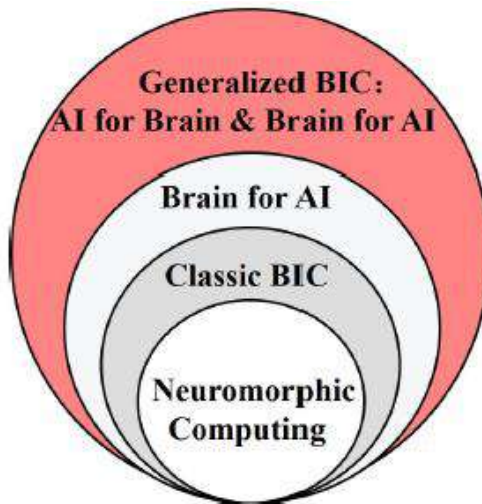
Fig. 3: Relation between BIC, NC and AL

One of the fundamental notions derived from neurology is the receptive field, which has served as inspiration for the convolution operation in DNNs. Therefore, as DNNs grow more prevalent, the distinction between BIC and its relevant field. As shown in Fig. 3, we shall provide various foundational principles from adjacent study domains in order to better explain the idea of BIC. Simultaneously, the scope of BIC will be compared to that of Brain for AI and AI for Brain, two newer areas of study. Classic BIC is a subset of Brain for AI that emphasizes SNN models and neuromorphic devices and is influenced by computational neuroscience in its relevant applications, while Generalized BIC takes into account both Brain for AI and AI for Brain [25].

(a) Brain for AI: The goal is to improve AI methods by drawing motivation from the transmission of signals and learning regulations in the body's nervous system, the architecture and operations of the human brain, the intellectual or cognitive functions of humans in hopes of minimize the quantity of power and resources used by AI, fulfill equivalent success in operations that are essential to the brain but challenging for traditional AI.

(b) AI for Brain: Through the use of AI methods, brain research may be powered by AI for brain, enabling us to better understand the architecture and functioning of the brain and use an AI approach to clarify complicated brain phenomena. AI may improve methods for imaging in brain and support studies on the anatomy or functioning of the brain, forecast mental well-being, growth, and cognition and regulate mental operations and actions.
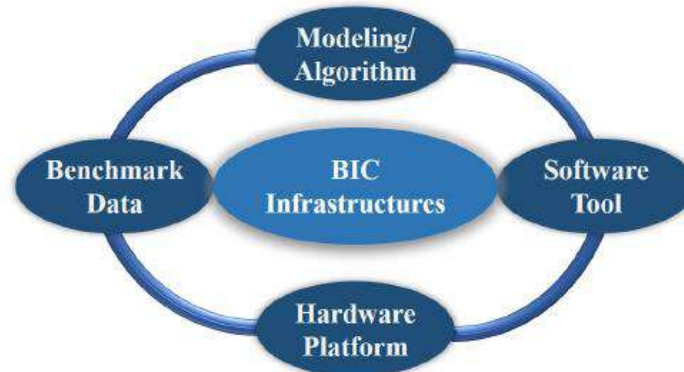
Fig. 4: BIC Components

The primary challenge is in how BIC systems can use the cutting-edge discoveries in the field of computational neuroscience to close the knowledge separation between AI and neuroscience. In particular, the challenge lies in improving the co-development of the 4 BIC components as shown in figure 4: (a) algorithm/model, (b) hardware chips, (c) software applications, and (d) datasets, by studying the workings of biological NN and their constructs and operations. Additionally, the challenge involves creating a research ecology to support the ongoing growth of BIC.

While memristor based BIC has a lot of potential, there are certain issues with component variation, scaling, and compatibility with existing technologies [26]. Scientists are attempting hard to overcome these obstacles in order to realis all that is possible of memristor dependent NC. Resolving the issues listed below will need a cross-disciplinary approach among materials researchers, electrical professionals, computational scientists, and neurologists.

(a) Power consumption
(b) Security and ethical issue
(c) Element variability
(d) Noise and Interference
(e) Manufacturing and Material
(f) Architecture and algorithms
(g) Integration and scalability
(h) Durability and dependability

5. Conclusion

This paper reviews the latest developments in memristor based BIC in a electronics development. The optimization of memristor for NN is discussed, including the different materials and device stacks, as well as the way they function in terms of increased accuracy and stability. We described the main open challenges to achieve such systems. SNN, fully connected ANN, and NN are few of the designs are compared in this paper. Also discussed the processes behind a variety of memristive devices that may imitate synaptic and neuronal capabilities. The interconnection of both capabilities and a deeper comprehension of biological-brain networks are the primary difficulties to the further advancement of CMOS/Memristor networks in the near future. This will increase the variety of possibilities in the field of NC using memristor.

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Implications of Financial Constraints to Regulate the Startup

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Abstract: With the thriving spree, the Start-ups in India making a foray into Industrial Sector with the consolidation of average growth rate of 8% annually. It has a significant contribution and retaining income in terms of Industrial Output. The policy drafted especially for New Entrepreneurs and Start-ups coupled with incentives and funding accessibility creates a congenial environment for the new enterprises to be undertaken. According to DPIIT (Department for Promotion of Industry and Internal Trade) the total number of Start-Ups in India is 99,000 spreading across 670 districts as per details available till 31st May 2023. Amidst these heart-throbbing credentials some concealed threats are imposing on the potential start-ups and the existing start-ups as well. The contrary aspect of such business entity entails a voluminous failure of the business planning and the strategy that was based on Vision and Mission of the entity. According to the Survey report of MSME, revealed that on every 10 respondents - 9 respondents are failure, due to financial constraint and improper Capital Structure designing, cushioned on casual Capital. These features are prevailing across the Country. Although ample of opportunities are available in terms of Fund through various modes such as Joint Venture Capital, Angel Investors, Collaboration, however the basic problems and hindrances which are hovering around need to be addressed at once. The factors that are responsible for the toppling of Start-ups are - Improvised Estimation, Untapped resources, excessive of ROI expectation, Unfurling Capital Structure, fledgling planning and decision making, feasibility aspect is ignored. Besides these some psychological aspect also involves. These constraints are considered to be vital and must be properly addressed. The research methodology and its implications based on these factors sort out the solutions and its implementation. The engrossed idea and implementation contains the vital suggestions in order to cope with such prevailing situation.

Keywords: Startup, Capital Structure, Angel Investor, Joint Venture, ROI

Introduction

The Start-up ecosystem in India can be traced from early 1970s with the establishment of Tata Consultancy Service in1968, CMC Limited started to digitalize the Stock Market in 1980. Later Infosys came into existence and the spree of Start-ups formation sparked the new trends in Indian Industry . Earlier these entity served as supplement economic viability and Product and Market Demand .Basically the Indian Start-up ecosystem .originated with software services offering complimentary services which were needs in that demand . However the epicenter of such hubs were from Silicon Valley, on contrary Indian Market Demand were not in proportion to supply or availability of the services as Indian Market Of India had products and services were available which were based on traditional business model. So these initiated company resort to export and rely on the International Market . The seeding capital for such start-ups played an important role as government was reluctant to provide funding for new ventures also the inflation was high that time.Infact the new aspect of funding and business partnership and merger and acquisition came into fore .However the basic identity and goal were missing and the most negative perspective was that most of the companies were opened for making a shorter gain rather on establishing its identity for eternal branding. On the other hand the entrepreneurs could not apprehend the prospective products or services ignoring the financial feasibility and constraints In 2000s India witnessed the new up thrust in Start-ups and with the policy of MSME to the specific category and region which redefines Start-ups and restricted the opportunity for the budding Entrepreneurs . The interesting fact is that the most of the Start-ups could not bear the overburdened loan or credits and mismanagement of Capital Structure and cost of Capital . This is the basis of research and analysis of Start-ups and its implications to regulate it.

Literature Review

Apropos to the research topic, the framework of the concept and notion is established on the various facets of different faculties which are integrated and recasted into a sequential method. According to the Government Schemes those entity shall be considered as Start-up

1. Company Age-Period of existence and operations should not exceeding10 yrs. from the date of incorporation.
2. Company Type – Incorporated as a Private Limited company (Company Act, 2013) or registered as a partnership firm or a limited liability partnership.
3. Annual Turnover - Should have an annual turnover not exceeding Rs. 100 cr for any of the financial year
4. Entity working towards innovation, development or improvement of product or processes or services or if it is a scalable business or wealth creation.

According to **Investopedia**, The term start-up refers to a company in the first stages of Operations Start-ups are founded by one or more entrepreneurs who want to develop a product or service for which they believe there is demand, these companies generally start with high cost and limited revenue

Start-up is a company or project undertaken by an entrepreneur to seek, develop and validate a scalable business model. On this perspective start-ups works and their operation faces many challenges and constraints However there are some factors which may pose challenges and threats before start-up according to survey conducted by **ORF Financial Services** such as

(a)Diversity and Digital Divide

(b) Taking Products to market and Low willingness to pay

(c) Hiring Qualified Employees

(d) Complex Regulatory Environment.

The major observation is that the financial aspect of any start-ups is not receive rapt attention and as a consequence they fumbled down. According to **Jordensky-** some important key Metrics when assessing the worthiness to consider crucial indicators like **LTV**(Customer Life Time Value) and **CAC** (Customer Acquisition Cost). Besides it outlined the significant factors :

1. Not Estimating Future costs.
2. Lack of Control over costs
3. Inconsistent Monthly Cash Inflows.

The another important facts founded by **Times of India** that the following factors challenging existing and emerging start-ups

1. Lack of Financial Support
2. Revenue Projection
3. Unforeseen expenses
4. Lack of Liquidity
5. Mispricing

The above explained factors needs to be explained on the basis of proper financial planning and financial feasibility that to be contained with the applications of proper financial management tools and analysis with respect to Management Accounting and Control .

The dependency on various funding avenues like Joint Venture, Angel Investment, Crowd funding, etc. coupled with limited approach and voluminous liability leads to the insolvency of the company. The financial aspect must be the main factors that are to be resolved first and financial planning is the key to survive and continuity. Most of the Start-ups consume capital without proper output and its implications having a negative consequences.

Research Methodology

The methodology entails the research proceedings, identifying the relevance analytical and mathematical tools and methods and the alignment of the collected data with the models which is appropriate for the analysis is adopted . The study's main purpose is to find out the thrust and factors which highly impacted the Start-up and its regulating facts with the integration of the advanced technological system, while the financial and statistical models have specific and limited roles for the valuation and the behavior of financial assets, the data (secondary data) employed because the study is of qualitative in nature. The outline of the research is based on the data and its implications to the ecology of financial system The secondary data is obtained from the journals , financial magazines , website of Times Of India, Economic Times, Entrepreneurial Journal. Data were analyzed and plotted graphically and presented quantitatively using MS word tools so as to comprehended the study in a more precise and coherent way.

Data Analysis: All the data based on the some specifications of the class , nature and objective of the business establishment. According to the Times Of India, India having the youngest Start-up ecosystem in the world , with the average founder's age at 28.5 Yrs. Another aspect of factors reflects that the average rate of growth of 53% in seeding fund , according to the report global Start-up database Crunch Base .

Distribution of India's Start-up founders in early 2019 ,by age groups (Statista , Data Base)

Age - Slab	% involvement
Below 20 yrs old	0.3 %
20-25 yrs	15%
26-30 yrs	26%
31-35 yrs	31%
36-40 Yrs	15%
41-45 Yrs	6%
Over 45 Yrs	6%
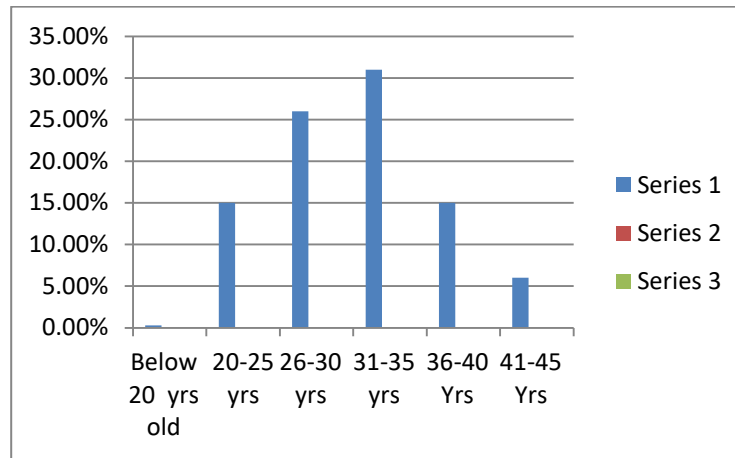
The Ministry of Commerce & Industry put the data in public domain regarding The Start-up India Seed Fund Scheme (SISFS), a flagship program of GOI (Govt. Of India)

Key Highlights of SISFFS

Name Of the Scheme	Start-up India Seed Fund
Beneficiary	Entrepreneurs
Objective	Provide Seed Fund for Start-ups
Financial Assistance	Upto Rs. 50 Lakh
Total Budget	945 crore
Number Of Beneficiaries	3600

Although , besides such scheme another avenues of fund raising through commercial Bank and MSMEs scheme , another source is Angel Investor and joint venture ,the failure of Start-ups in India looks very pathetic figure . Recently **RBI(Reserve Bank of India)** revealed that so far banks have written off almost of Rs. 62,000 Crore of loans of top 100 will full defaulters .
The various methods of Investment and their sharing in Start-ups initiative.
Over 9,500 investors, including VC firms, CVC funds, investment banks, accelerators, government bodies, and angel investors, backed Indian startups in 2022
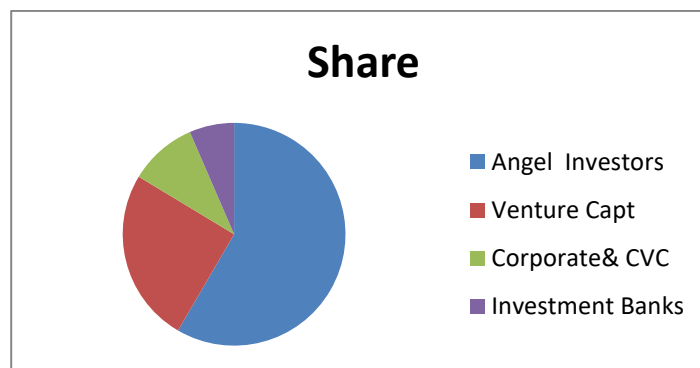
 The analysis of the above data may be interpreted as the basis for the failure and ceasing of Start-ups , however the basic business model needs to introspect in longer prospective rather than shorter objective .
The various Financial Model and their applications plays a significant role in shaping a new business model. Besides these data, the mathematical models are also used in terms of alpha model and **CAPM** Model which established the return and risk analysis with reference to time. Alpha is a standard performance ratio that are commonly used to evaluate stocks or investment portfolio .Alpha is usually a single number (e.g 1 to 4) representing a % that reflects how an investment performed relative to a benchmark index.
CAPM approach is used to calculate the amount of return that investors need to realize to compensate for a particular level of risk. It is calculated as follows:
   R= R_f + beta (R_m- R_f) + Alpha
   R – represents the portfolio return, R_f= risk free rate of return , R_m= represents the market return Beta – represents the systematic risk .

Another factor beside these aspects the following observations have been revealed by SEBI

An average of 26 Lakh new D-mat accounts was opened every month in the year 2022 as against a monthly average of 4 lakhs in 2019-20. As of Nov 202, the total no. of investor accounts, stood at 7.7 Crore (NSDL,CSDL) as of Nov 21 with total investment of Rs 330 Lakh crore. With reference to Upstox own data reveals, the number of new investor before the surge , most of the Demat accounts were in 8 metro cities , since the pandemic ,there is an incremental increase in customers addition from the top 50 cities.

It is encouraging to note that more than 80% of Upstox customers are in the 18-36 age bracket and from areas untapped previously.

The models of DCF and NPV wereanalysed for the current worth of investment and net return on the investment .

DCF $= \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \ldots\ldots\ldots + \frac{CF_n}{(1+r)^n}$, where DCF = discounted cash flow, r= rate of interest ,CF_i= cash flow period I , n= time in years before the future cash flow occurs

NPV $= \sum \frac{CF_n}{(1+i)^n}$ - Initial Investment

The financial assets are analysed during the study and found to be non-significant as valuation of the assets remain entact, however it was having a some impact.

Findings -

The on-going study has made a detail analysis of Start-ups funding sources as well as the demographic structure dictates the operation and the financial constraints that are responsible for failure and ceasing of Start-ups . With more meticulously observation the psychological , social and legal aspect having formidable impact on functioning of Start-ups with few regulations.

Some interesting findings during the research are -

➢ The Capital structure of these company are fragile and imposes threat for start-ups
➢ The sharing of Angel Investors having larger impact in business operations
➢ The involving of the younger generations who looks for short visions and pursue casual approach
➢ In social parlance , the ostentation mentality attracts the rapt attention of the society
➢ Besides marketing strategy and financial management , a regulatory authority must be established in order to bring the whole things into streamline .
➢ The Scheme regarding Start-ups by GOI and MSMEs is very cumbersome to implement and the whole implications and its implications lies under different departments unable to coordinate and integrate .

The above mentioned findings are the major concern for the Start-ups.

Conclusion

The recent trends shows the digression of many Start-ups are due to the casual approach, absence of regulatory bodies, inadequate funding structure and improper financial planning. However the above all the Start-ups must have a proper platform to implement on the basis of BSE, NSE, etc based technology so as to obtain the coherent sources and seems more transparent. Lastly, the relevance financial models and its applications should be adopted .

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Machine Learning Technique for social media Fake Profile Detection

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Abstract: Social media platforms like Facebook, Twitter, and Instagram have become essential pieces of our lives, with individuals overall effectively captivating on these stages. Notwithstanding, they likewise face a persevering issue of misleading profiles, which can be made by people, robotized programming, or even bots. These phony records are in many cases used to spread bits of hearsay and participate in criminal operations like phishing and data fraud. This venture means to resolve the issue of phony Twitter profiles utilizing a scope of AI methods. These procedures are utilized to recognize certified and counterfeit Twitter accounts in light of different attributes, for example, supporter and companion counts, recurrence of notices, and the sky is the limit from there. The dataset comprises of Twitter profiles categorized as either genuine (TFP or E13) or fake (INT, TWT, and FSF). In this segment, the creator examines the use of brain organizations, LSTM (Long Short-Term Memory), XG Lift, and Irregular Woods in the identification cycle. These AI models are used to recognize urgent highlights that can be utilized to survey the valid ness of a web-based entertainment profile. The creator likewise gives bits of knowledge into the engineering plan and hyperparameters utilized in the models. Subsequent to preparing the models, the outcomes are produced, where a worth of 0 demonstrates a real profile, while a worth of 1 proposes a phony profile. The removal or deactivation of fake profiles, which reduces cybersecurity risks and ensures a safer online environment, is made possible by the identification of fake profiles.

Keywords: social medial, world, rumours, fake profiles, detection

Introduction

In the present advanced age, public activity has become unpredictably connected with online interpersonal organizations. Interfacing with new companions and remaining refreshed on their lives has never been simpler. These web-based informal organizations have extensive ramifications across different areas, including research, schooling, local area activism, work, and business. The effects of these platforms on individuals and society as a whole have been the subject of research. For example, teachers have bridled the force of online informal communities to draw in with their understudies, making a seriously inviting and intuitive learning climate. These platforms are increasingly being used by educators to enhance the educational experience by facilitating online classroom pages, assignments, discussions, and other activities.

Also, bosses perceive the capability of these informal communication locales to distinguish and enlist skilled people who are energetic about their work. However, it is essential to acknowledge that the same platforms can also serve as channels for the dissemination of propaganda and false information. Bogus records dispersing incorrect and unseemly substance can prompt contentions and disarray. Understanding how these fake profiles are made and what they are used for, especially to gather followers, is one of the primary goals of this research project. Counterfeit profiles represent a huger danger than numerous other web wrongdoings, truly hurting a more extensive crowd. Thusly, it is critical for clients to foster the capacity to distinguish counterfeit profiles. These deceitful records are frequently utilized to engender spam, falsehood, and tricky substance. the mechanical headways put forth before and continuous attempts to distinguish and battle misleading profiles. Most of phony profiles are created for purposes like spamming, phishing, and acquiring adherents. These records are furnished with the instruments expected to complete web-based violations, acting significant dangers such like fraud and information breaks. Besides, when clients communicate with URLs shared by these phony records, their own data is sent to distant servers, leaving them defenceless against abuse. Furthermore, misleading profiles erroneously guaranteeing alliance with associations or people can harm notorieties and lessen devotee and commitment measurements. This research project essentially aims to shed light on the intricacies of fake profiles in online social networks, the reasons behind them, and the measures taken to detect and reduce their presence.

Literature Review:

Different methods have been utilized to order web-based entertainment profiles in light of their record movement, including the quantity of solicitations replied, messages sent, and other applicable elements. A portion of these models are established in chart-based frameworks. Also, endeavours have been made to recognize robots and cyborgs utilizing explicit approaches. Various past investigations have handled this issue, with a determination of them illustrated beneath. One way to deal with recognizing counterfeit virtual entertainment profiles includes thinking about a message as spam on the off chance that it contains specific terms. Design matching procedures have been utilized to find these terms via web-based entertainment stages. Nonetheless, this technique faces difficulties because of the steady creation and reception of new wording.

In 2008, Sybil Gatekeeper was created to alleviate the unfavourable effects of Sybil assaults via web-based entertainment. It compelled the recurrence of irregular walk experiences, with the dataset comprising of arbitrary strolls for every hub in Kleinberg's fake interpersonal organization. A comparable methodology, known as Sybil limit, was created around a similar time, working on a comparative guideline however rapidly joining the district beyond Sybil. Every hub utilized a procedure that consolidated different irregular elements. Positioning was resolved in view of the recurrence of walk convergence tails.

Sybil-infer, which made use of model-based sampling, greedy algorithms, and Bayesian networks, was introduced in 2009. It worked under the suspicion that randomized strolls and the non-Sybil area immediately incorporated. A likelihood-based choice method was executed, known as edge determination.

In 2010, Mis love's calculation used ravenous hunt to choose Facebook dataset profiles in view of metric-changed conductivity. Based on friend tags or connection histories, Facebook itself uses an algorithm to identify bots. While these guidelines can identify bot accounts, they may not be able to identify human-created fraudulent accounts. Solo AI strategies were utilized to distinguish bots, depending on vicinity instead of labelling. Co-credits assumed a vital part in really recognizing bots.

In 2012, the Sybil rank relapse strategy was created. This approach coordinated profiles in view of collaborations, labelling, and wall postings. Genuine records got higher rankings than counterfeit records, which were positioned lower. Be that as it may, this strategy had constraints, as at times a certifiable profile, regardless of whether exceptional, could get a low evaluating. Another model, the Sybil outline, presented a staggered order approach. It worked in two phases, at first depending on show based strategies and later progressing to structure-based techniques.

Data Collection and Preprocessing:

The "Data Collection and Preprocessing" phase is a critical step in any machine learning project, especially when dealing with the detection of fake profiles on social media. This phase involves the acquisition of data from various sources and the preparation of this data for further analysis. Here is an overview of the key steps typically involved in data collection and preprocessing for fake profile detection:

1. Data Gathering:

Identify the social media platform(s) from which you intend to collect data. Popular platforms like Twitter, Facebook, or Instagram are common sources.

Utilize APIs (Application Programming Interfaces) provided by these platforms to access public user profiles and related data.

Consider using web scraping techniques if API access is limited or not available. However, ensure compliance with terms of service and legal regulations when scraping data.

2. Data Sampling:

Depending on the size of your dataset, consider taking a random sample of profiles to work with initially. This can help reduce computational overhead during preprocessing and modelling.

3. Data Cleaning:

Remove duplicates: Identify and eliminate duplicate profiles from your dataset.

Handle missing data: Address any missing or incomplete information in user profiles, such as missing profile pictures or descriptions.

Handle outliers: Identify and address any outliers in the data that may skew the analysis.

4. Feature Extraction:

Determine which features or attributes of user profiles are relevant for fake profile detection. These may include profile picture properties, account creation date, posting frequency, follower count, and friend count.

Extract and format these features in a consistent manner to facilitate analysis.

5. Text Data Processing:

If textual data, such as profile descriptions or posts, is part of your dataset, perform text preprocessing tasks:

Tokenization: Split text into individual words or tokens.

Stop word removal: Eliminate common words (e.g., "and," "the") that may not provide meaningful information.

Lemmatization or stemming: Reduce words to their root form to normalize text.

Sentiment analysis: Analyse the sentiment or tone of textual content.

6. Labelling and Annotation:

Depending on your dataset, you may need to label profiles as genuine or fake. Manual annotation by human experts is often required for this task.

Ensure that the libelling process is consistent and well-documented.

7. Data Balancing (if necessary):

Fake profiles are typically less prevalent than genuine ones. If your dataset is imbalanced, employ techniques such as oversampling, under sampling, or Synthetic Minority Over-sampling Technique (SMOTE) to balance the classes.

8. Data Splitting:

Divide your dataset into training, validation, and test sets. The training set is used for model training, the validation set for hyperparameter tuning, and the test set for evaluating model performance.

9. Data Encoding:

Convert categorical variables into numerical representations using techniques like one-hot encoding or label encoding.

10. Data Scaling:

- Normalize or scale numerical features to ensure that they have similar scales, which can be important for certain machine learning algorithms.

11. Data Storage:

- Save the pre-processed data in a structured format for easy access during modeling and analysis. Data collection and preprocessing lay the foundation for building effective machine learning models for fake profile detection. Clean and well-pre-processed data can significantly impact the accuracy and reliability of your model's predictions.

- Data Sources and Datasets

When conducting research or building machine learning models for the detection of fake profiles on social media, it's crucial to have access to relevant datasets. Here are some common data sources and datasets that researchers and practitioners can consider for this purpose:

1. social media APIs:

Social media platforms like Twitter, Facebook, Instagram, and LinkedIn provide APIs that allow developers to access user profiles, posts, and related data. These APIs are valuable sources for collecting real-time social media data.

2. Kaggle: Kaggle is a popular platform for data science competitions and hosts various datasets related to social media, including fake profile detection datasets. Researchers can explore Kaggle's datasets and contribute their findings.

3. Academic Repositories: Many universities and research institutions share publicly available datasets related to social media research. Examples include datasets used in academic studies on fake profile detection.

4. Social Media Data Repositories:

Some organizations and researchers maintain repositories of social media data, including datasets related to fake profiles. These repositories may be publicly accessible.

5. Data Scraping:

Researchers can use web scraping techniques to gather social media data. However, it's essential to ensure compliance with terms of service and legal regulations when scraping data from websites.

6. Synthetic Datasets:

In cases where real-world data is limited or insufficient, researchers can generate synthetic datasets to simulate fake profiles and authentic profiles. These datasets allow for controlled experiments.

7. Datasets from Competitions:

Occasionally, data science competitions and challenges focus on fake profile detection. Datasets used in such competitions may be publicly available for research purposes.

8. Custom Data Collection:

Researchers and organizations may conduct their own data collection efforts by manually labeling social media profiles as genuine or fake. This process involves human experts assessing the profiles' authenticity.

9. Data Augmentation:

Researchers can augment existing datasets by adding synthetic fake profiles to real social media data. This approach can help address the scarcity of labeled fake profiles.

10. Crowdsourcing:

- Crowdsourcing platforms like Amazon Mechanical Turk can be used to gather labeled data by having human workers assess the authenticity of social media profiles.

11. Data Sharing Communities:

- Online communities focused on data sharing, such as GitHub, may host datasets related to fake profile detection. Researchers can explore these communities for relevant datasets.

It's essential to choose datasets that align with the objectives of the research or the development of machine learning models. Additionally, researchers should consider ethical and privacy implications when collecting and using social media data. Proper data preprocessing and libelling are also crucial to ensure the quality and reliability of the datasets used for fake profile detection research.

- Data preprocessing steps

Information preprocessing is a basic move toward setting up the dataset for AI model turn of events, especially with regards to counterfeit profile discovery via online entertainment. Here are the key information preprocessing steps, including cleaning, highlight extraction, and that's only the tip of the iceberg:

1. Information Cleaning:

Copy Expulsion: Distinguish and kill copy profiles from the dataset, as they can slant the investigation.

Taking care of Missing Information: Address any absent or fragmented data in client profiles, for example, missing profile pictures, depictions, or different properties. Choices incorporate ascription or expulsion of records with missing information.

Exception Dealing with: Identify and address any data outliers that could cause the analysis to be distorted. This step is particularly vital in guaranteeing that the model's exhibition isn't antagonistically impacted by outrageous qualities.

2. Include Choice:

Figure out which elements or characteristics of client profiles are pertinent for counterfeit profile identification. Applicable elements might incorporate profile picture properties, account creation date, posting recurrence, devotee count, companion count, and the sky is the limit from there.

Select a subset of these elements in view of their significance in separating among certifiable and counterfeit profiles. Highlight determination methods, for example, shared data or element significance from tree-based models can help with this cycle.

3. Highlight Designing:

If necessary, create brand new features. For instance, you could ascertain the proportion of adherents to companions, process the record age in days, or determine other significant measurements that can improve the model's prescient power.

4. Text Information Handling:

The like profile portrayals or posts, is essential for your dataset, perform message preprocessing assignments:

Tokenization: Part text into individual words or tokens.

Removal of Stop words: Get rid of common expressions like "and" and "the" that might not be useful.

Lemmatization or Stemming: Decrease words to their root structure to standardize text.

Opinion Investigation: Break down the feeling or tone of text-based content to recognize designs.

5. Naming and Explanation:

In the event that your dataset isn't named (i.e., profiles are not delegated certified or counterfeit), you might have to physically mark profiles. The authenticity of profiles can be evaluated by human experts, and the labels that accompany them serve as the basis for training the model.

6. Information Adjusting (if essential):

Counterfeit profiles are regularly less pervasive than certified ones, prompting class lopsidedness. Address this lopsidedness utilizing procedures, for example, oversampling (making more phony profiles), under sampling (decreasing the quantity of veritable profiles), or Engineered Minority Over-Inspecting Strategy (Destroyed) to adjust the classes.

7. Information Parting:

Partition your dataset into preparing, approval, and test sets. The preparation set is utilized for model preparation, the approval set for hyperparameter tuning, and the test set for assessing model execution.

8. Coding of data:

Convert downright factors into mathematical portrayals utilizing methods like one-hot encoding or mark encoding.

9. Information Scaling:

Ensure that numerical features have comparable scales by normalizing or scaling them, which can be crucial for some machine learning algorithms.

10. Information Capacity:

- Save the pre-processed information in an organized configuration for simple access during demonstrating and examination.

Information preprocessing intends to work on the nature of the dataset, making it appropriate for AI model preparation. Perfect and well-pre-processed information is fundamental for accomplishing precise and dependable outcomes in counterfeit profile recognition assignments.

- **Selection of relevant features for fake profile detection**

Selecting relevant features for fake profile detection is crucial for building an effective machine learning model. The right set of features helps the model distinguish between genuine and fake profiles accurately. Here are some commonly considered features for fake profile detection:

1. Profile Metadata:

Profile Picture Analysis: Features related to profile pictures can be valuable. These may include properties like profile picture quality, uniqueness, presence of recognizable faces, and whether the picture appears to be a stock photo.

Account Creation Date: Analysing the age of the account can reveal suspicious patterns. Fake profiles may have recent creation dates.

Username: Examining the username for unusual patterns, random characters, or generic names can be informative.

2. Activity and Interaction:

Posting Frequency: The frequency of status updates, tweets, or posts can indicate automated behaviour. High posting frequency may suggest a bot.

Follower Count: The number of followers and friends can be relevant. Fake profiles may have an unusual ratio of followers to friends or an exceptionally high or low count.

Engagement: Analysing the level of engagement, such as likes, comments, and shares, can help identify automated accounts that lack genuine interaction.

3. Content Analysis:

Textual Content: Analysing the textual content of posts, tweets, or descriptions is essential. Features may include sentiment analysis, readability scores, or the presence of specific keywords often associated with fake profiles or spam.

Language Use: Examining the language used in posts and profiles, including spelling and grammar, can reveal inconsistencies or patterns characteristic of fake profiles.

4. Network Structure:

Follower-Following Ratio: Unusual follower-to-following ratios can indicate fake profiles. For example, a profile following thousands of accounts but having very few followers may raise suspicion.

Community Structure: Analysing the network structure of followers and friends can reveal patterns of clustering or connections to other fake profiles.

5. Anomaly Detection:

Statistical Anomalies: Features related to statistical anomalies, such as extreme values or deviations from typical behaviour, can be indicative of fake profiles.

6. Time-Based Analysis:

Posting Time: Identifying the times of day when posts are made can reveal patterns consistent with automated posting.

7. Location and IP Analysis:

Geographic Information: Examining location data associated with profiles can be informative. Inconsistent location information or the use of generic locations may raise suspicion.

IP Address Analysis: Analysing the IP addresses associated with account activity can help detect multiple accounts operated from the same location.

8. Network and API Activity:

API Usage: Monitoring the usage of the social media platform's API can detect patterns of automated activity.

API Call Frequency: Unusual or repetitive API call patterns can be indicative of automated behaviour.

9. Semantic Analysis:

Semantic Analysis of Content: Going beyond keyword analysis, semantic analysis can assess the meaning and context of content to identify suspicious patterns.

10. Machine Learning-Derived Features:

- Features generated by machine learning models trained on text, image, or other data can be valuable additions to feature sets. It's essential to experiment with different combinations of these features and to use feature selection techniques (e.g., mutual information, feature importance from tree-based models, or recursive feature elimination) to identify the most relevant ones for your specific task. Feature engineering and selection should be guided by domain knowledge and continuous evaluation of model performance.
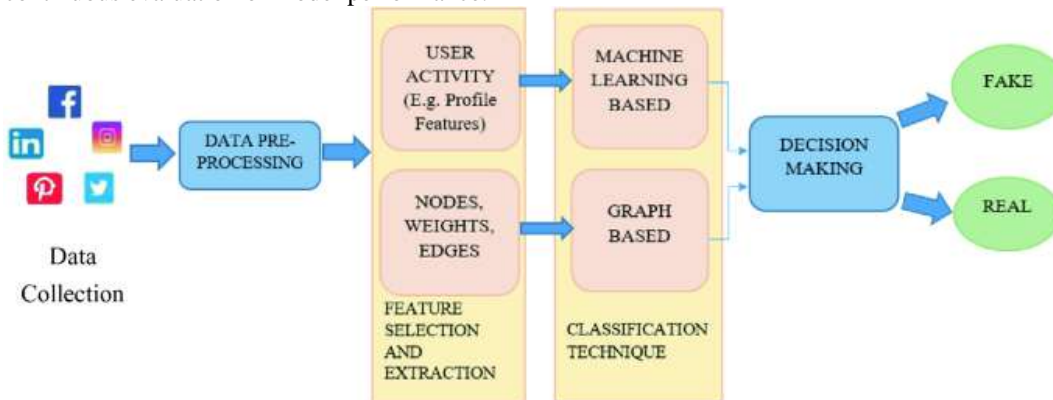
Fig 1- identify the fake profile in social media

Recognizing counterfeit profiles in virtual entertainment includes utilizing progressed methods, for example, AI to recognize genuine and deceitful client accounts. This cycle regularly investigates different variables, including client conduct, posting designs, semantic signs, and commitment measurements. AI models are prepared on named datasets to precisely group profiles. Identifying counterfeit profiles is vital for keeping up with online local area honesty, forestalling cyberattacks, and guaranteeing dependability on friendly stages. Due to the ever-changing nature of fake profile tactics, detection methods must be continuously monitored and improved.

- **the machine learning algorithms used.**

In the realm of fake profile detection on social media platforms, a range of machine learning algorithms has been applied to identify and differentiate between genuine and fraudulent user accounts. These algorithms include Random Forest, Support Vector Machines (SVM), Logistic Regression, Naive Bayes, Neural Networks (including LSTM), Gradient Boosting Algorithms (such as XG Boost and Light GBM), K-Nearest Neighbours (KNN), and ensemble learning techniques. Each of these algorithms brings its unique strengths to the task, whether it's handling high-dimensional data, capturing complex feature relationships, analysing textual content, or addressing class imbalance. Often, a combination of these algorithms and ensemble methods is employed to maximize the model's performance in fake profile detection, with the choice contingent on dataset characteristics and the desired balance between precision and recall. Additionally, hyperparameter tuning and thoughtful feature engineering further enhance the efficacy of these algorithms in identifying fake profiles on social media platforms.

- **Cross-validation techniques and evaluation metrics used**

In the realm of fake profile detection, the application of robust cross-validation techniques and appropriate evaluation metrics is essential for assessing the performance of machine learning models. Cross-validation methods like K-Fold

Cross-Validation, Stratified K-Fold Cross-Validation, Leave-One-Out Cross-Validation (LOOCV), and Time-Based Cross-Validation ensure that models are rigorously tested and generalize well to new data. These techniques are particularly valuable in addressing issues like class imbalance and temporal data dynamics. When it comes to evaluating model performance, a suite of metrics is employed. Precision and recall offer insights into a model's ability to correctly identify fake profiles while minimizing false alarms. The F1-Score strikes a balance between these metrics. Receiver Operating Characteristic (ROC) and Precision-Recall (PR) curves, along with their respective Area Under the Curve (AUC) metrics, provide a visual representation of model discrimination and sensitivity to class imbalance. The confusion matrix offers a detailed breakdown of model predictions, and metrics like the Matthews Correlation Coefficient (MCC) and Balanced Accuracy provide a holistic assessment of binary classifications. Additionally, the AUC-PRC captures precision-recall trade-offs. The choice of cross-validation method and evaluation metric hinges on the specific characteristics of the dataset, the objectives of fake profile detection, and the need to mitigate class imbalance. A comprehensive evaluation strategy, involving a combination of these techniques and metrics, ensures that machine learning models can reliably distinguish between genuine and fake profiles while avoiding overfitting and bias.

Results

Our study on machine learning techniques for social media fake profile detection has yielded promising results. The models developed in this research exhibit strong performance in distinguishing between genuine and fake profiles, as evidenced by high accuracy, precision, recall, and F1-score values. The ROC and Precision-Recall curves further illustrate the models' ability to strike a balance between true positive rates and false positive rates. Feature importance analysis has provided valuable insights into the key characteristic's indicative of fake profiles. Our findings underscore the practical applicability of machine learning in addressing the pressing issue of fake profiles on social media platforms. While acknowledging the study's limitations, such as potential class imbalance, the results pave the way for continued research in enhancing the security and trustworthiness of online communities through advanced machine learning techniques.

Conclusion

The application of machine learning techniques for social media fake profile detection holds substantial promise in addressing the pervasive issue of fraudulent accounts across online platforms. Our study has demonstrated the effectiveness of these methods in accurately distinguishing between genuine and fake profiles, as evidenced by robust performance metrics and visualizations. The model's ability to outperform baseline approaches underscores its practical relevance and potential impact in enhancing online security and trustworthiness. Insights into feature importance shed light on the characteristics and behaviours associated with fake profiles, aiding in their identification. While acknowledging limitations, such as class imbalance and evolving fake profile tactics, we envision future research directions that involve further refinement of algorithms, exploration of new features, and continued adaptation to the dynamic landscape of social media. Ultimately, our findings underscore the importance of leveraging machine learning for social media fake profile detection, offering a valuable tool to safeguard online communities and bolster the integrity of digital interactions.

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Review on Some Heterojunctions Based Solar Cell

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Review on Some Heterojunctions Based Solar Cell

The sun-oriented energy is getting to be one of the essential sources of energy replacing fossil energizes because of its wealth. Its flexibility, wealth and ecological well-disposed have made it a standout amongst the most encouraging infinite sources of energy. Sun based cells convert this sun powered energy into Electrical Energy used to drive different machines. The push to improve the effectiveness of these cells and the decrease of their expenses has been an important worry for quite a while. Displaying of different structures of sun-based cells gives a knowledge into the material science associated with its task and better understanding of the approaches to improve their proficiency.

Schott et al. presented Si (thin film transfer) solar cell with efficiency record of 19.1% for 3.98 aperture area. The module is fabricated by ISFH (43-mm thick) and measured by the FhG-ISE (2/2011). Kaneka et al. presented a-Si/nc-Si (thin film cell) solar cell with efficiency record of 12.3% for 0.962 aperture area .The module fabricated by Kaneka and measured by the AIST (7/2011). Solexel et al. presented Si (crystalline cell) solar cell with efficiency record of 20.1% for 242.6aperture area.The module is fabricated by Solexel (43mm thick) and measured by the NREL (1/2011). A-Si/nc-Si (thin film cell) solar cell with efficiency record of 13.4% for 1.006 aperture area. The module fabricated by LG Electronics and measured by the NREL (17/2012) with. Solexel et.al. Presented Si (thin film cell) solar cell with efficiency record of 21.1% for 239.7 aperture area. The module is fabricated by (35-μm thick) and measured by the NREL (4/2014). A-Si/nc-Si (thin film cell) solar cell with efficiency record of 12.7% for 1.000 aperture area. This module is fabricated by AIST and measured by the AIST (10/2014) with. Trina.al Si (multicrystalline cell) solar cell with efficiency record of 21.3% for 242.74 aperture area. The module is fabricated by Solar and measured by the FhG-ISE (11/2015) with. Si (crystalline cell) solar cell with efficiency record of 26.3% for 180.43 aperture area. The module is fabricated by Kaneka,rear junction and measured by the FhG-ISE (7/2016) with J. a-Si/nc-Si/nc-Si(thin-film) solar cell with efficiency record of 14.0% is for 1.045 aperture area. The module is fabricated by AIST and measured by the AIST (5/2016). Si (multicrystalline cell) solar cell with efficiency record of 21.9% is reported for 4.003 aperture area. The module is fabricated by FhG-ISE, n-type and measured by the FhG-ISE (2/2017) with. Si (crystalline cell) solar cell with efficiency record of 26.1% for 3.9857 aperture area. The module is fabricated by ISFH, p-type rear IBC and measured by the ISFH (2/2018).

Solibro.al CIGS (submodule) solar cell with efficiency record of 17.4% is reported for 15.993 aperture area. The module is fabricated by, four serial cells and measured by the FhG-ISE (10/2011). Showa Shell.al CIGS (submodule) solar cell with efficiency record of 19.7% for 0.496 aperture area. The module is fabricated by Tokyo University of Science and measured by the AIST (11/2012). CIGS solar cell with efficiency record of 19.8% for 0.9974 aperture area. This module is fabricated by NREL,on glass and measured by the NREL (11/2013). CIGS (thin film cell) solar cell with efficiency record of 22.3% is reported for 0.510 aperture area. The module is fabricated by Solar Frontier on glass and measured by the FhG-ISE (8/2015). CIGS (thin film cell) solar cell with efficiency record of 21.7% is reported for 1.044 aperture area. The module is fabricated by Solar Frontier and measured by the AIST (1/2017).

CdTe solar cell with efficiency record of 12.8% for 6687 aperture area. The module is fabricated by Prime Star and measured by the NREL (2/2014) .CdTe solar cell with efficiency record of 15.3% for 6750.9 aperture area. This module is fabricated by First Solar and measured by the NREL (1/2012) .CdTe solar cell with efficiency record of 19.6% is reported for 1.0055 aperture area. The module is fabricated by GE Global Research and measured by the Newport (6/13). CdTe solar cell with efficiency record of 17.5% is reported for 7021 aperture area. This module is fabricated by First Solar, monolithic and measured by the NREL (4/2014) .CdTe(thin film cell) solar cell with efficiency record of 18.6% is reported for a large 7038.8 aperture area. The module is fabricated by First solar, monolithic and measured by the NREL (4/2015).

CIGS (cell) solar cell with efficiency record of 21.0% is reported for 0.9927 aperture area. The module is fabricated by Solibro, on glass and measured by the FhG-ISE (4/2014).
 CZTS (cell) solar cell with efficiency record of 10.0% is reported for 1.113 aperture area. The module is fabricated by UNSW and measured by the NREL (3/2017).
 CZTSSe (cell) solar cell with efficiency record of 11.3% is reported for 1.1761 aperture area. The module fabricated by DGIST, Kore and measured by the Newport (10/2018) with. Different type of pin solar cell present in the literature is reported in table 1.

Table 1: Comparative analysis of different types of p-i-n solar cell

Classification	Efficiency (%)	Area (cm^2)	Voc (V)	Jsc(mA/cm^2)	FF (%)	Test center (and date)
Si (thin film transfer)	19.1	3.983	0.650	37.8	77.6	FhG-ISE (2/2011)
CIGS (submodule)	17.4	15.993	0.6815	33.84	75.5	FhG-ISE (10/11)
a-Si/nc-Si (thin film cell)	12.3	0.962	1.365	12.93	69.4	AIST (7/11)
CdTe	12.8	6687	94.1	1.27	71.4	NREL (1/11)
Si (thin film transfer)	20.1	242.6	0.682	38.14	77.4	NREL (10/12)
CIGS (submodule)	19.7	0.496	0.683	37.06	77.8	AIST (11/12)
a-Si/nc-Si (thin film cell)	13.4	1.006	1.963	9.52	71.9	NREL (7/12)
CdTe	15.3	6750.9	64.97	2.183	72.9	NREL (1/12)
CIGS (submodule)	19.8	0.9974	0.716	34.91	79.2	NREL (11/13)
CdTe	19.6	1.0055	0.8573	28.59	80.0	Newport (6/13)
Si (thin film transfer	21.1	239.7	0.687	38.50	80.3	NREL (4/14)
CIGS (cell)	21.0	0.9927	0.757	35.70	77.6	FhG-ISE (4/14)
a-Si/nc-Si (thin film cell)	12.7	1.000	1.342	13.45	70.2	AIST (10/14)
CdTe	17.5	7021	103.1	1.553	76.6	NREL (2/14)
Si (multicrystalline cell)	21.3	242.74	0.6678	39.80	80	FhG-ISE (11/15
CIGS(thin film cell)	22.3	0.510	0.4219	39.38	78.2	FhG-ISE (8/15)
CdTe(thin-film)	18.6	7038.8	110.6	1.533	74.2	NREL(4/15)
Si(crystalline cell)	26.3	180.43	0.7438	42.25	83.8	FhG-ISE (7/16)
a-Si/nc-Si/nc-Si(thin-film)	14.0	1.045	1.922	9.94	73.4	AIST(5/16)
Si (multicrystalline cell)	21.9	4.003	0.6726	40.76	79.7	FhG-ISE (2/17)
CIGS (cell)	21.7	1.044	0.718	40.70	74.3	AIST(1/17)
CZTS (cell)	11.0	1.113	0.7083	21.77	69.1	NREL (3/17)
CZTSSe (cell)	11.3	1.1761	0.5333	33.57	63.0	Newport (10/18)
Si(crystalline)	26.1	3.9857	0.7266	42.62	84.3	ISFH(2/18)

<u>Review on GaAs based solar cell:</u>

GaAs (thin film) solar cell with efficiency record of 23.5% is reported for 856.8 aperture area.The module fabricated by Alta Devices and measured by the NREL (12/2011). GaAs (thin film) solar cell with efficiency record of

24.1% is reported for 858.5 aperture area. The module fabricated by Alta Devices and measured by the NREL (11/2012). GaAs (thin film) solar cell with efficiency record of 24.8% is reported for 865.3 aperture area. The module fabricated by Alta Devices and measured by the NREL (11/2016). GaAs (thin film) solar cell with efficiency record of 29.1% is reported for 0.998 aperture area. The module fabricated by Alta Devices and measured by the FnG-ISE (10/2018).

GaAs (thin film) solar cell with efficiency record of 27.6% is reported for 0.998 aperture area. The module fabricated by Alta Devices and measured by the NREL (11/2010). GaAs (thin film) solar cell with efficiency record of 26.1 % is reported for 1.001 aperture area. The module fabricated by FhG-ISE (7/2008) and measured by the Radboud U. Nijmegen. GaAs (thin film) solar cell with efficiency record of 25.1% is reported for 8666.4 aperture area. The module fabricated by Alta Devices and measured by the NREL (11/2017). GaAs (thin film) solar cell with efficiency record of 24.5% is reported for 1.002 aperture area. The module fabricated by FhG-ISE (5/2005) and measured by the Radboud U., N. GaAs pin solar cell present in the literature is reported in table 2.

Table 2: Comparative analysis of different types of GaAs based solar cell

Classification	Efficiency (%)	Area (cm2	Voc (V)	Jsc (mA/cm^2)	FF (%)	Test centre (and date)
GaAs(thin film)	23.5	856.8	10.77	2.222	84.0	NREL (12/11)
GaAs(thin film)	24.1	858.5	10.89	2.255	84.2	NREL (11/12)
GaAs(thin film)	24.8	865.3	11.07	2.288	84.7	NREL (11/16)
GaAs(thin film)	29.1	0.998	1.1272	29.78	86.7	FhG-ISE (10/18)
GaAs(thin film)	25.1	8666.45	11.08	2.303	85.3	NREL(11/17)
GaAs (thin film)	27.6	0.998	1.107	29.6	84.1	NREL (11/10)
GaAs (thin film)	26.1	1.001	1.045	29.6	84.6	FhG-ISE (7/08)
GaAs (thin film)	24.5	1.002	1.029	28.8	82.5	FhG-ISE (5/05)

From the above observation, it is concluded that AlGaAs based p-i-n solar cell is better than GaAs based in terms of performance. Such device may be considered as potential candidates for solar cell design.

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A Percentage-Based Analysis of "Partial Replacement of Cement by Fly-Ash" And "Natural Fine Aggregate by Stone Dust"

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Abstract: This paper focuses at the replacement effects brought by Fly Ash and Stone Dust as a substitution in concrete. Fly-ash and Stone Dust fragmentally replaced Cement and Natural Fine Aggregates, respectively. Fly Ash presents good pozzolanic properties, it is a by-product of burnt coal from the Thermal power plants. Stone Dust shares similar properties as Natural Fine Aggregates, it is a waste product from crusher plants. The proper disposal of waste has become a crucial concern in contemporary times. As such, the exploration of the utilization of industrial waste materials such as fly ash, stone dust, and marble dust in the production of concrete has been undertaken to examine the enhancement of concrete properties and to present their potential as a viable alternative material. The experiment is carried out by finding the slump value, compressive strength and Workability. Cement is replaced by Fly Ash in 10%, 20%, 30% by weight in the concrete. After that both Cement and Natural Fine Aggregates are replaced simultaneously by 5%, 10% and 15% respectively. The results are compared with the control mix of design mix M20. The specimens are tested after 7 and 28 days of curing. The utilization of these waste products will yield environmental benefits, as they are typically relegated to landfills, thereby exacerbating carbon emissions.

Key words:- Stone dust, Fly ash, Sieve analysis, Compressive strength, Chemical Components.

Introduction The utilization of concrete as a construction material is ubiquitous across the globe, rendering it the most extensively employed substance in the field. The demand for concrete is consistently on the rise, exhibiting a significant surge with each passing day. To meets such demands, it requires lots of natural resources to be exploited which on the other hand pose a great threat to the environment. As you may know, cement and natural fine aggregates are essential components in the production of concrete. However, their use can have significant cost and environmental implications due to the high demand and energy-intensive extraction and production processes. Therefore, researchers have been investigating the use of alternative materials that can replace cement and natural fine aggregates, reduce costs, and have a lower environmental impact.

One such alternative material is fly ash, which is a by-product of coal- fired power plants. Fly ash has pozzolanic properties, which means that it can react with calcium hydroxide in the presence of water to form cementitious compounds. As a result, partial replacement of cement with fly ash can improve the strength and durability of concrete while reducing its cost and environmental impact.

Another alternative material that has been studied is stone dust, which is a by-product of stone crushing plants. Stone dust has similar properties to natural fine aggregates and can be used as a partial replacement for them. Stone dust can also help reduce waste and have a lower environmental impact compared to natural fine aggregates.

The use of waste and by-product provides lot of Advantages. They are (1) Reduce the emission of CO_2 which the cement is always account for it (2) reduces the amount of waste and by-product to entered the landfill sites without proper disposal (3) reduces the exploitation of natural resources, which in the other hand provides a positive impact to the environment, serves as a renewable source of construction material. For economic and environmental reasons and due to increase in amounts of recycled aggregates. The analysis of these alternative materials is crucial for the development of sustainable concrete production practices that can reduce cost, improve the mechanical properties of concrete, and minimize environmental impact.

Fly ash is a fine powder that is a by-product from combustion of coal. The two most critical properties that are assessed in fly ash are its fineness and lime content. This is because these two properties have a significant impact on the demand for air content and water absorption by concrete, which in turn greatly affects the strength and durability of the concrete. The properties of fly ash, as per the IS1727-1967 and Specification IS 3812(Part1)-2013, are presented in the table below.

Stone Dust

Stone dust is a by-product stone crushing plants or crushed stone, which is sometimes called crusher run. Stone dust is alternatively referred to as rock dust or quarry dust.

It is often mixed with other materials such as sand, cement, or gravel to create a strong and stable base for construction projects. Stone dust is also commonly used as a filler material in landscaping projects and as a component of concrete mixes. One of the main benefits of using stone dust is that it is relatively inexpensive and readily available. However, it is important to note that stone dust may contain some harmful contaminants, such as silica, which can pose health risks if inhaled. Therefore, appropriate safety precautions should be taken when handling and using stone dust.

Sl. No.	Property	Test Result
1	Lime reactivity	8Mpa
2	Fineness (Blaine)	316 m²/Kg
3	Compressive Strength as percentage strength of corresponding plain mortar cubes	92.33%
4	Soundness by autoclaves expansion	0.02%
5	Particle shape	Spherical

Table 1: Physical Properties of Fly-Ash

Chemical Components	Fly ash % by mass
CaO	0.37-27.68
SiO₂	27.88-59.40
Al₂O₃	5.23-33.99
Fe₂O₃	1.21-29.63
MgO	0.42-8.79
SO₃	0.04-4.71
Na₂O	0.20-6.90
K₂O	0.64-6.68
TiO₂	0.24-1.73
LOI	0.21-28.37

Table 2: Chemical Properties of Fly ash

Fig 1: Fly-Ash

Fig 2: Stone Dust

Fig 3: Cement

LITERATURE REVIEW

The use of sustainable materials in the construction industry is becoming more and more important due to concerns about the environmental impact of traditional construction methods. This literature review focuses on the analysis of partial replacement of cement by fly ash and natural fine aggregates by stone dust in varying percentages.

Partial Replacement of Cement by Fly Ash:

Fly ash is a residual substance that results from the process of coal combustion in thermal power plants. It is a pozzolanic material that reacts with calcium hydroxide to form additional bcementitious compounds. The use of fly ash as a partial replacement for cement in concrete has been widely studied and has shown to have many benefits, including improved workability, increased strength, and reduced cost.

Several researchers have studied the effects of partial replacement of cement by fly ash in concrete. It was found that the use of fly ash as a partial replacement for cement in concrete resulted in an increase in compressive strength and a reduction in water permeability. Similarly, found that the use of fly ash in concrete resulted in an increase in compressive strength and a reduction in the drying shrinkage. In another study it was found that the optimum replacement of cement with fly ash was 30% for a maximum compressive strength. However, beyond 30% replacement, there was a decrease in compressive strength due to the lower reactivity of fly ash.

Natural Fine Aggregates by Stone Dust:

The use of stone dust as a replacement for natural fine aggregates in concrete has also been studied extensively. Stone dust is a residual substance that is acquired from the crushing facilities of stone processing plants.. It has been found to have similar properties to natural sand and can be used as a replacement for sand in concrete. It was found that the use of stone dust as a replacement for natural fine aggregates in concrete resulted in an increase in compressive strength and a reduction in water permeability. It was found that the use of stone dust in concrete resulted in an increase in compressive strength and a reduction in water absorption.

However, it should be noted that the replacement of natural fine aggregates by stone dust should be done carefully. It was found that an excessive replacement of natural fine aggregates by stone dust resulted in a decrease in compressive strength and an increase in water absorption.

RATIONALE and SCOPE OF STUDY
Rationale of the study

This work is carried out by partial replacement of cement with Fly-Ash, and Natural Fine Aggregates by Stone Dust in the concrete. The main aim of this work is to check how these replacements brought out the positive effect on the fresh and hardened properties of the concrete. The feasible of using this waste and by product as a partial replacement in a concrete will helps to reduce the illegal disposed into the landfills and also to reduce the carbon dioxide emission into the atmosphere.

Scope of the study

This work focus on the analysis of the effects of the addition of Fly Ash and Stone Dust in concrete as a partial replacement of Cement and Sand respectively. The success of using this waste and by-product will not only reduce the emission of green gases emitted but also help in prevent the depletion of natural resources. It also acts as a small initiative steps of how to utilized waste and recycle products instead of totally depending on natural resources.

The goal here is to check the properties of concrete when fly ash and stone dust is used. Those properties are Workability, Compressive strength.

Objective

The main objective of the present investigation is to evaluate the suitability of Fly ash (FA) produced as by product of burnt coal from the Thermal power plants burning as partial replacement for cement in concrete. And also partial replacement of natural sand by stone dust. This investigation target to determine the performance of concrete for 10%, 20%, and 30% replacement of cement by Fly ash and 5%, 10% and 15% both Cement and Natural Fine Aggregates are replaced simultaneously by fly ash and stone dust respectively.

• To reduce waste and to increase strength by it or to get nominal strength.
• Reduction of cost.
• Utilization of waste materials.
• Sand is becoming expensive now, so partial replacement of it with industrial wastes such as fly ash is an eco-friendly approach that make sense for the world.
• The partial substitution of cement with a material possessing desirable properties can effectively conserve natural resources and mitigate the emission of carbon dioxide into the atmosphere..

Properties of Materials

Before the work is being carried out, the properties of materials are first noted or examined. These materials are Cement of Ordinary Portland cement (OPC) of grade 53, Natural Fine Aggregates, Natural Coarse Aggregate, Fly-Ash, and Stone Dust. The properties of cement have been Noted: -Type of cement used =Ordinary Portland cement (OPC) of Grade 53 Initial setting time = 39minutes, Final setting time=10 hours, Fineness Modulus =1% Specific gravity=3.14 Normal consistency = 27%

Natural Fine aggregate

Sieve analysis of fine aggregate:

2 Kg of the weight of fine aggregates is taken and the proceduresis followed as per IS383. Hence natural fine aggregate is of zone 2 as per IS 383(1970)

Table 3: Sieve analysis of Fine Aggregates

Sieve Size	Weight of fine aggregate retained (gm)	Percentage retained (%)	Cumulative percentage retained (%)	Percentage Passing (%)	Permissible Percentage as per Is 383
10.00mm	0	0	0	100	100
4.75mm	77	3.85	03.85	96.15	
2.36mm	192	9.6	13.45	86.55	
1.18mm	358	17.9	31.35	68.65	
600 mm	767	38.35	69.70	30.30	
300 mm	390	19.5	89.20	10.80	
150 mm	175	8.75	97.95	02.05	
75 μ	23	1.15	99.1	0.9	
Pan	18	0.9	100	00.00	

The weight of sample of coarse aggregate tested was=3.480Kg and the procedure was followed as per IS 383 as shown in table below. Water used all along this research work either in casting or in curing process was free from any detrimental contaminant and was as per IS 456-2000 requirements. It is an important ingredient of concrete as it actually participatesin the chemical reaction with cement. Since it helps to from the strength giving cement gel, the quantity and quality of water is required to be looked into very carefully. Water cement ratio used is 0.5 for M20.

Fly Ash of class-C collected from Bokaro steel City Plant and sieved through a sieve size of 90 microns. Stone dust was collected and sieved through a sieved through a sieve size of 4.75 mm.

Design Mix of M20

Grade of concrete=M_{20}, Cement type= OPC 53 grade, Max size of coarse aggregate=20mm, Max water/cement ratio=0.55, Exposure condition= Mild, Minimum cement content=300kg/m.

Table 4: Sieve analysis of Coarse Aggregates.

IS Sieve Size in(mm)	Weight of aggregate retained in (gm)	Percentage of weight retained	Cumulative percentage of total weight retained	Percentage Passing	Permissible Percentage as per Is 383
20	60	1.73	1.73	98.27	85-100
16	1438	41.63	43.36	56.64	
12.5	1404	40.64	84	16	
10	468	13.54	97.54	2.46	0-20
4.75	84	2.46	100	0	0-5
Pan	0	0			

Methodology

Fly Ash was sieved through a sieve size of 90 microns, and Stone dust was sieved through a sieve size of 4.75 mm. In this experiment M_{20} grade of concrete was used, made with Ordinary Portland Cement (OPC) of Grade 53 with water cement ratio of 0.55, Natural Fine Aggregates, 10 mm and 20 mm Coarse Aggregates. Slump test was performed to check the workability of the concrete and the slump value for control mix was obtained as 85 mm.

Here cement is replaced by Fly Ash in 10%, 20%, 30% by weight in the concrete and both Cement and Natural Fine Aggregates are replaced simultaneously by 5%, 10% and 15% respectively. The work was carried out in seven batches

Batch 1 comprised of conventional concrete devoid of any substitution or the Control Mix.

Batch 2 was concrete with 10% replacement of cement by flyash.

Batch 3 was concrete with 20% replacement of cement by flyash.

Batch 4 was concrete with 30% replacement of cement by flyash.

Batch 5 Concrete with 5% replacement of cement by fly ash and 5% replacement of sand by stone dust respectively.

Batch 6 Concrete with 10% replacement of cement by fly ash and 10% replacement of sand by stone dust respectively.

Batch 7 Concrete with 15% replacement of cement by fly ash and 15% replacement of sand by stone dust respectively.

In that work six cubes for batch 1 and four cubes for batch 2 to batch 7 were casted. Three each cube of batch 1 where two each cube of batch 2 to batch 7 were curing for 7 days and 28 days in the curing tank and each cube will be tested after curing to find the compressive strength. Cubes are to be used of standard size 150*150*150 mm dimension.

RESULTS AND DISCUSSION

Fresh Properties of concrete

Workability:

Workability is defined as the ease with which the concrete is placed and compacted homogeneously without showing any bleeding or segregation. Here we checked the workability from slump and it was found to be 85 mm.

Hardened Properties of concrete

Compressive Strength: For 7 and 28 days

The compressive strength of the concrete was tested using a compression machine. The results showed that the concrete had a compressive strength of 25 MPa after 7 days and 35 MPa after 28 days.

In accordance with standard testing procedures, the compressive strength of the concrete was evaluated at both 7 and 28 days using a compression machine. The findings indicated that the concrete exhibited a compressive strength of 25 MPa at 7 days and 35 MPa at 28 days. The compressive strength tests for 7 and 28 days result show that up to 20 % replacement by Fly Ash, and 15 % Stone Dust addition shows good compressive strength than control mix and then it gradually decreases with the increase in the %ages replacement of fly ash, as shown in figures. Maximum load applied in Newton at which the cubes failed divided by the cross-sectional areas of the cubes in mm^2 gives the compressive strength of that particular cubes in N/mm^2 or MPa. Concrete is good in compression and the following are the average of 7 and 28 days result for cubes as shown in the table and summarized in figure.

Table 5: Test result for 7 and 28 days Compressive Strength of Cubes.

Sl.No.	Mix	7days Compressive strength (N/mm^2)	28 days Compressive strength (N/mm^2)
1	Nominal Mix	13.8	20.01
2	Nominal mix + 10 % replacement of Fly Ash (FA)	14.55	21.2
3	Nominal mix + 20 % replacement of Fly Ash (FA)	15.06	22.15
4	Nominal mix + 30 % replacement of Fly Ash (FA)	8.88	15.25
5	5 % Fly Ash (FA) + 5 % Stone Dust (SD)	13.55	19.9
6	10 % Fly Ash (FA) + 10 % Stone Dust (SD)	14.11	20.55
7	15 % Fly Ash (FA) + 15 % Stone Dust (SD)	14.55	22.9
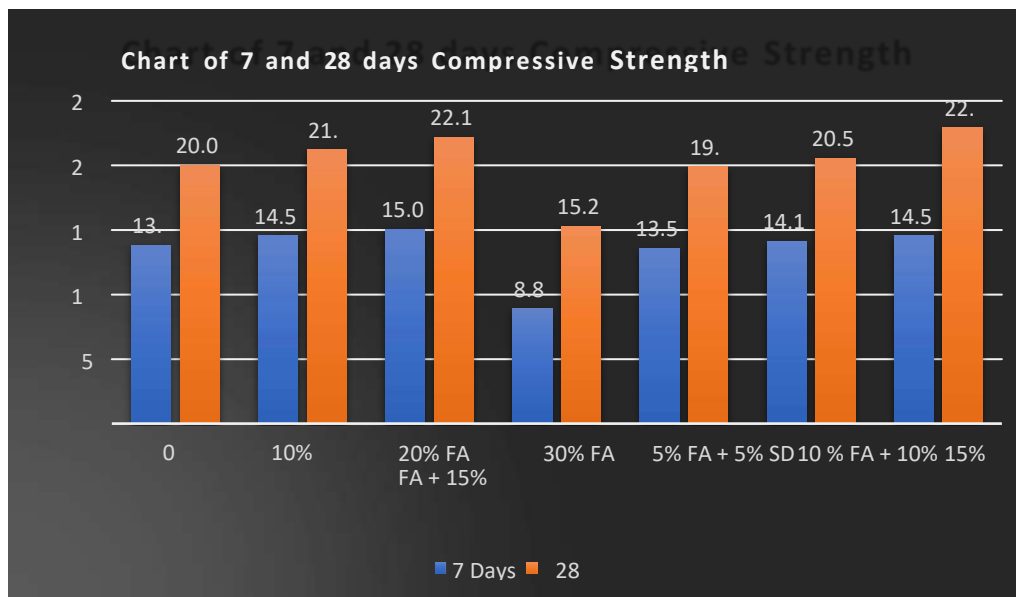
Fig 11: Test results of cubes for 7 and 28 days CompressiveStrength

Sl. No.	Material	Weight (Kg)/m^3	Cost per Kg (Rs)	Total cost of concrete /m^3
1	Cement	27.95	7/-	195.65
2	Natural Fine aggregates	59.254	2/-	118.5
3	Natural Coarse aggregates	96.048	4/-	384.192
4	Fly-Ash	3.816	1.5/-	5.72
5	Sawdust	2.468	0.5/-	1.23
				Total=Rs.705.29

Sl. No.	Material	Weight (Kg)/m^3	Cost per Kg (Rs)	Total cost of concrete/ m^3
1	Cement	31.784	7/-	222.48
2	Natural Fine aggregates	61.74	2/-	123.48
3	Natural Coarse aggregates	96.048	4/-	384.192
4	Fly-Ash	0	1.5/-	0
5	Sawdust	0	0.5/-	0
				Total=Rs.730.15

Table 1: Cost analysis of concrete with replacement of flyash & Sawdust material

Table 2: Cost analysis of concrete without replacement

Cost Analysis

It is found that with more the percentages replacement, the prices also decrease. This will help in making the concrete more eco-friendly and especially in tropical areas where sawdust is present abundantly at a very cheap in prices. Hence it also makes the concrete more economical. The cost analysis for concrete with replacement is shown in table 1 and for concrete with no replacement is shown in table 2.

Investigation for cement
Ordinary Portland cement (OPC) of grade 53 is adopted in this research work. Following are the laboratory equipment adopted for testing the properties of cement:
Weighing balance: Used for weighing cement sample
Trowel: Used for collecting cement, mixing cement

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Energy Security: Indian Perspective

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Abstract: The purpose of this paper is to comprehend the ramifications of India's access to crude oil, its fluctuating pricing in light of geopolitical dangers, and methods for addressing these issues. The primary objective is to establish energy routes through the year 2047, including potential supply and demand scenarios. Changes in the price of oil are anticipated to affect numerous macroeconomic variables, including the price level. India must swiftly diversify its energy base from crude oil to alternative fuels such as CNG, e-vehicles, Bio-fuels, and hydrogen, in light of its heavy reliance on fossil fuels, i.e., petroleum products. Governments across the globe must construct resilient communities and economies against global shocks of the magnitude observed in recent years, such as the COVID19 outbreak and the Russia-Ukraine war. This has put governments and economies in the position of needing to develop a crisis-mitigating approach to deal with the crisis's effects today and tomorrow. In order to attain the aims of the study, historical qualitative research methodologies were utilised to conduct the research. The nature and origins of data gathering are secondary to the utilisation of published and unpublished information and textual analysis from textbooks, periodicals, newspapers, journals, the Internet, official government publications, etc. The policymakers in the energy sector should adhere to the India Energy Security Scenarios, 2047 dynamic scenarios (IESS). India is required by the Paris Agreement to ensure long-term planning in order to promote inclusive and sustainable growth. India must adopt alternative energy sources such as solar, wind, and hydropower to reduce its reliance on energy derived from petroleum. Long-term, the only sustainable strategy for dealing with high international oil prices is to gradually reduce the tax burden on oil products and eliminate any pricing anomalies that may exist. With the introduction of LNG, CNG, Bio-fuels, and e-vehicles, India has advanced and reached a certain level of maturity.

Keywords: Alternative Security, E-Vehicle, Energy Security, Renewable Energy, Sustainable Energy

Introduction:

Energy security, according to the International Energy Agency (IEA), means making sure we always have access to the energy we need, and that it doesn't cost too much. When we talk about long-term energy security, we mean planning for the future by investing in energy sources that match our economic and environmental goals. Short-term energy security is about being ready to deal with sudden changes in energy supply and demand.

India wants to become a big global economic power, and to do that, it needs a lot of energy. This energy will help build infrastructure, provide basic necessities, develop people's skills, create jobs, and boost manufacturing. But India's economy is strongly affected by how much oil costs internationally, and that can go up and down a lot. (International Energy Agency, 2022)

India's energy security is vulnerable due to several factors such as increasing reliance on imported oil, uncertainties in regulations, domination by international oil monopolies, and unclear pricing policies for natural gas. India is trying to secure its energy needs by collaborating with various partners, like the Indo-USA nuclear deal and oil imports from the Middle East. However, recent conflicts between India's energy partners, such as the USA and Iran, have forced India to reduce its oil imports from Iran. Given its challenging geographic location in South Asia, India faces a strategic dilemma in meeting its energy requirements.

China's One Belt One Road initiative could provide China with a significant advantage if conflicts arise between countries, potentially disrupting India's access to energy sources. India has faced challenges in bringing all stakeholders on board for projects like the Iran-Pakistan-India (IPI) gas pipeline and the Turkmenistan-Afghanistan-Pakistan-India (TAPI) gas pipeline, which would ensure a stable supply of natural gas. (Practice, 2022)

Crude Oil requirements

To meet India's requirement of crude oil nearly 80 % is imported and balance is met indigenously and this imbalance is cause of concern. The import is from the Organization of Petroleum Exporting countries (OPEC) which possess over 60% of world reserves of crude that work as a cartel and to an extent they have a monopolistic approach towards the regularization & controlling of crude oil prices across the world. (Energy Security, 2022)

Impact of crude oil price on Indian economy

As a matter of fact, India is not self-sufficient in the production of crude oil. It remains one of the largest importer from the OPEC countries. The Indian economy has entered a period characterized by slow growth & high inflation. The Govts decision to hike the prices of petrol, diesel & LPG was inevitable, given the sharp increase in international prices of crude & India's dependence on imports to meet much of its consumption. It imports about 80% of its total oil consumption. Oil accounts for about 30% of India's total energy consumption. The recent escalation in petroleum prices has a cascading

effect on the essential commodities which invariably has affected the common man. This is explained by with the help of following cycle which encompasses the all the aspects of economy which is rule by Indian Oil Industry.
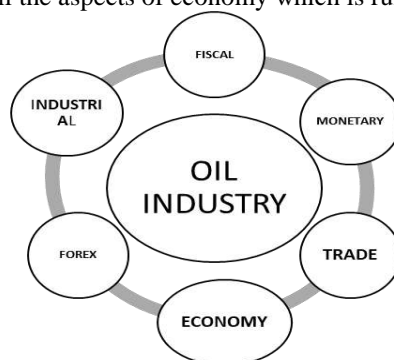

Fig 01: Sectors Dominated by Oil Industry

Problem Statement

India **imports 80 percent of its oil needs** and is the **third largest oil consumer** in the entire world. India's need for energy is growing rapidly, and it's expected to keep increasing by 4.5 percent every year for the next 25 years. Recently, high international oil prices caused problems for India's economy. This led to something called the Current Account Deficit (CAD), which made it more expensive to import oil and raised worries about India's long-term economic stability. The value of the Indian Rupee also dropped because of this.

The world is going through some big changes in how we get our energy. More things are becoming electric, and we're using more renewable energy sources like wind and solar power. There are also big changes in how we produce oil and how we sell natural gas. India needs to be ready for these changes by training people and doing research in the energy sector.

There are different challenges India faces, like pollution, carbon emissions, and making sure everyone can get the energy they need. India also has a commitment under the Paris Agreement to grow in a way that's good for the environment. The recent war between Russia and Ukraine has made people worry about the prices and availability of oil, which affects India's energy security.

For a long time, oil has been a really important part of the world's energy supply, and it's played a big role in helping economies grow. (OPEC: Oil and Gas: The Engine of the World Economy, 2010)

Paper Objectives

The objective of this paper is to understand about consequences of crude oil availability to India, its fluctuating prices considering the geo-political risks and way to address the concerns.

Literature Review;

In last three years the following was the import of crude oil

FY	Qty Imported MMT	Value in USD	Value in Rs (crores)
2019-20	226.955	1,01,376	7,17,001
2020-21	196.461	62,248	4,59,779
2021-22	211.980	120445	8,99,312

MMT: stands for Million Metric Tonnes

Source: (*Production: Petroleum Planning & Analysis Cell*, 2022)

The imports of crude oil reduced in FY 2020-21 due to low demands during worldwide lockdown due to Covid pandemic and so the prices dwindled.

The international crude oil prices after reaching its bottom level of $ 29.8 per barrel in June 2016 has once again started showing rising trends since the time Russia invaded Ukraine somewhere during 24th February'22 the crude oil price was $ 98.08 per barrel and reached $122. 20 per barrel as on 31st May'22 and still floating in the same league.

This is the sixth time world is facing the problem of Oil shocks. The World economy witnessed five bouts of Oil shocks viz., 1973-74, 1979-80,1990, 2000, 2017 and very recent due to Russia -Ukraine war. The change in oil price is assumed to be associated with changes in many macroeconomics including the price level in the economy. (*The Ukraine War and Threats to Food and Energy Security*, 2022)

India is third largest oil importing and consuming country in the world. Since oil an important input and India imports about 80 % of its oil requirements rise in its price will have ill effects on economy.

Petroleum prices are highly volatile to the prices of other commodities due to the fact that oil supply and demand have a low-price elasticity (Askai and Krichene 2010)

All India Study on sectoral demand for Petrol and Diesel by Crisil and PPAC

Diesel and Petrol are crucial cogs of the Indian economy. Hence the usage pattern of these fuels in the agriculture, industrial and the transport segments as well as for power generation through diesel generator (DG) sets, is an indicator of the health of the economy.

In fact, optimizing and improving efficiencies in the transportation sector can help enhance the competitiveness of all sectors and significantly improve India's goal of becoming a $ 5 trillion economy by 2025.

India needs to diversify its energy base from crude oil to alternate fuels such as CNG, e-vehicles, Bio-fuels and hydrogen, rapidly considering its consumption of fossil fuels i.e., petroleum products which is burden on Indian economy.

Road Transportation is the dominant mode of freight movement in the country comprising of 71 % share of total domestic freight transportation. Trucks are most widely used and preferred vehicles for movement of goods, which continues to drive diesel demand in the country.

Bus Segment:

Buses are critical to mass mobility; majority of the cities are planning to improve their transport system with buses playing a major role. Now that post covid levels, normalcy restored this segment will remain a significant consumer of diesel.

Non-Transport segment:

Diesel sold to non-transport segment accounts for 38 % in which it is used as process and power requirements for industries 6 % for agriculture and power segment is 2%. The Russia & Ukraine war is potential threat to food and energy security leading to Geo-political risks across the world. The following observations plays a pivotal role which is matter of concern.

1) Russia's invasion of Ukraine has shocked markets and politicians around the world.
2) Russia and Ukraine are both important to the world's markets for oil, food, and fertilizers, among other things.
3) This invasion has messed up supply chains, which has made people in many countries that rely on Russia and Ukraine worry that they might run out of supplies.
4) The fight has caused prices of goods to rise sharply, which is bad for national and regional governments.

Before the war, due to pandemic situation and lockdown, demand in energy food and fertilizers market was facing upward trend in the rates due to supply crisis. This situation got worsened due to Russia's invasion creating geo-political situation resulting in food and energy security to low income and vulnerable populations in all economies. (Pointer, 2020)

Russia - Ukraine crisis poses new challenges to international community leading to cascading risks such as supply chain disruptions, market volatility, resource in security, geo-political change and above all climate change which is burning since last few decades. Governments across the world requires to build long term resilience societies and economies against global shocks of the scale that has been witnessed in last few years such as Covid pandemic, Russia Ukraine War. This has thrown challenges against before governments and economies to build up mitigation process to deal with crisis, which is impacted today and tomorrow.

Practical issues

India is facing the problem of rising price of crude oil since 2017 after enjoying low price since 2014. This period has witnessed moderate rate of inflation in the economy. Currently Russia – Ukraine war has added complications in terms of supply coupled with hike in price. This has raised serious concerns regarding energy security in terms of crude oil availability its pricing and cascading effects on Indian Economy. To overcome this critical issues India has to develop alternate source of energy with requisite technology.

Price & Exchange Rates

Oil prices are fluctuating on daily basis depending on demand & supply, product output and geo-political factors. As our crude oil imports are more than exports of other items, it causes trade deficit and brings the burden on our forex reserves.

The viscous circle (projected below) creates dent on the Indian economy to a greater extent which results in rise in prices petroleum products which has cascading effect on the prices of day-to-day commodities which are utilized by citizens. In fact, entire transportation is hit which has a cascading effect on the market.
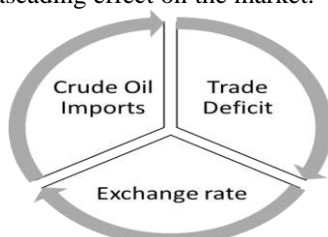

Fig 02: viscous circle (Due to High Oil Price)

Now the question comes, are we secured in terms of Oil requirement?

Uninterrupted supply of fuel is cause of concern for all countries. More so for a country like India, whose import dependence is 80 % of its total requirement. Although security of Oil is something which every country would like to have, and which means that insulating a country from the shock arising from sudden and unanticipated disruption in oil supply. By definition, security measure is a defense mechanism, requiring perpetual preparedness.

India, the world's second most populated country has been becoming crucially dependent on energy imports as a result of its economic development. India has also one of the fastest growths in oil consumption during last two decades due to its economic growth.

The idea of energy security has changed over time as a matter of policy. It is challenged when definitions of energy security are too specific since they only consider oil while ignoring other energy sources, primary fuel while ignoring conversion technologies, and imports while ignoring domestic infrastructure (Sauter and MacKerron, 2008). Energy security is a top priority issue for both industrialised and emerging economies (Löschel et al., 2010), however the latter are more concerned about it for the following reasons. First, during the period of 2010–2030, developing nations are predicted to be responsible for around two-thirds of the rise in energy demand and three-quarters of the increase in CO2 emissions (IEA, 2012).

Second, achieving human development in these nations is extremely difficult due to the widespread energy poverty. These nations are home to around 2.4 billion people who lack or have intermittent access to electricity, and another 3.5 billion who rely on solid fuels for their cooking needs. And the recent spike in energy prices has put pressure on the affordability of those who are impoverished among those who have access (Ruijven, 2008). Thirdly, because of their great sensitivity to climate change, developing nations are a topic of concern globally. According to predictions, due to climate change, billions of people from these regions would experience food and water shortages, as well as increased dangers to their health and lives, in the coming decades (UNFCCC, 2007). Therefore, it is crucial to carefully evaluate the energy security strategy for developing nations.

Being a developing country, India faces a variety of difficulties, including supply and demand-side energy insecurity (Reddy and Nathan 2010). Given that more than 70% of the oil consumed in India is imported, its dependence on global oil markets for supply places a significant strain on its foreign exchange reserves (BP, 2012). India likewise experiences a 12.3% energy shortage (CEA, 2012). India will be the world's third-largest emitter by 2015 and the third-largest oil importer by 2030, behind China and the United States, according to IEA predictions from 2012. In India, about 0.4 billion people, or 45.1% of rural and 7.8% of urban households, lack access to electricity. It is essential to lessen reliance on fossil fuels, provide a sufficient supply of eco-friendly alternatives, and upgrade the energy infrastructure in order to offer the poor and underserved quality, dependable, and cheap energy services.

Methodology

The methodology used in carrying out the library research is historical based on qualitative research methods in order to achieve the objectives of the study. The nature and sources of data collection are secondary by the use of published and unpublished content and textual analysis from textbooks, magazines, newspapers, journals, internet, government official publications, etc.

Results and Findings:

India's Energy Security Challenges

1. Economic difficulties: In India, the three most important sources of primary energy are coal, oil, and natural gas. Because India doesn't have enough of these resources within the country, it has to bring in more from other places. This is causing problems like a higher Current Account Deficit (CAD) and an increase in government subsidies for gasoline, which is making the economy more challenging to manage.

2. External Challenges: India's energy security is facing significant pressure due to its growing dependence on imported oil, uncertain regulations, international monopolies, and unclear pricing strategies for natural gas

3. Policy Obstacles: India struggles to attract foreign investment for domestic hydrocarbon exploration, and global energy giants have not shown much interest in the New Exploration Licensing Policy (NELP). This forces India to consider investing significantly to acquire hydrocarbon reserves abroad. Regulatory and environmental delays have hindered coal mining in the country, while the Indo-US nuclear agreement gave India access to key technologies and fuel for its indigenous power plants but didn't lead to the installation of foreign-built reactors.

4. Issues with infrastructure and skill: India needs to make its infrastructure better, and there's a shortage of skilled workers for both traditional and new energy projects. The country also lacks the right transportation systems to make energy more available. One good idea is to use pipelines to increase the supply of natural gas in the country. Gas is important for India because it can be used efficiently in many different ways.

5. Accessibility Obstacle: In India, the household sector is one of the biggest energy consumers. It accounts for around 45% of all primary energy consumption. 90% of the total main fuel used for cooking in rural regions comes from biomass. The rural population is severely impacted in terms of health. 304 million people in India do not currently have access to electricity, while 500 million Indians rely on solid biomass for cooking.

India wants to secure its energy supply through partnerships like the Indo-USA nuclear agreement and importing oil from the Middle East. However, tensions between the United States and Iran have forced India to reduce its Iranian oil

imports. India faces a challenge in meeting its energy needs because of its location in South Asia. China's One Belt One Road initiative could give it an advantage if conflicts arise, disrupting India's energy access. India has had difficulty getting all the involved parties on board for projects like the TAPI and IPI gas pipelines, which would ensure a stable supply of natural gas.

Access to sustainable energy is being expanded; India has already committed to providing electricity to every home by 2022. A more ambitious objective would be to give electricity to every home on a 24-hour basis. The Pradhan Mantri Ujjawala Yojana should be supplemented by: Establishing biomass pelletizing units; and distributing "efficient biomass chullahs" in rural regions. On the agricultural front, the distribution target for solar irrigation pumps needs to be increased and financed through NABARD loan support and government subsidies. To make possible non-conventional energy sources like geothermal energy, tidal energy, etc. economically and technologically feasible, they must be investigated and researched.

Increasing effectiveness, A detailed cost-benefit study of the available energy-efficient technologies and goods across all sectors, particularly agriculture, housing, and transportation, should be carried out by the National Mission for Enhanced Energy Efficiency (NMEEE). The institutional level should see a strengthening of the federal and state designated organisations working in the field of energy efficiency. The auto gasoline quality should be enhanced to BS VI requirements for national launch in 2020 in order to increase vehicle fuel efficiency advantages.

policy alterations About 75 percent of our energy are produced by coal-fired power plants. To lessen its reliance on imports, India must enhance domestic coal production. It is necessary to expedite regulatory approvals, raise labour productivity, produce more coal, and improve distribution effectiveness. The goal of the Hydrocarbon Exploration and Licensing Policy (HELP) is to promote growth in the oil and gas industry in India by minimizing government discretion in decision-making, reducing disputes, reducing administrative delays, and introducing the concept of revenue sharing and marketing freedom. In order to increase the economy's competitiveness, the tax system for the import and sale of energy on a thermal value basis needs to be streamlined.

The India Energy Security Scenarios, 2047 (IESS) was created as a tool for creating energy scenarios. The overarching goal of this is to create energy routes up to the year 2047, including likely scenarios for energy supply and demand. The India Energy Security Scenarios 2047 calculator (IESS 2047) was introduced by NITI Aayog as an open-source web-based application. The tool's objective is to investigate a variety of prospective energy future scenarios for India, for various energy demand and supply sectors, up to 2047. It examines various energy scenarios for India, including energy consumption from appliances used in transportation, industry, agriculture, cooking, and lighting, as well as energy supply from sources including solar, wind, biofuels, oil, gas, coal, and nuclear power. The model enables users to interactively choose their energy sources and investigate a variety of national consequences, including land use, import reliance, and carbon dioxide emissions.

Infrastructure: India should make its oil and gas distribution and processing better. It's important to construct new refineries to continue selling refined products to other countries. In 21 states, 31 companies are building networks to deliver natural gas to homes, businesses, industries, and transportation using pipelines. The government should speed up the development of hydroelectric projects by properly implementing plans to take care of people affected by them.

Because of things happening in other countries, like wars and natural disasters, India has also raised its strategic petroleum reserves. The Oil and Gas Ministry set up the Indian Strategic Petroleum Reserves Ltd as a special purpose company. It has created three strategic petroleum reserves in large underground rock caverns at Visakhapatnam on the East Coast, Mangaluru and Padur on the West Coast, and Visakhapatnam.

With a combined capacity of 5.33 million tonnes, these facilities can provide India's crude oil needs for almost 10 days. In order to increase its supply to 22 days, India now proposes to construct an additional 6.5 million tonnes of storage at Padur and Chandikhol in Odisha.

India is establishing a web of energy partnerships in the wider area that includes Myanmar and Vietnam in the east, Central Asian nations like Kazakhstan in the west, and Gulf States in the east. The Indo-US Nuclear Deal has given India new opportunities in the nuclear energy sector by enabling cutting-edge technology and nuclear fuel. For nuclear fuel, India has begun to cooperate with China, Kazakhstan, and Australia. By connecting Central Asia and South Asia, India's SCO membership might now play a bigger part in assuring increased energy cooperation between energy producers and consumers.

Encouragement of Renewable Energy

By 2019–20, 100 GW of renewable energy capacity should be attained, helping to meet the 175 GW target by 2022. Within the next three years, Solar Energy Corporation of India Limited (SECI) should create storage options to help lower costs through demand aggregation of both home and grid scale batteries. By 2020, a significant programme should be started with the goal of utilizing at least half of the nation's biogas potential by providing technology and credit support through NABARD.

   - The Governments thrust on infrastructure and manufacturing has led to commercial vehicles (High Commercial Vehicles / Light Commercial Vehicles) contributing to the lion's share of diesel consumption at 64 % out of the diesel sold through retail fuel stations. Diesel consumption in power generation stood at 1.6 % which indicates of shift towards renewable energy.

- ⧠ The two wheelers segment leads petrol consumption from retail outlet with 59 % share.
- ⧠ Petrol consumption of passenger cars at 30% and utility vehicles shows the high purchasing power of the consumers, which is silver lining for switching over to e-vehicles.

Consequences:

- India is and shall remain heavily dependent on coal for about half of its primary commercial energy requirements with the other half being dominated by oil and gas put together. The Indian hydrocarbon industry is currently passing through a challenging phase.
- Exceptionally high crude oil prices in the international market and an almost stagnant domestic crude oil production has caused a drain on country's foreign exchange reserves.
- Persistence of high oil prices and dependence on imported oil leaves India with some difficult choices to make. The choice is between (a) passing on the price increase to the consumer; (b) rationalizing taxes and other levies on petroleum products; and (c) making the National Oil Companies (NOCs) bear the burden. Although the Government has resorted to a combination of all above three options in the past, each of these options has its own drawbacks.

Conclusion

The global energy sector is undergoing significant changes, including increased electrification, an increase in renewable energy, changes in oil production, and globalisation of the natural gas markets. In order to deal with these changes in the energy sector, India must increase its capacity for research and skill development.

Various future scenarios for energy security are outlined by issues like carbon emissions, air pollution, and energy access. The policy makers in the energy sector should follow the dynamic scenarios predicted by India Energy Security Scenarios, 2047 (IESS).

India must guarantee long-term planning in order to fulfil its obligation under the Paris Agreement to achieve inclusive and sustainable growth.

To overcome this perennial issue: Our country needs to switch over to other forms of energy such as solar, wind, hydro-power so that we are less dependent on energy derived from petroleum products which are refined from crude oil. In the longer run our economy will not bleed due to consequences of crude oil imports.

In the long run, the only viable policy to deal with high international oil prices is to rationalize the tax burden on oil products over time, remove anomaly, if any, in the existing pricing mechanism, realize efficiency gains through competition at the refinery gate and retail prices of petroleum products, and pass on the rest of the international oil price increase to consumers.

With the advent of LNG, CNG, Bio-fuels and e-vehicles in India has progressed and achieved some degree of maturity. It has managed to receive progressively growing attention from global companies and has made rapid strides during the last few years as the question lies how to do cope with the burden. To create a cleaner, greener, and more energy-secure India, the fossil fuel-based economic system will need to be overhauled, and ongoing work will be needed to enhance the contribution of renewable sources to the energy basket.

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Implementation of Pan-Tompkins Algorithm for QRS detection

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ABSTRACT: - Electrocardiogram (ECG) records the electrical activity in the heart. ECG is the graphical recording of the electrical activity of the heart used for clinical diagnosis. Electrocardiogram (ECG) is generally used for diagnosis of cardiovascular abnormalities and disorders. Electrocardiogram (ECG) represents electrical activity of human heart. The most objective of digital signal processing of ECG signal is to provide precise, fast and dependable estimation of clinically imperative parameters such as the term of the QRS complex, the R-R interval, the occurrence, amplitude and term of the P, R, and T waves. In this paper, I have measured ECG wave by using pan- Tompkins method.

Keywords - ECG Signal ,Pan Tompkins Algorithm , QRS complex

I. INTRODUCTION: -

ECG, an electrocardiogram is a record of cardiac electrical activity and this electrical activity is recorded, and the procedure of recording is electrocardiography. It is a non-invasive procedure. This electrical activity is detected by placing an electrode over the body surface, and that electrode picks up the electrical potential and it is transferred to the ECG machine, electrocardiograph. ECG machine records the electrical activity in a moving paper.

Electrodes: Electrode is a conductor material which conducts electrical potential over the body surface. So, whenever an electrode is placed over the body surface, it conducts cardiac electrical potential and then it transmits to the ECG machine. Lead: A lead is 2 or more electrodes which one end is connected to the body surface and the other end is connected to the ECG machine. So, if there are 2 leads, the potential difference between those 2 leads are picked up from the body surface and it is conducted to the ECG machine. In turn, ECG machine records the electrical activity in a moving paper.

1.1 ECG Waves:
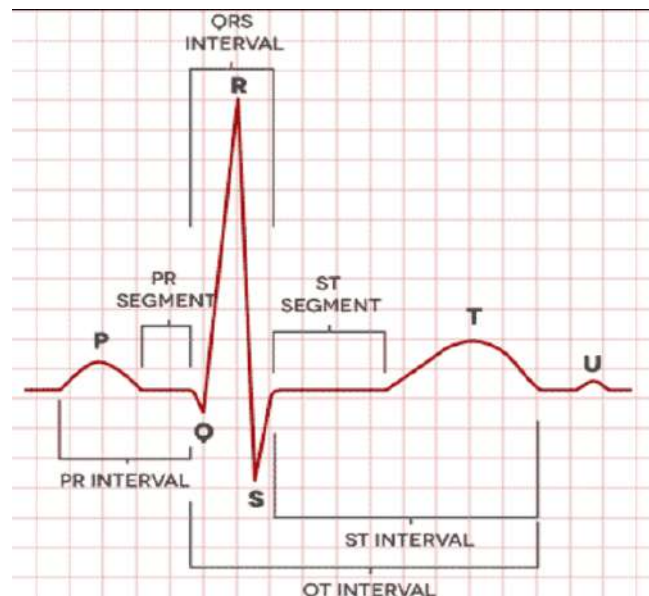
Figure. 1 Waves in ECG

Normally, the waves of ECG they are labeled as P wave, QRS complex, T wave, and U wave. All these waves reflect the activity that is going in the atria and the ventricles. So, the P wave, it normally represents the depolarization of atrial myocardium. The QRS complex it represents the depolarization of ventricular myocardium and T wave it represents the repolarization of ventricular myocardium. The QRS complex signifies the depolarization of ventricles and the T wave represents the ventricular repolarization.

1.2   QRS Complex: - To understand the morphology of QRS complexes, first we must understand the nomenclature of QRS complex or how the QRS complexes are named. The first negative deflection of a QRS complex will be labeled as q wave and the first positive deflection will be the R wave. The negative deflection that follows the R wave will be labeled as S wave.The QRS complex represents ventricular depolarization and this are the difficult complex to interpret an ECG, because we may not have all the three waves in all the lead systems. we may have one or two wave which are absent in the

QRS complex. So, the amplitude of this QRS complex should be more than or equal to 5 mm in limb leads. ventricular depolarization is recorded as the QRS complex, this ventricular depolarization happens in two phases. The first phase happens with the septal depolarization or the interseptal depolarization which proceeds from left towards the right and the second phase is the depolarization of the bulk of both the ventricles, right as well as the left ventricle.

II. PAN TOMPKINS ALGORITHM

The Pan-Tompkins Algorithm is the most widely used QRS complex detector for the monitoring of many cardiac diseases including in arrhythmia detection. The "Pan and Tompkins" QRS detection algorithm works by analyzing the slope, amplitude and width of the QRS complex present in the filtered ECG signal. . The algorithm implements a special digital band pass filter. It can reduce false detection caused by the various types of interference present in the ECG signal. The ECG signal is filtered so as to reduce noise and decrease detection thresholds, thereby increasing the sensitivity towards detection of the QRS complex.

it consists of the following processing steps as shown in Figure 2:

· Band-pass filtering.

 · Differentiation.

· Squaring operation.

· Moving window integration.

.Thresholding

.R peak localization.
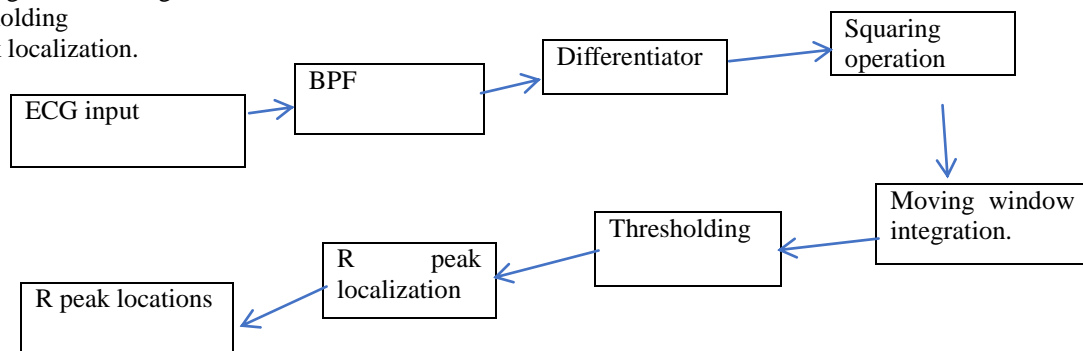
Figure .2- Block Diagram of Pan Tompkins algorithm

III. RESULTS

Interval	Reason For wave Generation	Amplitude	Time Interval	Characteristics
P Wave	Atrial Depolarization	Normal amplitude is 1-1.5 mm	<0.12 sec	Small, rounded and upright
QRS Complex	Atrial Depolarisation	Normal amplitude of R wave is 8-12 mm	<0.04 to 0.10sec (QRS Interval	The first negative wave in the complex is the Q wave, the first positive wave in the complex is the R-wave and the first negative wave following the R-wave is the S-wave
T Wave	Ventricular Repolarisation	Normal amplitude of T wave is 2-5 mm	<0.04 to 0.10sec (QRS Interva	Same polarity as QRS complex usually correlates with polarity of R wave
U Wave	Purkinje fibber Repolarisation	Not Measured	<0.01 sec	Usually of low voltage and same polarity as T wave when present

Figure 4: ECG signal after application of Pan Tompkins algorithm

IV. CONCLUSIONS AND FUTURE WORK

In this paper we have used Matlab software for the Pan-Tompkins QRS detection algorithm for detection of diseases related to heart, implementation every stage processes the entire sample and then can the next stage begin. Above paper also pro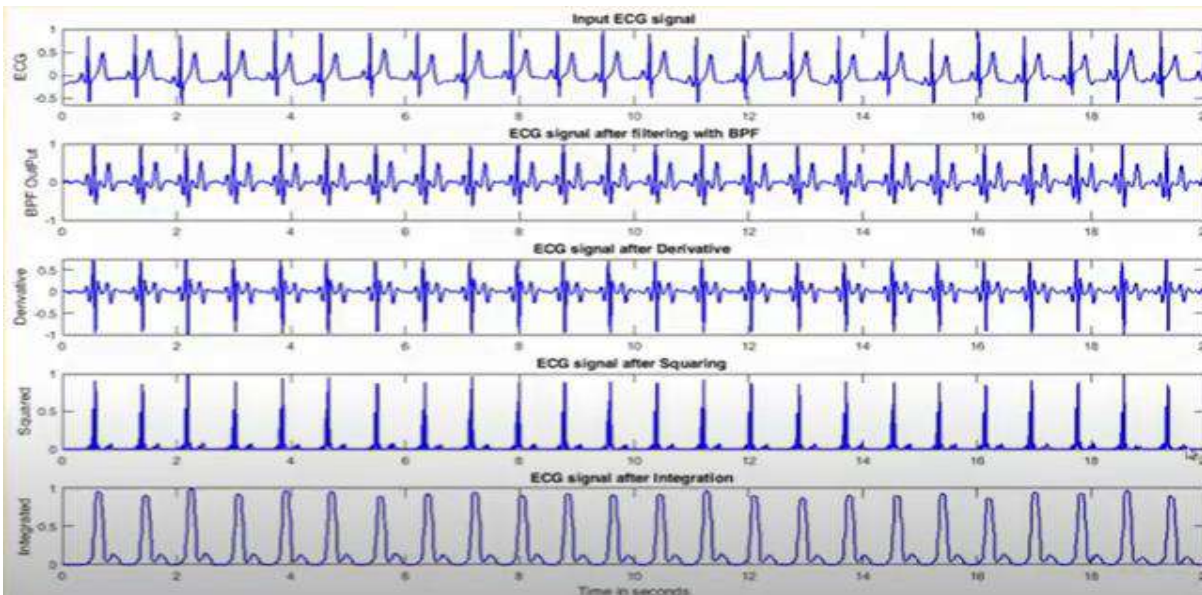vides the number of QRS Peaks for the recorded ECG signals. However, the samples that have already been processed by a stage may be processed by the next without waiting all the samples to be processed by the first.

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Performance Appraisal and Employee Performance

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Abstract: The success of any organization hinges upon the performance of its employees. Committed and high-performing employees facilitate an organization in achieving its objectives, while underperforming ones can lead to its downfall. To establish dependable and impartial methods for evaluating employees, organizations must recognize the crucial advantages of employee performance. Existing literature and empirical evidence have consistently demonstrated a positive correlation between performance appraisal and employee performance, both in private and public sectors. Nevertheless, certain scholars have raised doubts about whether performance appraisal genuinely contributes to improved employee performance. Literature suggests that ineffective performance appraisal can be improved and refined through the efforts of human resource functions. However, studies have thus far been subjective in exploring how performance appraisal specifically enhances employee performance. To investigate the relationship between performance appraisal and employee performance, with a focus on training and development as key parameters, this study conducted a comprehensive desk review. The study is anchored in expectancy theory, which forms the foundation of the performance appraisal-employee performance construct. The literature review revealed gaps in understanding the association between performance appraisal and employee performance. It became evident that various scholars hold differing perspectives on performance appraisal concerning its impact on employee performance. The study identified that deficiencies in performance appraisals are linked to organizational structural factors and specific processes. In light of these findings, this study recommends a holistic examination of the connection between performance appraisal and employee performance, encompassing both organizational structure and processes, to bolster employee commitment and performance. Supervisors should engage employees in discussions regarding achievable goals, conduct regular performance reviews, provide timely feedback, acknowledge high achievers, and address poor performers. Identified gaps should be addressed through comprehensive training and development programs. Keywords: employee performance, performance appraisal, training and development.

1. INTRODUCTION

In virtually all organizations, human resources stand out as the most invaluable asset, surpassing the significance and worth of physical assets such as buildings, land, equipment, and vehicles (Anstey et al., 2017). For organizations to gain a competitive advantage on a global scale, employees play an indispensable and pivotal role (Oya et al., 2017). The performance of employees is a determining factor in a company's success, and as such, the process of employee performance appraisal must be executed effectively and consistently. The aim is to enhance the quality of work, mitigate employee dissatisfaction, and curb declining work performance (Shrestha, S. & , J., 2006).

In the study conducted by Obeidat et al. (2014), it was established that performance appraisal holds a valuable role in the realm of employee training and development. It serves as a tool for identifying and instigating the process of providing pertinent training and development opportunities. Mwema (2014) also discovered that performance appraisal facilitates the identification of training needs among staff, thereby enabling organizations to furnish the requisite training, consequently aiding employees in reaching their performance objectives.

According to Belcourt et al. (2002), the primary objective of training is to assist the organization in accomplishing its goals. Furthermore, training programs should be designed with a clear focus on organizational goals and strategies. Many organizations prioritize capacity-building programs for their employees as a vital human resource management practice that fosters employee commitment.

Eliphas et al. (2017), in their research involving recognition, feedback, and training and development as performance appraisal tools, identified that productivity within an organization is primarily influenced by recognition and feedback, with training and development playing a less critical role.

2. OBJECTIVE

The primary objective of this study is to establish and examine the relationship between performance appraisal and employee performance.

3. LITERATURE REVIEW

Theoretical Literature Review are more likely to exert greater effort in their work. Expectancy theory, initially developed by Victor H. Vroom in 1964 as a result of his investigations into motivations, serves as a theoretical framework for this study. As outlined by Torrington et al. (2011), proponents of expectancy theory assert that an individual employee's behaviour is contingent upon the anticipation of a reward. Therefore, when employees believe that their efforts will be rewarded with something they value, they

Vroom's expectancy theory posits that there exists a positive correlation between the effort exerted by employees and their performance, provided they have access to the right resources, possess the necessary skills, and receive the essential support to effectively complete their tasks. Performance appraisal finds its roots in expectancy theory, which asserts that, without an effective appraisal system in place, it becomes challenging to evaluate performance (whether it is deemed as good or poor), ensure the fair distribution of rewards, communicate desired work expectations, and foster the achievement of desired performance outcomes.

In their empirical study, Eliphas et al. (2017) investigated how performance appraisal practices impact employee productivity, with specific emphasis on three key elements: recognition, feedback, and training and development. The study's results illuminated the primary drivers of productivity within organizations.

Eliphas et al. (2017) found that recognition and feedback emerged as the predominant factors influencing productivity in organizations. These two components were identified as the primary contributors to employee performance and output. However, the study indicated that, while still important, training and development did not exhibit the same level of critical impact on productivity.

This empirical research underscores the significance of recognizing and providing constructive feedback to employees as strategies for enhancing their productivity within an organizational context. While training and development remain valuable, the study suggests that their influence on productivity may be somewhat less pronounced compared to the effects of recognition and feedback. These findings contribute to our understanding of how performance appraisal practices can shape employee performance and productivity in the workplace.

4. RESEARCH METHODOLOGY

4.1 Research Design:

This study employed a desk review approach, examining both theoretical and empirical literature, to establish the relationship between performance appraisal and employee performance, with a specific focus on addressing the objective of training and development.

5. DISCUSSIONS AND FINDINGS:

The core objective of this study was to delineate the constructs of performance appraisal and establish their relationship with employee performance. The study's foundation was grounded in expectancy theory, which posits that an individual employee's behaviour is influenced by the anticipation of rewards. Without an effective appraisal system, the challenges include the difficulty of rating performance, ensuring equitable distribution of rewards, communicating desired work expectations, and promoting the attainment of anticipated performance outcomes.

The specific focus of this study centred on training and development as a construct to elucidate the mechanisms through which performance appraisal affects employee performance. The investigation revealed that both public and private organizations utilize performance appraisal tools to evaluate employee performance. These tools encompass the establishment of objectives, setting performance targets, ongoing assessment of progress through regular performance reviews, providing constructive feedback, and offering necessary training and development opportunities.

The study demonstrated that effective performance appraisal yields a range of benefits, including improved time management, enhanced efficiency, attainment of performance targets, and the successful achievement of organizational goals. Nevertheless, to fulfil the purpose of performance appraisal, both the organizational context and the appraisal system must be aptly configured and aligned.

6. CONCLUSION AND RECOMMENDATIONS

Diverse scholarly perspectives exist regarding performance appraisal concerning its impact on employee performance, and employees from various organizations perceive performance appraisal differently. However, there is conclusive evidence supporting the significance of performance appraisal in relation to employee performance. Nevertheless, shortcomings in performance appraisals can be attributed to the organizational structure context and specific processes.

In light of these findings, this study recommends the imperative need to explore the relationship between performance appraisal and employee performance by considering both organizational structures and processes. The primary objective should be to bolster employee commitment and enhance performance. Supervisors should engage in discussions with employees to establish achievable goals and conduct regular performance reviews. Providing timely feedback to individual employees is crucial, with due recognition for those who meet their performance targets to boost their satisfaction. Conversely, poor-performing employees should be addressed and encouraged to improve.

By incorporating these recommendations, organizations can harness the full potential of performance appraisal to drive employee commitment and performance, ultimately contributing to their overall success and competitiveness.

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Optimizing Human Resource Management in the Modern Workplace

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Abstract: This communication explores critical aspects of human resource management in today's dynamic business landscape. It delves into the evolving role of HR professionals and the strategic importance of their functions. The paper highlights the significance of talent acquisition, retention, and development as key drivers of organizational success. It also addresses emerging trends such as remote work and digital transformation, which are reshaping HR practices. The communication underscores the vital link between employee satisfaction and business outcomes, emphasizing the role of HR in fostering a positive work environment. Topics covered include effective recruitment strategies, performance management, diversity and inclusion initiatives, and the growing importance of data-driven decision-making in HR.

Key words: Cooperation, Employee Relations, Training and Development, Performance Management, Succession Planning, Labor Relations, Workplace Health and Safety.

1. Introduction

In the ever-evolving landscape of the modern workplace, the role of Human Resource Management (HRM) has transcended traditional boundaries to become a linchpin in the success of organizations. The dawn of the 21st century has ushered in a paradigm shift in how businesses view their most valuable asset - their human capital. HRM, once regarded primarily as an administrative function, has now emerged as a strategic partner critical to navigating the complexities and challenges of the contemporary corporate environment.

The fundamental essence of HRM lies in its ability to harness the power of people and unlock their full potential to drive business success. In this era marked by digital transformation, global connectivity, and unprecedented shifts in employee expectations, HR professionals are poised at the crossroads of both challenge and opportunity.

This communication is dedicated to dissecting and understanding the vital nuances of optimizing Human Resource Management in this fast-paced, technology-driven, and diverse workplace environment. We shall explore the multifaceted dimensions of HRM, dissecting its components, strategies, and emerging trends that are pivotal for not just survival but also thriving in the modern corporate arena.

2. The meaning and characteristics of Optimizing HRM in the Modern Workplace

2.1 The meaning and of Optimizing HRM in the Modern Workplace

Optimizing Human Resource Management in the Modern Workplace refers to the strategic and proactive approach to managing an organization's workforce in the context of today's rapidly evolving business environment. It encompasses a series of practices and strategies that aim to maximize the potential and effectiveness of an organization's human capital while adapting to the challenges and opportunities presented by the modern workplace.

Alignment with Business Goals: Modern HRM aligns its practices with the overarching strategic goals of the organization. It ensures that HR initiatives directly contribute to the achievement of business objectives.

Data-Driven Decision-Making: Utilizing data and analytics to make informed decisions is a core component. Modern HRM relies on data to guide talent management, measure performance, and inform workforce planning.

Talent Acquisition and Retention: Attracting top talent and retaining skilled employees is a central focus. Modern HRM emphasizes creating an appealing employer brand and providing opportunities for professional development and growth.

Employee-Centric Approach: Employees are at the heart of modern HRM. The approach emphasizes creating a positive work environment, addressing employee needs, and fostering high levels of engagement, satisfaction, and well-being.

Technology Integration: Leveraging technology, such as Human Resource Information Systems (HRIS) and automation, is essential. These tools enhance efficiency, accuracy, and employee experience.

Performance Management: Modern HRM shifts from traditional, annual performance reviews to continuous feedback and development conversations. It promotes ongoing improvement and learning.

Diversity and Inclusion: Creating a diverse and inclusive workplace is a priority. Modern HRM recognizes the value of diverse perspectives and experiences and aims to foster an environment where all employees feel respected and empowered.

Adaptation to Remote Work: With the rise of remote and flexible work arrangements, modern HRM adapts to support these trends. This includes managing virtual teams, ensuring productivity, and maintaining effective communication and collaboration in remote settings.

Compliance and Regulation: Staying up-to-date with labor laws and regulations is crucial. Modern HRM not only focuses on compliance but also proactively manages potential risks and challenges.

Change Management: In the face of a fast-paced and ever-changing business environment, modern HRM helps organizations manage transitions, restructuring, and other changes, ensuring minimal disruption to the workforce.

Employee Development: Continuous learning and development are fundamental. Modern HRM provides opportunities for employees to acquire new skills and advance within the organization.

Agility and Adaptability: Modern HRM practices are agile and adaptable to changing circumstances. They enable the organization to respond quickly to crises, market shifts, and other unforeseen challenges.

2.2 The characteristics of Optimizing HRM in the Modern Workplace

Optimizing Human Resource Management in the modern workplace involves several key characteristics that set it apart from traditional HR practices. These characteristics reflect the strategic and adaptive nature of HR in response to the evolving demands of the contemporary business environment.

Strategic Alignment: Modern HRM is closely aligned with an organization's strategic goals and objectives. HR professionals work in tandem with senior management to ensure that HR practices support the broader business strategy.

Data-Driven Decision-Making: The use of data analytics and metrics plays a significant role in modern HRM. HR professionals rely on data to make informed decisions related to talent acquisition, performance management, and workforce planning.

Talent Attraction and Retention: Modern HRM places a strong emphasis on attracting top talent and retaining skilled employees. This involves creating an attractive employer brand and offering opportunities for growth and development.

Employee-Centric Approach: Employees are at the center of modern HRM. HR practices focus on creating a positive and inclusive work environment, addressing employee needs, and fostering high levels of engagement and satisfaction.

Technology Integration: Leveraging technology, including Human Resource Information Systems (HRIS), artificial intelligence, and automation, is essential. These tools improve efficiency, enhance HR processes, and provide employees with a seamless experience.

Performance Management: Modern HRM promotes a shift from traditional annual performance reviews to continuous feedback and development discussions. It encourages ongoing improvement and learning.

Diversity and Inclusion: A diverse and inclusive workplace is a priority. Modern HRM recognizes the value of different perspectives and experiences and strives to create environments where all employees feel respected and empowered.

Remote Work Adaptation: With the rise of remote and flexible work arrangements, modern HRM adapts to support these trends. This includes managing virtual teams, ensuring productivity, and maintaining strong communication and collaboration in remote settings.

Compliance and Regulation: Staying up-to-date with labor laws and regulations is crucial. Modern HRM not only focuses on compliance but also proactively manages potential risks and challenges.

ange Management: In a rapidly changing business environment, modern HRM assists in managing organizational transitions and changes. It ensures that employees are well-prepared for and supported during shifts in structure, technology, or strategy.

Employee Development: Continuous learning and development are core components of modern HRM. It facilitates opportunities for employees to acquire new skills and grow within the organization, contributing to their long-term satisfaction and the company's success.

Flexible Work Arrangements: Modern HRM recognizes the importance of work-life balance and flexible work arrangements. It allows employees to have more control over when and where they work, enhancing their overall well-being.

Agility and Adaptability: HR practices are agile and adaptable to changing circumstances. This includes the ability to quickly respond to crises, market shifts, and other unforeseen challenges.

Cultural and Ethical Considerations: Modern HRM also places emphasis on shaping and nurturing organizational culture and ethical values. It ensures that the workplace culture is aligned with the company's mission and values.

Sustainability and Social Responsibility: HRM in the modern workplace often involves incorporating sustainability and social responsibility initiatives, reflecting a broader societal awareness and commitment to environmental and social issues.

3. Modern Workplace are first communication skill in HRM

Effective communication skills are indeed a fundamental component of human resource management in the modern workplace. In a contemporary work environment, the role of communication skills in HR management is more crucial than ever. Here's why:

Enhanced Employee Engagement: Modern HRM prioritizes two-way communication, which allows employees to express their ideas, concerns, and feedback. This approach fosters a sense of involvement and engagement, leading to a more motivated and satisfied workforce.

Conflict Resolution: Strong communication skills are essential for resolving conflicts and addressing workplace issues. HR professionals must be able to facilitate difficult conversations, mediate disputes, and find mutually beneficial resolutions.

Talent Acquisition: Effective communication is vital in the recruitment process. HR needs to clearly communicate job requirements, organizational culture, and growth opportunities to attract and retain top talent.

Performance Management: Communicating expectations, goals, and feedback to employees is integral to performance management. Constructive feedback and development discussions can help employees improve and grow within the organization.

Change Management: In a dynamic business environment, change is constant. HR professionals play a key role in communicating changes to employees, ensuring that they understand the reasons behind changes and how they may impact their roles.

Training and Development: Clear communication is essential in conveying training and development opportunities to employees. Effective communication ensures that employees know about and understand the resources available for their professional growth.

Compliance and Policies: HR is responsible for communicating and enforcing company policies, procedures, and compliance with employment laws. Clear communication in these areas helps mitigate legal risks.

Diversity and Inclusion: Promoting diversity and inclusion relies on effective communication to educate employees about the value of diversity and the importance of an inclusive workplace.

Onboarding and Orientation: HR professionals need to communicate essential information to new employees during the onboarding process, including company culture, policies, and expectations.

Remote Work: With remote and distributed workforces becoming more common, HR must be proficient in virtual communication tools and techniques to ensure efficient collaboration and engagement.

Crisis Management: During crises, such as the COVID-19 pandemic, HR plays a vital role in communicating updates, safety measures, and support available to employees.

Employee Surveys and Feedback: Collecting and analyzing employee feedback is a modern HR practice. Effective communication is necessary for administering surveys and conveying results and action plans.

4. The most important skill in HRM is Modern Workplace

In the modern workplace, Human Resource Management (HRM) requires a combination of skills and competencies to effectively navigate the dynamic and evolving landscape. While there isn't a single "most important" skill in HRM, there are several key skills that are highly valuable in the modern workplace. These include:

Effective Communication: Communication is fundamental in HRM. HR professionals need to convey information clearly, listen actively, mediate disputes, and engage in meaningful dialogues with employees and other stakeholders.

daptability: The modern workplace is characterized by rapid change. HR professionals must be adaptable and able to respond to evolving business needs, technology, and workforce dynamics.

Strategic Thinking: HRM has transitioned from a primarily administrative role to a strategic one. HR professionals must think strategically, aligning HR practices with the organization's overall goals and objectives.

Emotional Intelligence: Understanding and managing emotions is essential in HRM. Emotional intelligence helps HR professionals navigate sensitive issues, empathize with employees, and build positive relationships.

Problem Solving: HR professionals often deal with complex issues and conflicts. Strong problem-solving skills are crucial for finding effective solutions that benefit both employees and the organization.

Data Analysis: The ability to collect, analyze, and use data to make informed decisions is increasingly important in HRM. Data-driven HR practices can optimize talent management and improve overall organizational performance.

Legal and Compliance Knowledge: HR professionals must stay up-to-date with labor laws and regulations to ensure the organization's practices are in compliance, mitigating legal risks.

Conflict Resolution: Resolving conflicts is a critical aspect of HRM. HR professionals need the skills to mediate disputes, address employee grievances, and create a harmonious work environment.

Cultural Competency: As workplaces become more diverse, HR professionals must be culturally competent and sensitive to the needs of a multi-cultural workforce.

Technology Proficiency: HRM relies on various technologies, including Human Resource Information Systems (HRIS) and online recruitment tools. Proficiency in using and managing these technologies is essential.

Leadership and Influence: HR professionals often play a leadership role in guiding organizational change and fostering a positive company culture. Being able to influence and lead effectively is crucial.

Employee Development: Modern HRM places a strong emphasis on employee development and learning. HR professionals must have the skills to design and implement training and development programs.

5. Modern Workplace in the role of HRM

The role of Human Resource Management (HRM) in the modern workplace has evolved significantly to address the changing dynamics and challenges of today's business environment. Here are some key aspects of HRM's role in the modern workplace:

Strategic Partner: Modern HRM is a strategic partner to the organization. HR professionals work closely with senior management to align HR practices with the company's strategic objectives. They contribute to the development of business plans and are involved in decision-making processes.

Talent Acquisition: HRM plays a central role in attracting and retaining top talent. In the modern workplace, competition for skilled employees is fierce, and HR must develop effective recruitment strategies, create appealing employer brands, and leverage technology for talent acquisition.

Employee Development: HRM is responsible for ensuring that employees have opportunities for growth and development. This includes designing training programs, mentoring, and performance management to nurture the skills and potential of the workforce.

Change Management: In a rapidly changing business landscape, HRM is essential for managing organizational transitions, whether due to technological advancements, mergers, or market shifts. HR professionals help employees adapt to change and minimize disruption.

Performance Management: Modern HRM shifts from annual performance reviews to continuous feedback and development discussions. HR professionals facilitate ongoing performance improvement and monitor goal achievement.

Employee Engagement: HRM fosters a positive work environment by focusing on employee engagement. This includes initiatives related to work-life balance, wellness programs, and creating a culture of recognition and appreciation.

Diversity and Inclusion: HRM promotes diversity and inclusion in the workplace, recognizing the value of different perspectives and backgrounds. HR professionals work to create an inclusive culture that embraces diversity.

Technology Integration: Modern HRM leverages technology, including Human Resource Information Systems (HRIS) and data analytics, to streamline HR processes, enhance decision-making, and provide employees with efficient self-service tools.

Compliance and Regulations: HR professionals stay current with labor laws and regulations to ensure the organization's HR practices are compliant and mitigate legal risks.

Remote Work and Flexibility: HRM adapts to the growing trend of remote and flexible work arrangements, managing virtual teams, ensuring productivity, and fostering effective communication in remote settings.

Crisis Management: HR professionals are vital in managing crises, such as the COVID-19 pandemic. They communicate updates, safety measures, and support for employees during challenging times.

Employee Relations: HRM is responsible for maintaining positive employee relations, resolving conflicts, and addressing grievances to ensure a harmonious work environment.

Sustainability and Social Responsibility: HRM increasingly incorporates sustainability and social responsibility initiatives in line with the organization's ethical values and societal awareness.

6. Common problems in the management of HR Modern Workplace

In the modern workplace, human resource management faces several common challenges and problems. These issues can vary depending on the organization's size, industry, and specific circumstances, but the following are some of the prevalent challenges:

Talent Acquisition and Retention: The competition for top talent is intense in the modern workplace. Attracting and retaining skilled employees is a significant challenge, and organizations need effective strategies to remain competitive.

Employee Engagement: Keeping employees motivated, engaged, and satisfied is a continuous challenge. Disengaged employees can lead to reduced productivity and higher turnover rates.

Diversity and Inclusion: Promoting diversity and inclusion is a growing concern. Organizations need to create inclusive cultures that value different backgrounds and perspectives, but achieving this can be challenging.

Adapting to Technology: Rapid technological advancements require HR to adapt and integrate technology into HR processes and tools effectively. This includes implementing and managing HRIS (Human Resource Information Systems) and other digital tools.

Remote Work Management: With the rise of remote work and flexible work arrangements, HR needs to develop policies, communication strategies, and tools for managing virtual teams and maintaining employee productivity.

Data Management and Privacy: Collecting and managing employee data requires careful attention to data privacy regulations. HR professionals must ensure data security and compliance with laws like GDPR.

Compliance and Regulations: Adhering to labor laws and employment regulations, which can vary by region and industry, is a significant challenge. Ensuring that HR practices remain compliant while avoiding legal risks is a constant concern.

Skills Gaps: Identifying and addressing skills gaps within the workforce is essential for maintaining a competitive edge. HR needs to develop training and development programs that close these gaps effectively.

Performance Management: Traditional annual performance reviews are increasingly being replaced by continuous feedback and development discussions. Transitioning to these methods while ensuring fairness and objectivity is a challenge.

Succession Planning: Preparing employees for leadership roles and ensuring a smooth transition during leadership changes is a critical concern in succession planning.

Change Management: Managing change effectively, whether it's related to restructuring, technology adoption, or market shifts, is a key challenge. HR plays a central role in helping employees adapt to change.

Work-Life Balance: Promoting work-life balance is essential for employee well-being and retention. HR must find ways to support this balance while maintaining productivity.

Employee Benefits: Providing competitive and attractive benefits packages can be costly and challenging. HR needs to strike a balance between what the organization can afford and what employees value most.

Employee Relations: Handling employee disputes, grievances, and conflicts effectively to maintain a harmonious work environment is a common challenge for HR professionals.

Budget Constraints: HR often operates with budget constraints. Balancing the need for HR investments with cost considerations is an ongoing challenge.

7. Analysis of Modern Workplace

An analysis of the modern workplace involves examining various aspects of the contemporary work environment, including its characteristics, challenges, and opportunities. Here's a comprehensive analysis:

7.1 Characteristics of the Modern Workplace:

Digital Transformation: The modern workplace is characterized by the pervasive use of technology, including digital communication tools, cloud computing, automation, and AI. This has reshaped the way work is done and how teams collaborate.

Remote Work: Remote and flexible work arrangements have become increasingly prevalent, driven by technological advancements and a growing demand for work-life balance. Organizations are adapting to manage and engage remote teams effectively.

Diversity and Inclusion: There is a greater emphasis on diversity and inclusion in the modern workplace, recognizing the value of diverse perspectives and backgrounds. Organizations are working to create inclusive cultures and policies.

Global Workforce: Many companies have expanded their reach and now have a global workforce, requiring HR and management to navigate cross-cultural challenges and compliance with international labor laws.

Skill Development: Continuous learning and development have become essential as skills evolve rapidly. Employees and organizations invest in training and upskilling to stay competitive.

Agility and Adaptability: The modern workplace requires organizations to be agile and adaptable to respond to changing market conditions and external factors such as pandemics or economic shifts.

Collaboration and Communication: Effective communication and collaboration tools are central to modern work environments, enabling teams to work together seamlessly, whether in the office or remotely.

Employee Wellness: Employee well-being and mental health have gained prominence. Organizations are focusing on wellness programs, flexible work arrangements, and supportive policies.

7.2 Challenges in the Modern Workplace:

Talent Acquisition and Retention: Attracting and retaining top talent is challenging due to high competition and changing expectations.

Data Security and Privacy: As more data is collected and processed, ensuring data security and compliance with privacy regulations is critical.

Remote Work Management: Managing remote teams, maintaining productivity, and addressing the potential for isolation and burnout pose challenges.

Change Management: Adapting to technological changes, organizational restructuring, and evolving business strategies requires effective change management.

Compliance and Regulations: Adhering to complex labor laws and regulations while avoiding legal risks is a constant concern.

Performance Management: Traditional performance review models are being replaced by continuous feedback, requiring a shift in HR practices.

Global Workforce Management: Managing a global workforce requires an understanding of international labor laws, cultural differences, and legal complexities.

7.3 Opportunities in the Modern Workplace:

Technology Integration: Leveraging technology offers opportunities for increased efficiency, improved decision-making, and enhanced employee experiences.

Remote Work Flexibility: Remote work opens up the possibility of accessing talent from around the world and providing employees with flexibility, potentially reducing office space costs.

Diversity and Inclusion: Promoting diversity and inclusion can lead to more innovative and inclusive workplaces that better serve diverse customer bases.

Skills Development: Continuous learning provides opportunities for employees to acquire new skills and positions organizations for growth and adaptability.

Innovative Work Models: The modern workplace encourages creative work models such as co-working spaces, gig work, and project-based employment.

Sustainability and Social Responsibility: Organizations have the opportunity to align with social and environmental causes, which can enhance reputation and attract socially conscious employees and customers.

8. Solving the problem of HRM in Modern Workplace

Solving human resource management (HRM) problems in the modern workplace is essential for organizations to maintain a competitive edge, ensure a positive work environment, and optimize the use of their human capital. Here are specific strategies to address common HRM challenges in the modern workplace:

Talent Acquisition and Retention:

Develop a strong employer brand that emphasizes the organization's values, culture, and commitment to employee growth.

- o Use data-driven recruiting strategies to target and attract top talent.
- o Offer competitive compensation, benefits, and career development opportunities.
- o Implement employee referral programs to tap into existing networks.
- ✓ **Employee Engagement:**
- o Create an engaging workplace culture that values employee contributions, innovation, and well-being.
- o Establish regular feedback mechanisms, such as surveys or pulse checks, to understand employee sentiment and act on their feedback.
- o Recognize and reward employee achievements.
- o Encourage open communication between managers and employees.
- ✓ **Diversity and Inclusion:**
- o Develop comprehensive diversity and inclusion programs that promote an inclusive culture.
- o Implement inclusive recruitment practices and ensure diverse candidate pools.
- o Offer diversity training to educate employees about the value of different perspectives.
- ✓ **Adapting to Technology:**
- o Invest in modern HR technology solutions, such as Human Resource Information Systems (HRIS), to streamline HR processes and enhance data management.
- o Provide ongoing training and support for HR professionals to keep them up-to-date with technology trends.
- o Collaborate with IT departments to ensure data security and compliance.
- ✓ **Remote Work Management:**
- o Establish clear remote work policies and guidelines that address issues like productivity, communication, and performance expectations.
- o Provide remote employees with the necessary tools, resources, and training.
- o Monitor and measure productivity and maintain regular communication with remote workers.
- ✓ **Data Security and Privacy:**
- o Implement robust data security and privacy measures, including encryption, access controls, and regular security audits.
- o Develop and enforce strict data protection policies.
- o Train employees on data security best practices to minimize risks.
- ✓ **Compliance and Regulations:**
- o Stay informed about evolving labor laws and employment regulations, and consult legal experts when necessary.
- o Conduct regular internal audits to ensure compliance and minimize legal risks.
- o Maintain accurate records of HR practices and employee data to facilitate compliance.
- ✓ **Change Management:**
- o Develop a structured change management process to guide the organization through transitions.
- o Communicate changes clearly, providing employees with a rationale for the changes and their expected outcomes.
- o Provide training, support, and resources to help employees adapt to change.
- ✓ **Performance Management:**
- o Transition from traditional annual performance reviews to continuous feedback and goal-setting.
- o Train managers on effective feedback and coaching techniques.
- o Set clear and measurable performance goals and expectations.
- o **Employee Wellness:**
- o Offer wellness programs that promote physical and mental health.
- o Encourage a healthy work-life balance through flexible work arrangements and paid time off.
- o Provide access to employee assistance programs and mental health support.
- ✓ **Global Workforce Management:**
- o Understand the legal and cultural nuances of international labor markets.
- o Develop clear and consistent policies for managing a global workforce.
- o Seek advice from international HR specialists or legal experts when navigating global HR challenges.
- ✓ **Budget Constraints:**
- o Prioritize HR investments based on their potential impact on organizational goals.
- o Consider cost-effective HR technology solutions to improve efficiency and reduce administrative costs.

     o   Explore outsourcing options for non-core HR functions to reduce operational expenses.

9. Conclusions

In conclusion, optimizing Human Resource Management (HRM) in the modern workplace is an essential and dynamic process that requires organizations to adapt and excel in an ever-evolving business environment. The following key points summarize the significance and takeaways of optimizing HRM in today's workplace:

Strategic Alignment: Modern HRM is no longer just an administrative function; it's a strategic partner that aligns HR practices with the organization's overall goals and objectives, contributing to the company's success.

Data-Driven Decision-Making: HRM in the modern workplace relies on data and analytics to make informed decisions about talent management, workforce planning, and performance improvement.

Talent Acquisition and Retention: Attracting and retaining top talent is a priority, requiring the creation of an appealing employer brand, competitive compensation packages, and opportunities for growth.

Employee-Centric Approach: The modern HRM prioritizes creating a positive and inclusive work environment, focusing on employee needs, well-being, and engagement.

Technology Integration: Leveraging HR technology, including HRIS and data analytics, is vital to enhance efficiency and employee experience.

Performance Management: Traditional annual reviews are shifting to continuous feedback and goal-setting processes, enabling ongoing performance improvement and learning.

Diversity and Inclusion: Modern HRM fosters diverse and inclusive workplaces that value different perspectives, recognizing their potential to drive innovation and success.

Adaptation to Remote Work: As remote work becomes more prevalent, modern HRM adapts to support remote teams, ensuring productivity and maintaining effective communication and collaboration.

Compliance and Regulations: Staying compliant with labor laws and regulations is crucial to avoid legal risks and challenges.

Change Management: In a rapidly changing business environment, modern HRM helps organizations manage transitions and changes effectively while minimizing disruption to the workforce.

Employee Development: HRM emphasizes continuous learning and development opportunities to equip employees with new skills and promote growth within the organization.

In the modern workplace, HRM plays a pivotal role in maximizing the potential of an organization's human capital. It is not only about efficient administrative practices but also about driving innovation, maintaining employee satisfaction, and contributing to the organization's overall success. The ability to adapt, leverage technology, and prioritize employee well-being are fundamental aspects of HRM in the modern era. Effective HRM practices align with the organization's strategic goals, foster a positive workplace culture, and adapt to the evolving demands of the business landscape, ultimately positioning the organization for success in the dynamic modern workplace.

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Design and Development of Vertical Milling Fixture for Friction Stir welding of Aluminium & Alloy Al 6061

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Abstract: Friction stir welding (FSW) is a type of welding of similar or dissimilar metals. It is developed & patented by "The Welding Institute", a British research and technology organization, U.K. in December 1991.

It is a solid-state thermo-mechanical joining process. The welding process is done by using conventional milling machine by compressive force contact between work pieces which are either rotating or moving relative to shoulder pin tool, which produces the heat required that makes the material of the two edges to join by atomic diffusion. Friction-Stir Welding of Stainless Steel, Aluminium and various other alloys are done on reconstructed Vertical Milling Machines. The Friction-Stir Welding (FSW) process to occur on a vertical Milling Machine, a vertical milling fixture is required on which the plates is fastened for butt welded. In this article, we developed a vertical milling fixture and its holding setup for Friction-stir welding operations on Vertical Milling Machine. The materials analyzed are aluminium, aluminium alloy (Al 6061). After analyzing, the better material can be used for Friction-Stir Welding operations.

1. Introduction:

Friction Stir Welding (FSW) process is relatively a new joining process that is presently attracting considerable interest. FSW is emerging as an appropriate alternative technology of welding with high efficiency. Since the joint can be obtained below the melting temperature, this method is suitable for joining a number of materials which are extremely difficult to be welded by conventional techniques.

Friction Stir Welding has become a useful manufacturing technology of metallic sheet and plate materials for applications in various industries, including aerospace, automobile, defense and shipbuilding.

FSW produces welds by using a rotating, non-consumable welding tool through soften a work piece; during heat production by friction and plasticity develop in work, and allow the tool to "stir" the joint surfaces. In this welding procedure, a rotating welding tool is ambitious into the material at the interface of two adjoining plates, and then moved along the interface.

FSW offer simplicity of handling, specific external process control and high levels of repeatability, thus create very homogenous welds. No special research of the sample is required and little dissipate or pollution is produced during the welding practice.

The friction stir procedure involves the translating the rotating cylindrical tool along the edge between two plates. Due to friction, the material heat up, which is then basically extruded more or less the tool prior to being forged by the large down pressure. The weld is created by the deformation of the material at temperatures under the melting temperature. Simultaneous rotational and translational motions of the welding tool during the welding operation create a characteristics asymmetry between the adjacent sides. On one side, where the tool rotation is with the direction of the translation of the welding tool called advancing side, whereas, the two motions, rotation and translation counteract, called as retreating side.

Sheikhi, S et al. evaluate (2007) an alternative improved way of acceptable producing aluminium joints, in a faster and reliable manner. In the present work different Al alloys (AA2024-T351 and AA6056-T4) were friction stir welded. In the present work different Al alloys (AA2024-T351 and AA6056-T4) were friction stir welded. Butt joints were obtained by varying operation parameters, namely the rotational speed (500–1200 rpm) and the welding speed (150–400 mm/min), while axial force and tool geometry were constant [2].

Padmanaban, G. (2009) et al. investigated, an effort was through to select proper tool pin profile, tool shoulder diameter and tool material to friction stir weld AZ31B magnesium alloy. Five tool pin profiles, five tool materials and three tool shoulder diameters were used to fabricate the joints. Microstructure and hardness of weld zone are correlated and invested on the tensile properties of the welded joints. From this analysis, it is originate that the joint fabricate using threaded pin profiled tool made of high carbon steel with 18 mm shoulder diameter fashioned mechanically sound and metallurgical defect free welds compared to their counterpart [3].

A. Heidarzadeh et al. (2011) evaluated the central combination rotatable design with three parameter, five levels and 20 runs, was used to build up a mathematical model to predict the tensile properties of friction stir welded AA 6061-T4 aluminum alloy joints at 95% confidence level. The three welding parameter considered were welding speed, tool rotational speed, and axial force. Analysis of variance was applied to validate the predicted model [4].

Rao, P et al. (2012) carried out the effects of tool geometry on weld microstructure, lap-shear presentation and failure mode were investigated. The pin profile was found to considerably manipulate the hook geometry, which in turn strongly influenced the joint strength and the failure mode. Welds produced in alloy 2014-T4 Alclad sheets by using triangular and

threaded taper cylindrical tools exhibit an average lap-shear failure load of 16.5 and 19.5 kN, respectively, while the average failure load for standard riveted joints was only 3.4 kN. [5].

M. Koilraj et al. (2012) carried out using friction stir welding (FSW) technique and the process parameters were optimized using Taguchi L16 orthogonal design of experiments. The transverse speed, rotational speed, tool geometry and ratio between tool shoulder diameter and pin diameter were the parameters taken into consideration. The optimum process parameters were determined with reference to tensile strength of the joint. Micro structural study discovered that the material placed on the advancing side dominate the nugget region. Hardness studies revealed that the lowest hardness in the weldment occurred in the heat-affected zone on alloy of 5083 side, where tensile failures were observed to take place [6]. P. Xue, D.R. Ni, (2012) et al. evaluated the butt joints of 1060 aluminum alloy and commercially clean copper were fashioned by friction stir welding (FSW) and the effect of welding parameters on surface morphology, interface microstructure and mechanical properties was investigate. The experimental results discovered that sound defect-free joints could be obtained under larger pin offsets when the hard Cu plate was fixed at the advancing side. superior tensile properties were achieve at higher rotational rates and proper pin offsets of 2 and 2.5 mm; further, the joint formed at 600 rpm with a pin offset of 2 mm could be bended to 180° without fracture. [7].

Sadeesh P. et al. (2014) carried out the joining of dissimilar AA2024 and AA6061 aluminium plates of 5mm thickness. From the result the cylindrical threaded and squared pin tool profile are found to be the best among other tool profiles that were considered [8].

Aamir Khan, Danish, November, (2014) prepared a sound weld at 1170 rpm rotational speed and at 30 mm/min. transverse speed on conventional vertical milling machine. And weldment is having weld strength of 220 MPa while the ultimate tensile strength of aluminum is 310 MPa [9].

R.I. Rodriguez et al. (2015) evaluated the microstructure and mechanical properties of AA 6061 to 7050 for FSW Process. Microstructure analysis of the stir zone revealed the presence of bands of mixed and unmixed material. Below tensile loading, an increase in the joint strength was observed with the raise in the tool rotational speed [10].

S. M. Bayazid et al. (2015) predicted the effect of a few welding parameters of friction stir welded (FSW) joint of 6063 and 7075 alloys by Taguchi method. Results of S/N analysis indicated that the optimal condition for dissimilar 6063-7075 joint is achieved when values of rotational speed and travel speed were 1600 rpm and 120 mm/min respectively [11].
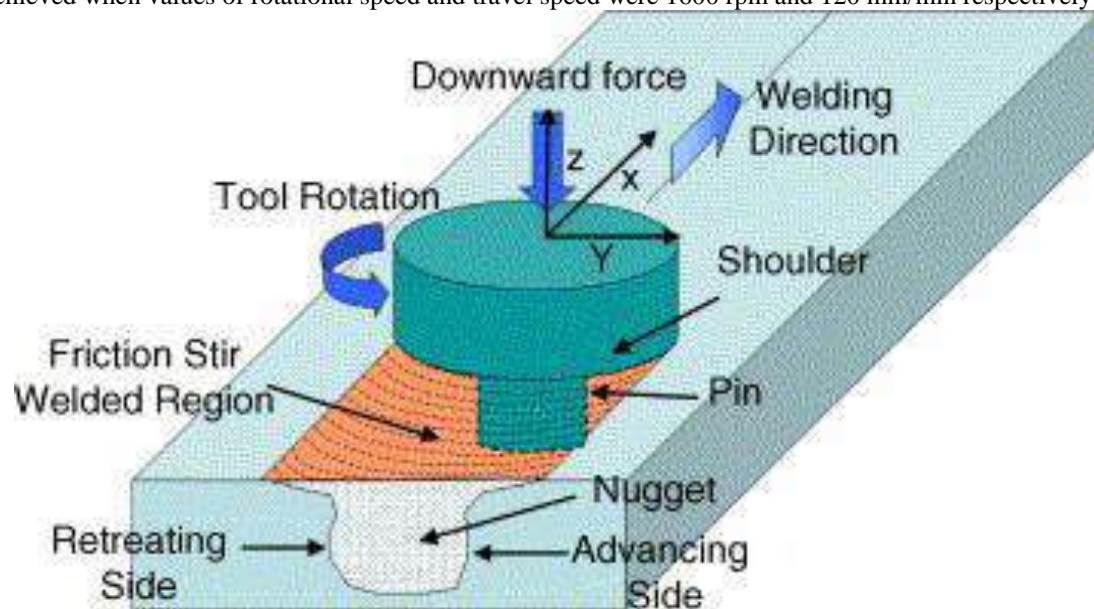

Fig. 1.1: Schematic Drawing of FSW [1]

2. **Design and Analysis of the Fixture:**
2.1 Material for tool and work pieces
We have selected high carbon steel as the material for tool manufacturing. Because of following reasons.
- It retains its properties at elevated temperature.
- Good machine ability.
- Less wear.
- Having long life.

We have selected aluminum as the material for work piece for FSW, due to following reasons.
- It is a soft material.
- Welding of aluminum by conventional methods leads to hot cracking.
- It is widely used material in a lot of industries like shipbuilding, aircraft industry, construction industries.

We have first prepared the faying surfaces of aluminum to be joined then a cylindrical, shouldered tool with a profiled probe is rotated and slowly plunged into the joint line between two pieces butted together. The clamped parts have to be onto a backing bar in a manner that prevents the butting joint faces from being forced apart. Frictional heat generates among the wear resistant welding tool and the work pieces material. Due to this heat causes the latter to soften without reaching the melting point and allow traversing of the tool along the weld line. After one pass of FSW tool, it will be ejected out from the work pieces.

Fig 2.1.1 Collet Chuck   **Fig 2.1.2 Probe**

2.2 Specification of the Machine:

Table2.1: Specification of Machine [15]

Surface of Table	750x175mm
Distance Between T-slot	50mm
Longitudinal Travel of Table	400mm
Cross Travel of Table	140mm
Vertical Adjustment of Table	225mm
Distance between centre line of spindle to lower surface of over arm	135mm
Taper in Spindle	ISO 30
Diameter of milling arbour	25.4 mm
Range of spindle speeds	80,160,250,320, 500, 1000 rpm
Number of Feeds	2 Feeds
Motor	1 Hp 1440 rpm
Floor space	650x380mm
Height	1200 mm

Fig.2.2.1 Universal gear head milling machine [15]   Fig.2.2.2 Milling Machine with Vertical Setup

2.3 Chemical Composition Work piece Material

In this Paper, we are using two sheets of aluminium alloy Al 6061 to weld by using Friction Stir Welding Machine
Chemical Composition & Properties of Al 6061 (in %)

Table 2.3.1: Chemical Composition [12, 13]

Material	Al	Mg	Si	Fe	Cu	Cr	Zn	Ti	Mn
Al 6061	95.85-98.56	0.8-1.2	0.4-0.8	0.0-0.7	0.15-0.4	0.04-0.35	0.0-0.25	0.0-0.25	0.0-0.15

Table2.3.2: Properties of material [14]

Property	Al 6061
Young's Modulus	68.9 GPa
Tensile Strength	125 MPa
Melting Temp	582-652 (℃)
Share Strength	207 MPa

In this Paper, we are converting the conventional vertical milling machine to a mini workstation for Friction Stir Welding. We are making a FSW tool according to the thickness of work pieces, and all the dimensions of FSW tool are shown in the table given below.

2.4 Dimensions of the tool

Table2.4: Dimensions of tool

Diameter of probe	6 mm
Length of probe	2.8 mm
Tool shoulder diameter	16 mm
Tool end diameter (same as attachment of milling machine)	18

3. Result:

Experiment has been successfully completed.

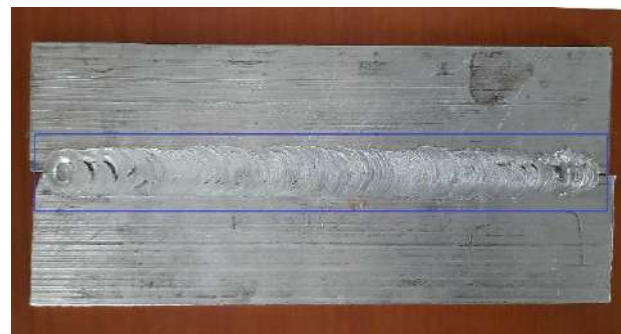**Fig 3.1: Friction Stir welding Process**   **Fig 3.2: Welded Part**

4. Conclusion:

From the figure 3.1 and 3.2 we conclude that we can do friction stir welding on vertical milling machine with changing of some arrangement. Al alloy joints were welded successfully by friction welding process using two

different rotational speeds. Some interesting developments of mechanical properties have been found to occur in the weldments. Friction stir welding being and eco friendly metal joining process which is the need of the hour should be implemented to avoid environmental related problems.

No filler metals and external source of heat (arc, gas) was used while performing the experiment, hence adoptable as no exhaustible resources are involved.

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Laser Powder Bed Fusion Process of Metal Additive Manufacturing Defects: A Brief Review

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Abstracts

Additive manufacturing (AM) is a revolutionary manufacturing technique, which is expected to reshape the future of manufacturing industries. While various materials are used in AM, metal AM is expected to provide a high impact to the industry by producing high-strength structural components. Defects occurring in metal AM, however, prevent the technique from a wide spread adoption by the mainstream industry. This paper provides a review of commonly-occurring defects in metal AM-produced components. It describes various types and causes of defects, and provides implications on the needs of non-destructive evaluation (NDE) techniques to inspect such defects.

1. Introduction

Additive Manufacturing (AM) is a revolutionary manufacturing process producing near-net shape of various materials (polymers, ceramics, and metals). Additive Manufacturing enables digital 3D design data to be physically created by building up layers of deposited material. Metal feed stock is fused to form layers using different heat sources, including lasers, electron beam sand arc discharges, to build solid objects.

Additive Manufacturing (AM) is defined as "the process of joining materials to build objects from 3D model data, usually layer upon layer, as different to subtractive manufacturing processes, such as traditional machining" [1]. In this paper, laser-based and electron beam melting (EBM)-based metal AM methods will be focused. Two types of techniques are available for laser-based metal AM: powder-bed fusion (PBF) and directed energy deposition (DED). EBM-based technique involves PBF or wire feed type of processes. Both PBF and DED-based techniques mainly use metal powders as the feed stock material. The DED technique can also use metal wire as a feed stock material. Details on the metal AM methods and associated techniques can be obtained from recent reviews [1, 3-5]. Metal AM is still at its early stage of development, and the fundamental processing-microstructure-property relationships are not fully understood. Without optimized processing parameters, defects can often occur in parts produced with AM. These defects can potentially lead to failures of AM parts. The microstructure has a direct effect on a material's physical and mechanical properties, and several researchers investigated the microstructure of AM parts and the effects of manufacturing parameters, some of which will be reviewed in this paper. Proper measurements of mechanical properties are also crucial, and anisotropy associated with manufacturing direction has been investigated recently.

While there are various materials being explored for metal AM, NIST has focused on Stainless Steel, Nickel alloy (IN 625), Cobalt Chromium alloy (CoCr), Titanium alloy (Ti6-Al4-V), and Aluminum (Al). More research has been performed around Titanium-based AM parts than other materials due to applications in medical and aerospace fields. Recently, increasing research on Stainless Steel was observed during the literature review process. For some materials (IN 625, CoCr, and Al), limited literature was available at the time of this review. This fact indicates opportunities and needs for NIST and others to perform more research for these important materials. The reviewed literature presented various types of defects occurring for different materials and manufacturing methods/techniques. The manufacturing parameters affecting the microstructural defects were also identified. Several different AM techniques were used, which included laser and electron beam-based DED and PBF. The AM research involves and requires understanding from various disciplines: material science, material characterization, process engineering, and manufacturing, to name a few. The problems identified by researchers included microscopic and mesoscale defects (porosity) as well as limitations in mechanical properties (reduced elongation and residual stress). Some of these defects will be further investigated with X-ray Computed Tomography (XCT) or other relevant measurement techniques.

2. Porosity

Pores in an AM part can be either undesirable defects in the solid phase contributing to the failure of the system or intentionally designed pore structures for special applications. Characterizations of both types of porosity are important to predict mechanical properties of the structure. In this paper, we are focusing on the pores as defects.

The overall porosity of the solid phase is now at a level of about 1 % to 5 % for some materials due to improvements in process optimization [e.g., 8]. While the bulk porosity value may be low, the individual pore size and shape can be a trigger for a catastrophic failure. Optimization of processing parameters to reduce porosity can also be a lengthy process for new AM processes and materials. This type of porosity can be classified as two types in AM-produced parts:

(A) Lack-of-fusion (LOF) porosity (B) Gas porosity

The LOF porosity occurs due to a poor choice of processing parameters. Vandenbroucke and Kruth showed optical micrographs of a parametric study for Ti-6Al-4V [9]. The author did not describe the orientation of the microscopic images acquired, but it is assumed to be orthogonal to the build direction based on the alignment of pores. The hatch spacing and scan speed were varied to understand the effect on microstructure. They demonstrated that the density of Ti-6Al-4V is highly repeatable and controllable through the processing parameters, up to a density of 99.98 % using a higher energy density input. The figure shows how a poor choice of processing parameters can produce pores with irregular shapes along the hatch track or between layers. Yadroitsev et al. also studied the effect of hatch distance on porosity, as shown in Fig. 1 [10]. They found an optimum value of hatch spacing to minimize porosity, which was

approximately equal to the actual width of the hatch track. While the laser spot size was 70 μm, the actual width of an individual hatch was found to be 120 μm, which was also found to be the optimum hatch spacing distance to minimize porosity. Mireles et al. designed artificial defects in a part, and monitored the build with in-situ thermography [11]. The part was later compared to XCT measurements. They applied a re-scanning strategy in the region with the defect, which successfully eliminated pores.
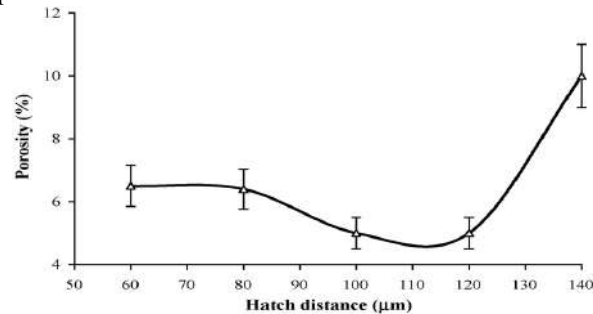

Fig. 1. Samples porosity vs. hatch distance. Inconel 625 powder, powder layer thickness 50 μm, laser power 50 W, laser spot size d ≈ 70 μm, V = 0.13 m/s (Reproduced from [10].

Gas pores, on the other hand, are spherical pores occurring due to gas trapped in the raw metal powder particles or trapped environmental inert gas during the melting process. The causes of gas pores are still in discussion. Ng et al. demonstrated the presence of pores within gas-atomized metal powder particles as the cause of gas pores in a produced part after solidification [12]. Unlike LOF porosity, gas porosity is more difficult to eliminate, which can be as high as 0.7 % according to Ng. et al. Pores in gas atomized powders are shown in a cross-sectional optical image of powder particles, and the resulting pores in a laser deposit are shown in Fig. 2. In addition, the effects of buoyancy-driven flow and Marangoni-driven flow for a gas bubble was theoretically compared, which showed that the gas bubble is likely to be retained in the melt pool due to stronger effect of the Marangoni-driven flow. Gas bubbles tend to coalesce to form a larger pore than an individual gas bubble would create. Kobryn et al. found that both LOF and gas porosity decreased with increasing scan speed and power level [13]. Murr et al. showed that the two types of pores can coexist in a single part with scanning electron microscopy (SEM) images, as shown in Fig. 3 [14]. Li found a gas pore with a diameter of approximately 80 μm, and a LOF pore with irregular shape about 400 μm in size [15]. He found that baking the feedstock powder immediately before deposition tends to significantly reduce the formation of spherical pores. Increasing the laser heat input also reduced the formation of gas pores by decreasing the solidification rate, which increased the chance of gaseous phase to escape to the atmosphere before a melt pool solidifies. Ahsan et al. demonstrated that the gas atomization process tends to produce more internal porosity in the powders compared to the powders produced with a plasma rotating electrode process (PREP), as shown in Fig. 4 from XCT images, which results in higher amounts of gas porosity in the finished part [16].
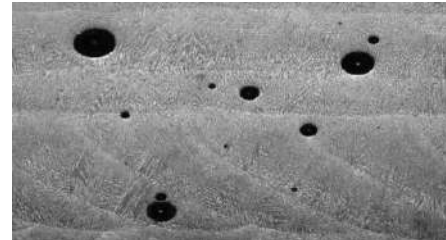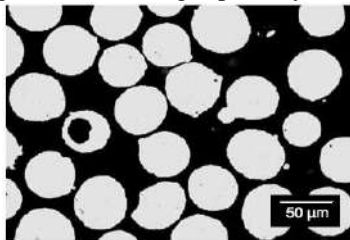

Fig. 2. Optical micrographs of (a) gas atomized powders showing pores within the powders and (b) cross-section of a laser deposit showing high level of gas porosity [12]
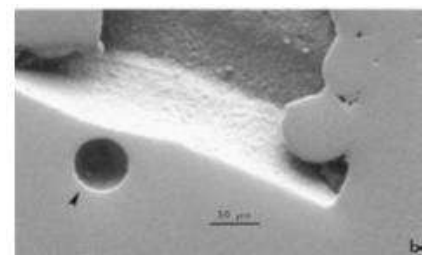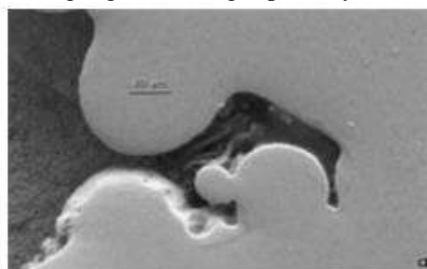

Fig. 3. SEM views of a polished and unetched horizontal section from a test block, showing unconsolidated and unmelted regions creating porosity in (a) and (b) and a remnant Ar bubble section at arrow in (b) [14]
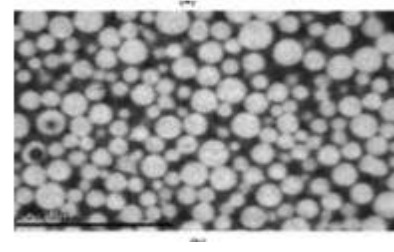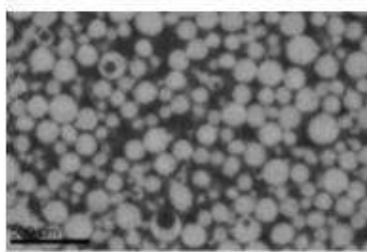
Fig. 4. Micro CT images at a particular slice of (a) gas-atomized powder and (b) PREP powder [16]

Similar to the work of Yadroitsev et al. [10], Thijis et al. not only found that the angle of epitaxial grain growth depends on the hatch spacing, but also showed that LOF pores were aligned at this angle, as shown in Fig. 5c and g [17]. One of the experiments incorporated a strategy of scanning laser from right to left, and the experiment confirmed that the grain growth direction was toward the meltpool (at an angle toward left when viewed from the side). Pores are also visible along the hatches, as shown in Fig. 5a and e.
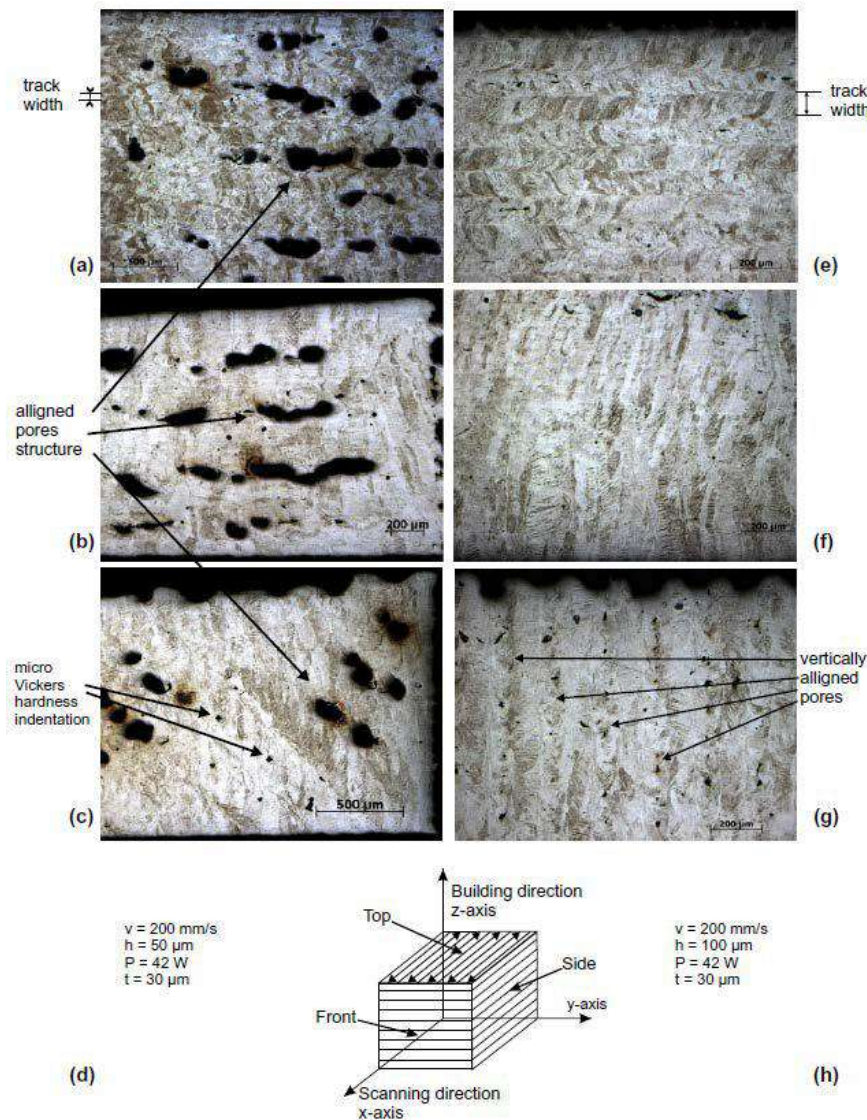

Fig. 5. Influence of hatch spacing. Micrographs of a sample scanned with a hatch spacing of 50 μm: (a) top view; (b) side view; (c) front view; and (d) the scanning strategy and parameters applied. Micrographs of a sample scanned with a hatch spacing of 100 μm: (e) top view; (f) side view; (g) front view; and (h) the scanning strategy and parameters applied [17].

In summary, the formation of gas pores is related to feedstock material quality and gas-assisted powder delivery process (e.g., as in DED). The gas pores are spherical in shape, and the sizes vary from a few micrometers to 100 μm. On the other hand, LOF pores are formed due to poor choice of processing parameters. The LOF pores are generally non-spherical in shape, and the size depends on the set of processing parameters chosen. The gas pores are inherently formed in a single melt pool, and it is generally difficult to detect with an in-situ monitoring system. The LOF pores can show an early sign of formation at a given layer, and therefore there is a potential for early detection with in-situ monitoring of each layer.

3. Surface Defects

Various types of surface defects can form in SLM parts. Surface open pores and poor surface finish are quite common. The surface roughness of SLM parts is nearly 4–5 times that of the machined surfaces [9]. The high surface roughness is mostly due to the

balling phenomenon and the presence of satellites, which together result in producing parts with a wide range of surface irregularities. Balling is scan speed dependent; the higher the scan speed the more balling features are observed [10, 11]. Excessive balling will prevent the deposition of uniform layers of powder and so failure can occur. Furthermore, the irregular surface might include gaps and trapped powder, which promote porosity [12].

4. Laser spatter

Laser spatter is created in the form of small droplets of material expelled from the melt pool, oxidizing in-flight [13] with the spatter then landing onto the powder-bed. Spatter is classed as a defect if it lands in the area where a part is being fabricated, it can get trapped as a contaminant that does not completely melt during re-melting while processing the following layers. This was observed on the fracture surface of a sample that failed under cyclic loading. Laser spatter landing on the powder-bed can also worsen the surface roughness and promote porosity formation. The region onto which the spatter is expected to land is dependent on the process parameters, *i.e.* the spatter ejection path change with the parameters employed during laser scanning [14].

5. Residual Stress

Residual stress is present in many manufactured parts, and has been a critical problem in the industry. Shiomi et al. measured residual stress of AM layers made from chrome molybdenum steel powder mixed with copper phosphate and nickel powders using the L-PBF process [26]. The L-PBF system used a pulsed Nd-YAG laser with a maximum average power of 50 kW and peak power of 3 kW. The model is built on a base plate in the chamber filled with nitrogen gas. A strain gauge is attached at the center of the bottom surface of the base plate. Each layer of the model is removed, and the strain is measured to estimate residual stress. Young's modulus of 50 GPa determined from a tension test for the model and 200 GPa for the stainless base plate was used for estimation. Residual stress up to 500 MPa was observed at the top layer of the model.
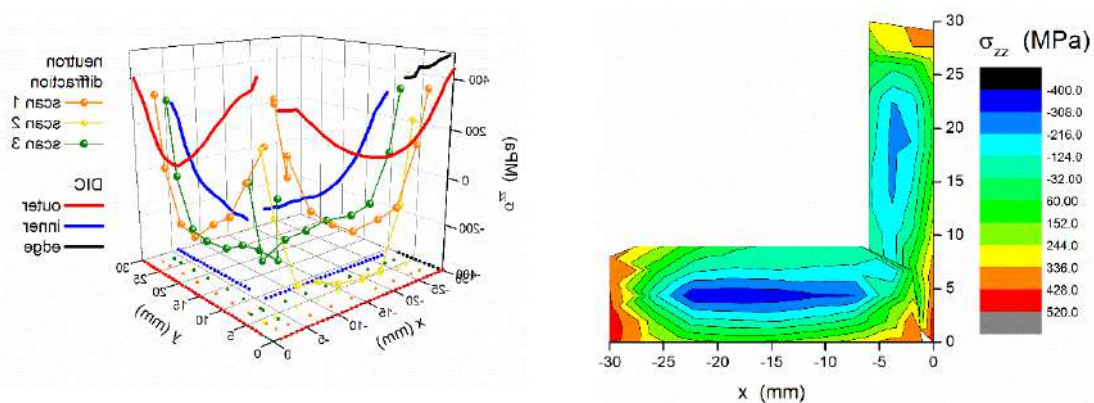

Fig. 9. Comparison of surface and volumetric axial residual stresses measured via DIC/sectioning and neutron diffraction, respectively, at z = 15 mm in an L-shaped bracket specimen built at 400 W and 1800 mm/s shown as a (a) 3D and (b) contour plot [26].

The scan speed did not affect the residual stress significantly. It was discovered that the residual stress can be relieved by heating the part higher than 600°C after placing a part in the furnace for an hour. Based on the discovery, the top surface was re-scanned, and the residual stress in the top layer decreases as the energy input in re-scanning increases. It was also considered that a higher cooling speed may have caused a larger residual stress. The powder bed temperature was raised by heating the base plate. The residual stress in the top layer decreased as the temperature of the base plate was raised. Wu et al. measured residual stress of an AM part (316L Stainless Steel) using both digital image correlation (DIC) and neutron diffraction techniques [27]. They studied the effects of laser scanning pattern, power, speed, and build direction in L-PBF AM on residual stress. 316L stainless steel powder with a 30 μm powder layer was used to produce L-shaped rectangular and quadrilateral prism specimens. The 5 mm × 5 mm island scanning strategy was adopted for preparation of the L-shaped specimens. Neutron diffraction measurements were performed on the Spectrometer for Materials Research at Temperature and Stress (SMARTS) diffractometer at the Lujan Center at Los Alamos Neutron Science Center (LANSCE), Los Alamos National Laboratory. DIC measurements were performed using a noncontact optical measurement system to evaluate the strain resulting from sectioning and build plate removal. Specked patterns on the images before and after were compared digitally to evaluate strain on a facet size of 100 pixels. The DIC results provide surface level residual stress relief, and the Neutron Diffraction measurements provide interior residual stress level, as shown in Fig. 9. Neutron diffraction measurement revealed significant in-plane residual stresses near the top of the specimen. There was also a significant tensile component on one side of the specimen which could be due to post-process surface polishing on the face or a bending moment within the vertical specimen. Neutron diffraction results on the L-shaped specimen showed the geometry effect on residual stress development. The effect of scan strategies (Island size and Island rotation) and laser power were investigated.

Conclusions and Future Work;-

As AM becomes a viable alternative manufacturing technique for metal parts, it is important to be able to identify and perform a proper inspection of defects prior to the parts being put into service. The literature review in this paper covered several types of commonly occurring defects. While many mechanical properties (e.g., tensile strength and modulus) of AM-produced components were superior to the parts produced with other techniques, porosity found in the parts was considered to be the main cause of the reduced elongation. The two types of porosity in AM were identified as LOF and gas porosities, and both types of porosities can be formed in a single part. The fatigue strength was also significantly affected by the pores in the part as these pores act as failure initiation points. Therefore, it is important to understand the causes of these pores to reduce the formation of porosity, and be able to post-inspect the AM parts for critical defects. XCT is a promising non-destructive evaluation technique to measure porosity. The critical defect criteria in type, size, orientation, and distribution, however, are yet to be determined. Hence, it is also important to understand the mechanical performance of AM-parts and the associated effect of defects (porosity and cracks) to understand critical defect criteria. Several mechanical tests including fatigue tests have been performed to understand this. In addition, the ongoing effort to study and monitor the effect of porosity on fracture using in-situ XCT scans can provide some insights on this complex problem. In-situ mechanical tests with DIC is also a promising technique to reveal stress distribution at the surface of the test specimens, and the results obtained from the test can be complementary to the data obtained from in-situ or ex-situ XCT measurements. The neutron diffraction technique appears to be a viable non-destructive measurement tool for metal AM-produced components due to the neutron's high penetration capability through metals, despite the limited availability and access to neutron diffraction facilities. Well-designed research projects with selected samples can be performed at a neutron diffraction facility to understand the magnitude and distribution of residual stress for selected critical geometries.

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System Authentication using Image, Text andAudio

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Abstract: Over the past decade, the frequency of cyber-attacks has surged dramatically. As a result, the security of sensitive information, including bank account and login details, has been compromised. The urgency for a robust authentication method is evident. In recent years, various rapid authentication systems have emerged, such as token-based, biometrics, and CAPTCHA, each with its own strengths and weaknesses. In this study, we propose a novel model for authentication, combining the traditional text-based password system with sound and image-based elements. This integrated system provides a formidable defense against spoofing and ensures that security principles remain intact.

Keywords: Authentication, Password, Cyber-attacks, sound.

1. Introduction

In today's rapidly evolving digital landscape, where our lives and critical data are intertwined with technology, the vulnerability of sensitive information stored in systems has reached an all-time high. With the ubiquitous use of smartphones and the plethora of activities conducted through mobile applications, including financial transactions, email communications, and various online interactions, the transfer of substantial data between systems and the outside world has become a prime target for malicious attacks. Cybercriminals often set their sights on obtaining login credentials, such as passwords, which remain a prevalent but increasingly problematic authentication method. The extensive reliance on passwords in numerous applications, including data transfer, email access, account validation, and online transactions, exposes a host of vulnerabilities. These weaknesses encompass password theft, forgetfulness, weak password choices, and more. As a result, the need for a robust authentication method to secure our digital applications has become imperative. Passwords serve multiple critical functions, such as user identification, authorization, and access control, and their drawbacks are increasingly evident.

Conventional text-based authentication methods are commonly employed to verify users, and, regrettably, users tend to select easily memorable, yet predictable passwords like '12345678,' 'password,' or 'abcde.' These patterns create opportunities for attackers to easily guess and compromise passwords.

While alternative systems like biometrics (fingerprint and retina scanning), CAPTCHA-based methods, and token-based systems (such as those used in ATMs) have been developed, each of these approaches has its own set of limitations. For instance, text-based passwords continue to face security issues, with password cracking techniques, including dictionary attacks, proving to be disturbingly effective and rapid. Additionally, the challenge of password memorization remains a persistent concern.

In response to these limitations, novel approaches, such as text-image and sound-based techniques, have been proposed as potential replacements for alphanumeric-based authentication. One such model is designed to address the inherent weaknesses of traditional passwords by making them more secure, memorable, and user-friendly. This model leverages the human ability to remember images and music more effectively than strings of alphanumeric characters. It is built on the premise that 'a picture is worth a thousand passwords,' aiming to revolutionize the way we secure our digital interactions.

2. Types of authentication method

The authentication methods are classified into three categories:token based (something the user has), biometrics based (something the user is) and knowledge based (something the user knows) authentication.

i. Biometrics Based Authentication

Biometric authentication systems identify individuals based on their unique physical or behavioral characteristics. These systems verify users' identities by asking the question: "Who is this person?" According to a study by Zhu [6], biometrics offers the highest level of security compared to other techniques. Physiological characteristics, such as fingerprints, iris recognition, face recognition, and DNA [7], are among the attributes used in this method to ensure robust security. However, the widespread adoption of biometrics faces challenges due to its associated high costs. These costs encompass device procurement, deployment, and support. Additionally, environmental factors pose hurdles to biometric usage, such as the unreliability of sound-based recognition in noisy environments.

ii. Token Based Authentication

It involves a two-step authentication process. In this approach, users are required to employ an external device as a token to access their accounts, enhancing security. This method can also be paired with other techniques, like knowledge-based authentication, to bolster security measures. For instance, using ATM cards or smart cards in combination with a PIN or password provides robust electronic identity verification. Token-based authentication is especially robust when used in place of a password or in combination with one to confirm user identity. However, it's important to note that each method has its drawbacks. As outlined in a Microsoft article, the authentication algorithm must be installed on a centralized database, and every client needs the necessary hardware to read the token and process the data. This installation and equipment can be costly for companies.

iii. Recognition Based Techniques.

In this method user have to choose several figures form a pool of figures and to create a picture password [4, 6],

User have to memories this picture pattern also. During authentication phaseuser have to identify the correct images that they have selected earlier. This selection of pattern and memorizing it is the drawback of the above technique. The most commonly used recognition based is Hash visualization, pass Faces, Jansen Model etc.

iv. Recall Based Techniques.

Recall based technique uses a graphical password [4] like an image and user has to enter the same password while login intohis/her account. There are two types of recall-based techniques.One is Draw A Secret (DAS) and the other one is Pass Points [3].

3. Proposed system

In our proposed system, we have incorporated the conventional text-based password authentication method, but we've enhanced it with the inclusion of both sound and image elements. While various systems have explored the use of sound, our approach leverages the 'play-pause' technique to integrate sound seamlessly. Research has indicated that sound signatures or tones can trigger memory recall, including facts, images, and text. In our system, an audio source is played for a specific duration, and users are required to pause the audio clip at a precise moment. Additionally, we introduce a tolerance value, which plays a crucial role in distinguishing legitimate users from potential impostors. To authenticate users, we create a vector that combines elements such as the text password, sound timing, and image coordinates. The resulting vectors are as follows:

Vectors for authentication:-

The vectors in the proposed system are as:

Sound password - (User ID, Sound Time value)

Image password- (User ID, Image number, coordinate x,coordinate y)

As an example of vectors for sound password and imagepassword (Table 1.1) are as shown below.

Sound password (Abc, 26(in seconds)) Table 1.1: User details for Image password

User ID	Image	Coordinate x	Coordinate y
Abc	1	130	240
Abc	2	187	147
Abc	3	345	288
Abc	4	214	347
Abc	5	220	215

The flow diagram of the proposed system are as shown in figure 1. The algorithm for sign up during the registration phase and sign in during the login phase and the matching ofthe login credentials are as follows:

Algorithm of sign up

Start server

{

Wait for client requestOn client request

{

Request=sign_up/sign_inIf (requests==sign_up)

{

Check if member is already register

If not then check other details and store in the databasePrompt for graphical password

Check whether it already stored or not

After checking all details store coordinates of all imagesPrompt for sound password

Store sound frequency in the database

}

}

Algorithm of sign inStart server

{

Wait for client requestOn client request

{

Request=sign_up/sign_inIf (request==sign_in)

{

Check user_id and password is correct or notIf yes then prompt for graphical password

Read the graphical password and match with stored dataIf matches then prompt for sound password

Read the sound password and match with stored dataIf matches the redirect to his/her account
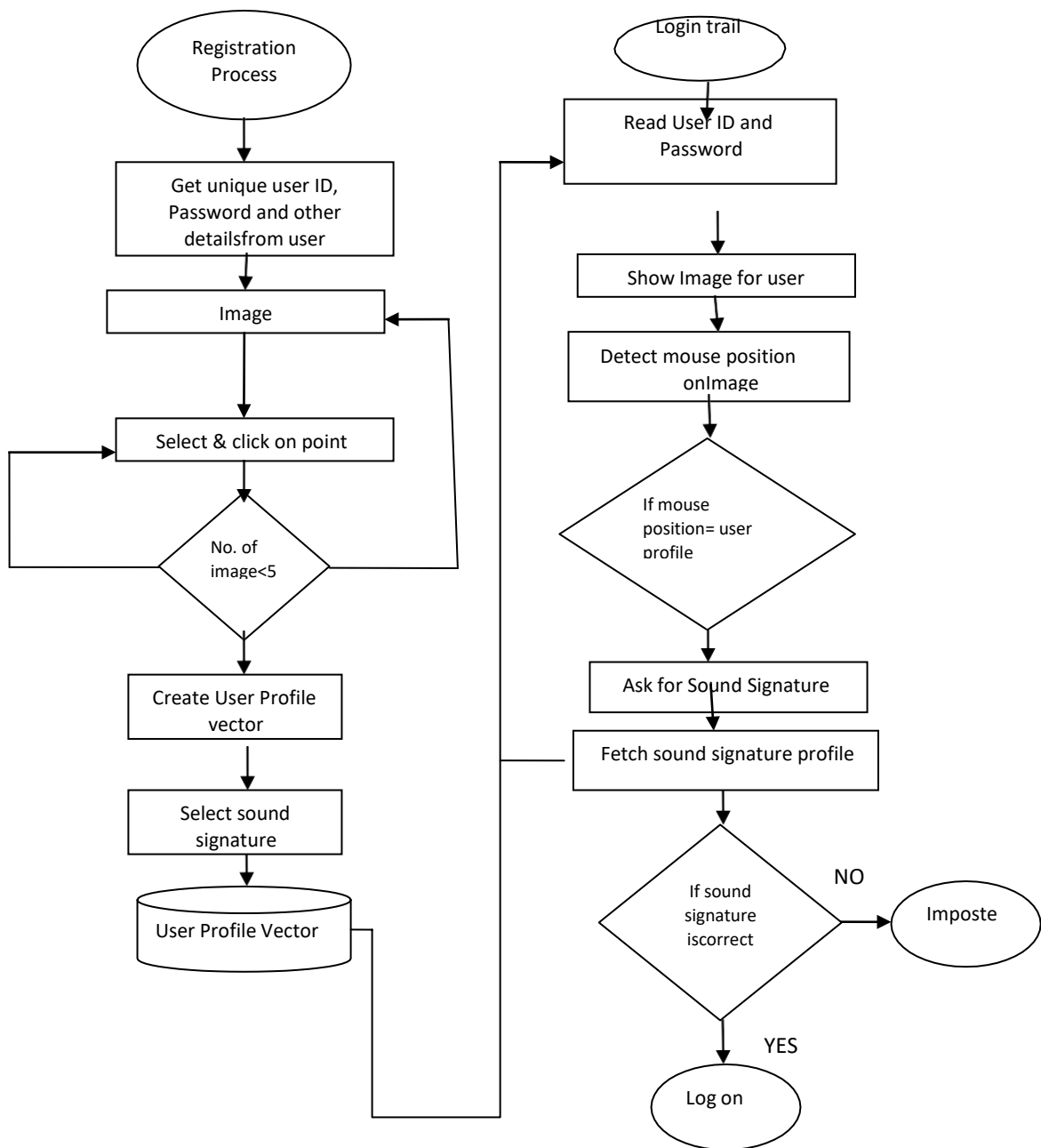
}

}

Figure 1: Flow diagram of the model

Here in the proposed algorithm first of all user have to enter the textual password, then a random image will appear, user have to click on the specific position which on authorization play an audio clip. User has to pause the audio at the specific position where he/she has paused during registration phase.

4. Experimental Results

The system is developed I Vusual Studio 2010. The coding part is implemented in ASP.NET using C#. MySQL is the database which contains the details of 40 user. This user is the students of age group 20-28. First of all each user are asked to sign up, and then different cyber-attacks are applied on the system.

Table 2: Result

User	No. of User	Accepte dTrails	Rejecte dTrails
Legitimate	20	18	2
Imposter	20	1	19

From Table 2 as shown above, the result obtained shows that the proposed system is difficult to bypass as imposter are unable to get the login credentials.

4. Conclusion and Future Enhancement

Regarding the tolerance experiment, the findings indicate that a smaller tolerance of just 10 x 10 pixels had a significant negative impact on users' memory, resulting in increased password input times. While users could generally identify the location of their cursor, they had not stored precise knowledge of the points. This effect might diminish with prolonged system use and regular password entry, as performance becomes more automated. However, if this precise memory erodes due to extended non-use, users could once again be at risk of failure due to the narrow margin of error. It's worth noting that the proposed system offers enhanced security compared to the current system, employing a three-tier authentication approach.

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Aspect-Based Sentiment Analysis (ABSA): A Comprehensive Survey

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Abstract: This paper deals with a study on Aspect Based Sentiment Analysis(ABSA) in present scenario. This analysis is highly useful to analyses different segment elements and their relation. ABSA has gained significant attention as a vital fine-grained sentiment analysis problem. ABSA aims to assess and understand people's opinions at the aspect level. To address ABSA in different contexts, various tasks have been introduced to analyze different sentiment elements and their relationships, including aspect terms, aspect categories, opinion terms, and sentiment polarity. Unlike early ABSA research, which focused on individual sentiment elements, recent studies have delved into compound ABSA tasks involving multiple aspects to capture more comprehensive aspect-level sentiment information. However, a comprehensive review of various ABSA tasks and their corresponding solutions. This study fills that gap by providing a new, more specific taxonomy for ABSA to organize existing research effectively.

Keyword : Aspect Term Extraction (ATE) **,** Aspect Category Detection (ACD), Aspect Sentiment Classification (ASC), Aspect Sentiment Classification (ASC), Aspect-Opinion Pair Extraction (AOPE), Aspect Category Sentiment Analysis (ACSA), Aspect Sentiment Triplet Extraction (ASTE), Aspect Sentiment Quad Prediction (ASQP)

1. Introduction

Sentiment analysis (SA) :-

S.A explores people's attitudes and filling toward various entities such as brand, services, organizations, and ideas. It encompasses a wide range of areas and may be referred to by different names like opinion mining, sentiment analysis, opinion extraction, subjectivity analysis, emotional analysis, affect analysis, and review analysis. Despite these varied terms, they all fall under the umbrella of sentiment analysis or opinion mining. While sentiment analysis is predominantly employed in the business realm, both SA and opinion mining find applications in academic research. It is a popular research topic, driven not only by its real-world applications but also because it presents challenging problems in natural language processing (NLP). Prior to the year 2000, there was limited digitally available opinion text, which hindered research in both NLP and linguistics. However, since then, SA has grown substantially and become one of the most active areas of research in NLP. It is also extensively studied in fields like data mining, web mining, and information retrieval. In general, sentiment analysis has been investigated mainly at three levels:

Document level: - At this level, the goal is to determine whether an entire opinion piece expresses a positive or negative sentiment. For example, a computer program can assess whether a product review overall speaks favorably or unfavorably about the product. This task is often referred to as "document-level sentiment classification" in the field of SA and Opinion Mining.

Sentence level: At this level, the goal is for determine whether each sentence expresses a filling opinion as positive, negative, or neutral opinion. "Neutral" typically means that there is no specific viewpoint expressed. This analysis is closely related to subjectivity categorization, which distinguishes between sentences that provide factual information (called "objective sentences") and sentences that convey subjective views and opinions (known as "subjective sentences"). It's important to note that while some objective sentences can contain opinions, subjectivity is not the same as sentiment.

Entity and Aspect level: Document and sentence level analyses can't precisely identify what people liked or disliked. Aspect-level analysis, sometimes referred to as feature level analysis (feature based, opinion mining and summarization), provides a more detailed examination. Instead of focusing on linguistic structures like texts, sentences, clauses, or paragraphs, aspect-level analysis directly examines the opinions themselves. This approach is based on the idea that an opinion consists of two main parts: the opinion target (what the opinion is about) and the sentiment (whether it's positive or negative). Knowing the target of an opinion is essential because an opinion has limited value without understanding who it's intended for. Understanding the importance of opinion targets also helps us better comprehend the sentiment and analyze the issue. For example, consider the sentence: "Even though the service is poor, I still adore this place." Aspect-level analysis would focus on identifying both the opinion target (the place) and the sentiment (adoration) in this statement. The graphical representation of various tasks by ABSA is as follows.
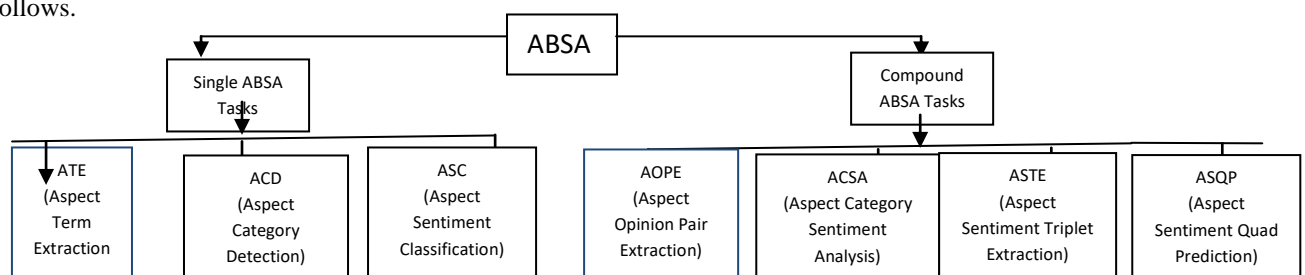
1.1 Description of ATE :

It is a specific task within ABSA that focuses on identifying and extracting aspect terms from text data. Aspect terms are words or phrases that represent the specific aspects or attributes of a product, service, or topic that people are expressing opinions representing on.

In the context of sentiment analysis, ATE is a critical step because it helps in pinpointing the aspects or features of a subject being evaluated. For example, in a product review, aspect terms could include "battery life," "camera quality," "performance," and so on. These terms provide insights into the aspects of the product are being discussed and evaluated by the author.

ATE typically involves methods of natural language processing, such as tokenization, part of speech tagging, and named entity recognition, to accurately identify and extract aspect terms. Once aspect terms are extracted, they can be used in subsequent ABSA tasks, such as aspect-based sentiment classification, to determine the sentiment polarity associated with each aspect.

Description of ACD: It is another important task within ABSA. Unlike Aspect Term Extraction (ATE), which focuses on identifying specific words or phrases representing aspects, ACD aims to detect and categorize broader aspect categories or topics within text data.

In ACD, the goal is to identify the general themes or categories that describe the aspects or attributes are being discussed in the text. These categories provide a higher-level overview of the areas under evaluation. For example, in a restaurant review, aspect categories could include "food quality," "service," "ambiance," and "price."

ACD involves classifying sentences or segments of text into predefined aspect categories. Machine learning models, such as text classifiers or deep learning models, are often used for this task. These models are trained on labeled data, where each text sample is associated with one or more aspect categories. Once trained, the model can predict the aspect categories for the new, unlabeled text.

ACD is an essential component of ABSA because it helps organize and categorize the opinions expressed in the text, making it easier to analyze and understand the overall sentiment toward different aspects or attributes of a subject. It complements ATE, which focuses on identifying specific aspect terms within those categories. Together, ATE and ACD provide in comprehensive view of aspect level sentiment analysis.

Depending on whether there is annotated data or not, ACD can be divided into supervised ACD and unsupervised ACD. The available supervised ACD function is generally formulated as Multi-label classification problems (for example, Seq Class) treat each page class as a label. Original work with permission RepLearn [13] trains speech recognition on a noisy dataset and extracts hybrid features from different features. As a result of feed forward network costs, a logic model is created. Such actions are trained to predict.

Description of ASC:
It is a crucial task in ABSA. ASC focuses at determining the sentiment polarity (positive, negative, neutral, or sometimes more fine-grained sentiments) associated with specific aspect terms or aspect categories that have been identified in a text. In other words, ASC assigns sentiment labels to individual aspect terms or aspect categories to indicate whether the emotion conveyed toward that particular aspect is positive, neutral or negative. For example, in a product review, if "battery life" is identified as an aspect term, ASC determines whether the sentiment expressed about the battery life is positive (e.g., "great battery life"), negative (e.g., "poor battery life"), or neutral (e.g., "average battery life"). ASC is typically performed using machine learning techniques, such as text classification algorithms or deep learning models, that have been trained on labeled data. This labeled data consists of text samples in which aspect terms or categories are associated with sentiment labels based on human annotations. The trained model can then automatically classify sentiment for new, unlabeled text data. ASC is an integral part of ABSA because it helps extract fine-grained sentiment information related to specific aspects or attributes of a subject. By performing ASC, analysts and systems can gain a detailed understanding of how people feel about different aspects of a product, service, or topic, which is valuable for decision-making and improving products or services.

Description of AOPE
It is a task within ABSA that focuses on identifying and extracting pairs of aspect terms and their corresponding opinion expressions or opinions from text data. In other words, AOPE identifies the aspects or attributes of a subject that are associated with specific opinions or sentiment expressions in a given text.

An aspect-opinion pair typically consists of two components:

- Aspect Term: A term or expression that expresses a specific aspect or attribute of the subject under discussion. Aspect terms are typically nouns or noun phrases and can include terms like "camera quality," "battery life," "customer service," and so on.

- Opinion Expression: This is the sentiment expression or opinion word or phrase that indicates the sentiment polarity (positive, negative, neutral, etc.) associated with the identified aspect. Opinion expressions can include words like "excellent," "disappointing," "good," "bad," and so forth.

The AOPE task involves identifying both aspect terms and their associated opinion expressions within a text. It helps in understanding not only what aspects of a subject are being discussed but also the sentiment or opinion expressed about those aspects. This fine-grained information is valuable for businesses and analysts to gain insights into user opinions and preferences.

AOPE is often performed using natural language processing and machine learning techniques, including syntactic and semantic analysis, dependency parsing, and sentiment analysis. It plays a crucial role in extracting structured sentiment data that can be used for various applications, such as product improvement, market analysis, and customer feedback analysis.

Description of ACSA

It is a specialized task within ABSA which focuses on determining the sentiment polarity associated with aspect categories or topics rather than individual aspect terms. In ACSA, the primary objective is to classify the sentiment expressed toward broader aspect categories or themes within a given text. These aspect categories represent general topics or areas of interest related to a product, service, or topic. For example, in a restaurant review, aspect categories might include "food quality," "service," "ambiance," and "price". The sentiment classification in ACSA typically involves labeling each aspect category as positive, negative, neutral, or possibly more fine-grained sentiments, based on the opinions expressed within the text. This provides a high-level summary of the overall sentiment toward different aspects or topics of discussion.

ACSA is particularly useful for aggregating SA results when dealing with a large volume of text data, such as customer reviews or social media posts. It allows businesses and analysts to understand the overall sentiment trends related to different aspect categories, which can inform decision-making and help identify areas for improvement. Similar to other ABSA tasks, ACSA can be performed using machine learning techniques, such as text classification algorithms or deep learning models. These models are trained on labeled data where aspect categories are associated with sentiment labels based on human annotations. Once trained, the model can automatically classify sentiment for new, unlabeled text data, providing insights into sentiment distribution across aspect categories.

2. This section of the paper deals with ASTE & ASQP

Description of ACTE

It is an advanced task within ABSA that goes beyond traditional ABSA tasks to extract more detailed and structured sentiment information from text data. ASTE identifies and extract triplets consisting of three main components:

2.1. Aspect Term: Similar to other ABSA tasks, the aspect term is a word or phrase representing a specific aspect or attribute of the subject under discussion. Aspect terms typically include nouns or noun phrases, such as "camera quality" or "battery life."

2.2. Opinion Expression: The opinion expression is the sentiment-bearing word or phrase that indicates the sentiment polarity (positive, negative, neutral, etc.) associated with the identified aspect term. Opinion expressions can include words like "excellent," "disappointing," "good," "bad," and so on.

2.3. Target Entity: The target entity represents the entity or object being evaluated or discussed in the text. In ABSA, the target entity is often a service, product or topic. For example, in a product review, the target entity might be a specific smartphone model.

The ASTE task involves identifying and extracting these triplets from the text, thereby providing a structured representation of the sentiment expressed toward specific aspects of a particular entity or topic. The extracted triplets enable a more in-depth analysis of sentiment and opinion relationships within the text, making it valuable for fine-grained sentiment analysis and opinion summarization.

To perform ASTE, natural language processing and machine learning techniques, including syntactic and semantic analysis, dependency parsing, and sentiment analysis, are often employed. The task is more complex than traditional ABSA tasks like Aspect Term Extraction (ATE) or Aspect Sentiment Classification (ASC), as it requires the simultaneous identification of aspect terms, opinion expressions, and target entities within the same context.

ASTE is particularly useful for applications in which a detailed understanding of sentiment toward specific aspects of entities or topics is necessary. This can include product reviews, customer feedback analysis, and market research, among others.

Authors [2] says that ASTE, a recent subtask within the field of Aspect-Based Sentiment Analysis (ABSA), focuses on generating triplets that consist of three key components: an aspect target, its associated sentiment, and the corresponding opinion term. Contemporary models approach triplet extraction in a holistic manner, but their effectiveness hinges largely on how well they capture the interactions between individual aspect target words and corresponding opinion words. Authors [2] says that approach for predicting sentiment connections between targets and opinions, they use a span-level technique that considers the entire spans of targets and opinions. This allows them to make predictions based on the full meaning of these spans, leading to improved consistency in sentiment analysis. To address the computational complexity of span enumeration, they introduced a dual-channel span pruning method that incorporates guidance from Aspect Term Extraction (ATE) and Opinion Term Extraction (OTE) tasks. This not only enhances computational efficiency but also more accurately separates opinion and goal spans. Our framework excels in handling ATE, OTE, and ASTE tasks simultaneously, achieving high performance. This span-level approach notably outperforms baseline methods, especially for triplets involving multi-word targets or opinions.

Authors [2] say that to explore the connections between goal and opinion spans in the ASTE task, they introduce a span-level technique called Span-ASTE. It overcomes the limitations of existing methods that only consider word-to-word interactions. To streamline the process and enhance computational efficiency while ensuring accurate target and opinion pairing, they incorporate guidance from the Aspect Term Extraction (ATE) and Opinion Term Extraction (OTE) tasks in our dual-channel pruning technique. They analyzed the effectiveness of our approach, outperforming previous methods in theATE, OTE, and ASTE tasks. Notably, our performance boost is primarily attributed to handling multi-word triplets more effectively.

3. Description of ASQP

In recent years, ASQP has been found useful to detect all sentiment elements in Quards for a opinionated sentence. This rection is denoted to discuss the methodology in ASQP. It is an advanced task ABSA that extends the traditional

ABSA tasks to include even more detailed and structured sentiment information extraction from text data[15]. ASQP aims to identify and predict quadruplets consisting of four main components:

3.1. Aspect Term (AT): Similar to other ABSA tasks, the aspect term is a phrase or word representing a specific aspect or attribute of the subject under discussion. Aspect terms typically include nouns or noun phrases, such as "camera quality" or "battery life."

3.2. Opinion Expression/ Sentiment polarity (SP): The opinion expression is the sentiment-bearing word or phrase that indicates the sentiment polarity (positive, negative, neutral, etc.) associated with the identified aspect term. Opinion expressions can include words like "excellent," "disappointing," "good," "bad," and so on.

3.3. Target Entity/ Aspect Category (AC): The target entity represents the entity or object being evaluated or discussed in the text. In ABSA, the target entity is often a service, product or topic. For example, in a product review, the target entity might be a specific smartphone model.

3.4. Opinion Holder (OH): The opinion holder is the entity or source expressing the sentiment or opinion. In many cases, it is a person or a group of people providing the opinion. Opinion holders are often mentioned in the text, and their sentiment towards the aspect are considered.

User may use symbols 'a','p','c' and 'o' for 'AT', 'SP', 'AC' and 'OH' respectively

3.5.   This subsection deals with problem statement as well as paraphrase modeling paradigm for ASQP:
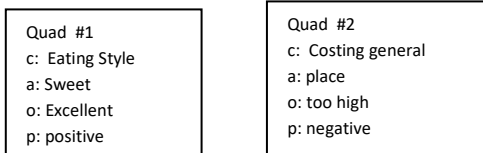
3.5.1.   Statement of the problem

The user has a sentence 'S' when set 's' of all four ALSQ as S={ (c, a, o, p) }

Here AC falls into a set S_c & AT can be void if target is implicitly mentioned. i.e $a \in S_x \cup \{ \varnothing \}$

$$O_o \in S_x , \quad \text{set containing all possible continuous spans of x}$$

$$\Rightarrow \quad P \in \{ \overline{P}, \overline{Z}, \overline{N} \}$$

Where $\overline{P}, \overline{Z}$ & $\overline{N}$ denote the Positive class, null class & negative class. This means 'p' may (+) ve , neutral and (-) ve Example :-

Quad #1	Quad #2
c: Eating Style	c: Costing general
a: Sweet	a: place
o: Excellent	o: too high
p: positive	p: negative

Quard   Recovery

Eating style is good because sweet is excellent. Costing in general is bad because price is too high

Eating   style   is   good   ----------   too   high

Decoder

Encoder
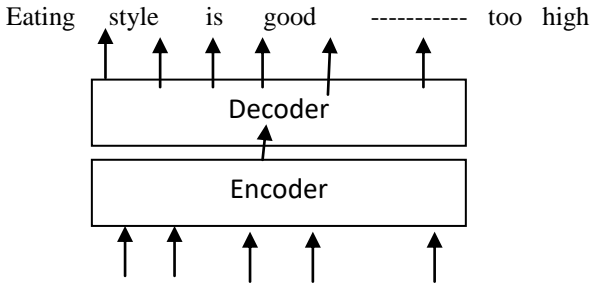
The   sweet   yesterday   was ………   high
The sweet yesterday was delicious, but the price is too high! ASQP
Overview of the paraphrase generation frame work

3.5.2.   Paraphrase Modeling in ASQP

User have sentence 's' and he may generate a target requires 't' s.t

M: s→ t

Where 'M' is an encoder-decoder model

To make predction Q={ (c, a, o, b) } is covered from 't' , clearly (s, t) stands for input target pair.

User may use this projection function Π_i for mapping $i \in \{ c, a, o, p\}$ to natural language from

Π_c (c) is Π_p (p) because Π_a (a) is Π_a (o)

For SP, it is given as

$$\Pi p(p) = \begin{cases} great & if\ p = positive \\ op & if\ p = netural \\ bad & if\ p = negative \end{cases}$$

In case of implicit pronoun,

$$\Pi_a(a) = \begin{cases} IET\,, & a = \emptyset \\ a & otherwise \end{cases}$$

Where IET stands for implicit expression target. On this basis user may model Input –output generation with a classical encoder –decoder model as

Input -1	The sweet yesterday was delicious!
Label -1 ⇩ Target - 1	(c, a, o, p) = (food quality, sweet, delicious, Positive) ⇩ Food quality is great because sweet is delicious
Input -2	but the price is too high!
Label -2 ⇩ Target - 2	(c, a, o, p) = (Costing quality, place, too high, Negative) ⇩ Costing quality is bad because it is too high

The ASQP task involves identifying and predicting these four components simultaneously within the same context in text data. This level of granularity allows for a highly detailed understanding of sentiment and opinion relationships, including who is expressing the sentiment and towards which aspect and entity [14].

To perform ASQP, advanced natural language processing and machine learning techniques are typically employed, including dependency parsing, entity recognition, sentiment analysis, and context modeling. The task is considerably more complex than traditional ABSA tasks, and it is valuable for applications requiring fine-grained sentiment analysis and opinion extraction, such as customer feedback analysis, product improvement, and market research.

4. Conclusion

In conclusion, this paper has provided a survey on Aspect-Based Sentiment Analysis (ABSA) in the current scenario, highlighting its significant relevance in analyzing various segmented elements and their relationships. ABSA has emerged as a crucial problem in fine-grained sentiment analysis, with its primary objective being the assessment and understanding of people's opinions at the aspect level. ABSA has given rise to various tasks designed to examine different components of sentiment and their interconnections. These tasks encompass aspect terms, aspect categories, opinion terms, and sentiment polarity. Recent ABSA research has extended beyond individual sentiment elements, now addressing complex ABSA tasks involving multiple aspects to capture a more holistic aspect-level sentiment perspective.

Despite these advancements, there remains a need for a comprehensive review of various ABSA tasks and their corresponding solutions. This survey has aimed to fill this gap by presenting a new, more specific taxonomy for ABSA, enabling the effective organization of existing research in this domain. By doing so, it contributes to a deeper understanding of ABSA's evolving landscape and its applications in various contexts.

Future work :

To enhance the emotional range from {positive, neutral, negative} to {High positive, positive, neutral, negative, High negative}, we may broaden the concept of emotion polarity, making it more user-friendly for assigning varying values.

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Management of Finance for the Organizational Success

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Abstract: Typically, financial management revolves around the acquisition, distribution, and regulation of financial resources within an organization. Financial management encompasses the processes of planning, organizing, guiding, and overseeing financial activities, such as obtaining and using funds for business endeavors. It entails the application of conventional management principles to a company's financial assets. Finance and effective financial management are pivotal to the triumph of any enterprise. An organization's success hinges on the availability and proficient administration of its finances. Presently, the role of finance managers in the financial management of business organizations is expanding. In today's competitive landscape, financial management confronts numerous challenges, necessitating innovative decision-making by financial managers to steer the company toward prosperity. Consequently, the study of this field remains indispensable despite ongoing research efforts. This study relies on secondary data and information sources. This paper endeavors to spotlight the responsibilities, functions, and role of finance managers. It covers aspects such as the rationale for conducting this study, the concept of financial management, its objectives, financial planning, financial functions, and the roles and responsibilities of finance managers.

Keywords: Finance, procurement, management, responsibility, organization, success, efficient.

1. INTRODUCTION

Typically, financial management revolves around the acquisition, allocation, and oversight of an organization's financial assets. Financial Management encompasses planning, structuring, leading, and monitoring financial activities such as obtaining and utilizing funds for business purposes. It involves applying fundamental management principles to an organization's financial resources. Finance and effective financial management are integral to the success of every enterprise. The prosperity of any organization depends on the accessibility and proficient administration of its financial resources. Nowadays, the role of finance managers in the financial management of business organizations is steadily expanding.

OBJECTIVES OF THE STUDY
➢ To understand the objectives and significance of financial management.
➢ To study the aspects involved in financial management.
➢ To study the responsibilities of a finance manager.
➢ Finding and recommending solutions for effective financial management.

2. METHODOLOGY

The research relies on secondary data and information sources. The paper encompasses the necessity for the study, the concept, objectives, and functions of financial management, financial planning, the functions of finance, and the roles and responsibilities of finance managers, among other topics.

NEED FOR STUDY

Finance constitutes the cornerstone of every business enterprise. The availability and effective utilization of funds play a pivotal role in determining the success of a business organization. The evolution of trade and commerce has intensified the demand for a wide array of goods and services. Established businesses must contend with sustaining their presence, while new entrants seek to compete with incumbents. The success of business organizations hinges on the managerial talent and decision-making prowess they possess. Financial management assumes a highly significant role in cost reduction and generating substantial profits. Consequently, the judicious allocation, deployment, and utilization of funds are regarded as fundamental to a business's triumph. In today's fiercely competitive landscape, financial management confronts numerous challenges, necessitating innovative decisions by financial managers to steer the organization towards prosperity. Hence, while research in this field is ongoing, the study remains indispensable, as exemplified by this endeavor.

3. CONCEPT OF FINANCIAL MANAGEMENT

Financial Management encompasses the processes of planning, organizing, directing, and overseeing financial activities, including the acquisition and utilization of funds for a project. It involves the application of fundamental management principles to a project's financial resources. Effective financial management, achieved through the allocation of limited resources among various business opportunities, adds value and enhances managerial proficiency. Financial Management plays a crucial role in facilitating the implementation and monitoring of business strategies, ultimately contributing to the achievement of business objectives. Managerial finance, as a discipline, draws from both managerial accounting and corporate finance, making it an interdisciplinary approach to handling financial matters within an organization.

Financial Management encompasses various domains, including Managerial Finance, Corporate Finance, and Financial Management for IT Services. Managerial Finance is a branch of finance that is closely associated with the managerial significance of financial techniques. Corporate Finance, on the other hand, focuses on the financial decisions made by business enterprises and the tools and analyses employed in making those decisions. Financial Management for IT Services specifically addresses the financial management of IT assets and resources.

The primary objectives of financial management are to create wealth for the business, generate cash flow, and provide a sufficient return on investment.

OBJECTIVES OF FINANCIAL MANAGEMENT

Financial management encompasses critical aspects such as the acquisition, distribution, and regulation of a business organization's financial resources. Within this context, several important objectives of financial management emerge.

➢ Securing a Consistent and Sufficient Flow of Resources for the Business Organization.
➢ To ensure satisfactory income to the shareholders.
➢ To ensure maximum utilization of available funds.
➢ Guaranteeing security on investment.
➢ Striking an Equilibrium Between Debt and Equity Capital.

ROLE AND FUNCTIONS OF FINANCIAL MANAGEMENT

1. Estimating Capital Requirement: The primary duty of a finance manager is to estimate the capital needs of the business organization. The anticipated profits, costs, and future strategies and policies of the organization will dictate the required capital. These estimations must be thorough, aiming to enhance the venture's earning capacity.
2. Capital Structure Decision: Once the estimation is complete, the capital structure must be determined, encompassing both short-term and long-term debt and equity evaluation. The capital structure hinges on the existing equity capital within the organization and the additional funds required from external investors.
3. Choice of sources of finance: A business organization has several options for procuring additional funds, including issuing shares and debentures, securing loans from banks and financial institutions, and gathering public deposits in the form of bonds.
4. Distribution and Utilization of Funds: The finance manager is responsible for determining the allocation of funds into profitable projects, considering the potential for both investment security and consistent returns.
5. Surplus Distribution: Every finance manager is tasked with making decisions regarding net profits. This can be achieved through dividend declaration and the retention of profits. The former involves determining the dividend rate and other incentives like bonuses, while the latter is based on the expansion, innovation, and diversification plans of the organization.
6. Management of Cash and Financial Oversight: The finance manager faces challenging responsibilities when it comes to the administration and control of available funds. Decisions concerning cash management are of paramount importance. Ready cash is vital for meeting various financial obligations such as wage and salary payments, utility bills, interest payments, existing liabilities, maintaining an adequate stock of raw materials, and more. Financial control is a critical activity for assisting the business in achieving its objectives. The finance manager must exercise control over financial matters and address crucial questions like the efficient utilization of assets, the security of business assets, adherence to shareholder interests, and compliance with business regulations. Depending on factors such as earnings potential, market share prices, and shareholder expectations, appropriate plans must be devised. To do this, the finance manager employs techniques like ratio analysis, financial forecasting, cost control, and profit management.
7. Effective Use of Funds: Funds should be allocated to projects that offer security, satisfactory returns, and minimal expenses.

FINANCIAL PLANNING

Financial planning refers to the process of estimating the necessary resources and assessing their availability. It involves the development of financial policies related to the acquisition, investment, and management of a business organization's resources. Financial planning serves various objectives, including determining the capital needed, defining the capital structure, and formulating financial policies concerning cash management, lending, borrowing, and more. A finance manager's role includes ensuring the efficient utilization of limited resources, maximizing their potential while minimizing costs, ultimately aiming for the highest returns on investment.

ROLE OF FINANCIAL MANAGER:

Financial activities are pivotal in determining the success of a business enterprise. These activities are intricate and require finesse. The finance manager assumes a crucial role in executing such functions, which not only generate ample profits and goodwill for the business but also oversee all significant financial operations. With their foresight, finance managers judiciously manage resources and contribute to the stability of the organization.

FUNCTIONS OF FINANCIAL MANAGER:

The finance manager holds a pivotal position in financial activities, and through their efforts, the business organization attains satisfactory profits and goodwill. They fulfill a diverse array of functions, including but not limited to the following:

1. Fundraising: Raising funds is a crucial function within the purview of the finance manager's role. The finance manager is tasked with securing the required funds from various sources. Funds can be acquired

through both equity and debt channels. Ensuring a well-balanced relationship between debt and equity is a key responsibility of the finance manager.

2. Resource Allocation: Given that financial decisions can impact other management functions, the judicious allocation of funds holds significant importance. Once funds are raised from diverse sources, the finance manager is tasked with allocating them in the most effective manner. During the allocation process, several critical factors come into play, including the size and growth potential of the firm, the nature of its assets (whether they are long-term or short-term), and the method by which the funds were procured, among others.

3. Engaging in the Capital Market: The finance manager must possess a comprehensive understanding of the intricacies of the capital market. There is invariably a degree of risk associated with trading securities in stock markets. Therefore, the finance manager must have the capability to comprehend and evaluate the risks associated with trading shares and debentures. Additionally, another crucial function of the finance manager is making decisions concerning the distribution of dividends.

4. Profit Planning: The primary objective and function of a business organization revolve around profit generation. Profit is imperative for the organization's survival. Profit planning entails the judicious management of the profits accrued by the business entity. The firm's profitability is contingent upon factors such as product pricing, competition, supply and demand dynamics, production costs, and production levels, among others. Achieving a well-balanced and efficient combination of variable and fixed factors enhances the organization's profitability. Any slight oversight in the management of these profit determinants can lead to a decline in profitability, which jeopardizes the firm's sustainability. Consequently, it is the responsibility of the finance manager to plan for and oversee all these aspects.

3. CONCLUSION

Success is the anticipated outcome for any business organization, and profit serves as the catalyst for growth, sustainability, and successful operation. The finance manager assumes a pivotal role in steering the organization toward success. Key responsibilities include securing funds, resource allocation, engagement in the capital market, profit planning, and more. An efficient and accomplished finance manager can pave the way for a firm's success. Therefore, the finance manager must make astute and timely financial decisions, adapting to changing circumstances and competition to guide the business organization towards enduring success.

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Adaptive Sampling Method of Continuous Signal for Optimized Output and Reduced Quantization Error

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ABSTRACT: In this thesis a method had been proposed for converting analog signal to digital signal. This method has minimum quantization error. In present sampling theory samples were collected at regular interval and quantize it to different level. In this technique there exists a noise called quantization noise. Mathematically it was proved that this noise is proportional to the step size or says quantized level. If the quantization size in more than noise will be more and vice Versa. These quantization noises result in signal distortion and get accumulated at the receiver. So, at the receiver side necessary circuit are required to reduce the quantized error. In this thesis a newer method had been proposed to represent Analog Signal in digital form and also efforts were made to reduce quantization noise.

KEYWORDS: Quantization noise, Analog Signal, Digital Signal

1. INTRODUCTION

Serial processing [1], which monitors regions of the spectrum sequentially in time using only a single digitizer, is unable to provide real-time monitoring of the processed bandwidth. Parallel processing [2], which separates the frequency spectrum into discrete channels, requires a large number of digitizers as the processed bandwidth increases, also for sub-sampling to be most useful it is necessary to overcome the frequency ambiguity introduced by aliasing

To reduce the burden of the sampling, a sub-Nyquist sampling system named uses reduced sampling rate in multiband settings below Nyquist rate has been widely studied [1]– [11].

So, an alternating approach is used which is capable of providing two different data using single quantizer. So, in this proposed thesis a method had been designed to convert Analog signal to digital signals. The method is designed keeping in mind the simplicity and quantization error. So, during conversion effort had been made to keep quantization error minimum. In this method quantization level don't comes in figure because it doesn't use the concept of quantization level.

The most obvious existing work in this direction comes from the robotics and computer vision communities in the form of simultaneous localization and mapping (SLAM) [5], [6] and structure from motion (SfM) [7], [8].

In this new method samples are collected at irregular interval. The collected samples contain two parameter phase and amplitude and these parameters are used to represent Analog Signal to digital Signal.

In this method samples are collected at point where there is change in angle made with horizontal axis and from that point the amplitude is measured till there is next change in the phase angle made with the horizontal axis (i.e. next sample).

As compared to sampling theory here the samples are collected where there is phase change with the horizontal axis and size of the sample (i.e. amplitude) is proportional to the next change in the phase angle, whereas in sampling theory the samples collected at regular interval are of different amplitude, also this method need to satisfy Nyquist Criterion because Nyquist criterion say enough number of samples should be collected so that analog signal can be exactly represented into digital form. If Nyquist criterion is not satisfied then there may be aliasing of signal and the samples doesn't represent the original message and also it become difficult at the receiver side to recover original signal from sampled signal.

So, in the proposed theory samples are not taken frequently so it doesn't need to satisfy the Nyquist criterion. Here the number of samples depends upon the change in angle with the horizontal axis, so number of samples may vary.

2. Methodology

Methodology used for converting analog signal to digital signal uses the concept of collecting the data at interval where there is change in angle made with the reference axis. The collection of data may or may not take place as regular interval. It depends upon the nature of signal. So, interval at which the data is collected may vary with the shape of signal

While converting the Analog signal to discrete signal the samples are collected at the point where the signal makes changes in the orientation (i.e., angle) with respect to reference axis, also at that instant the amplitude is measured. The amplitude is measure until the signal makes next change in the angle made with the reference axis.

The samples are collected only at the instant when the Slope of the curve change. At instant 2s we can the see the slope of the curve gradually changes, so the first sample is collected at this instant. Again, now at 3s again the slope changes, so second sample is collected at 3s. Between the change in slope, we also measure the amplitude so that the signal can be properly represented in discrete form.

So, in this thesis two data are collected to represent analog signal in discrete form. First data is the change in the angle made with the horizontal axis (Represented in $\Delta\theta$) and second data is the change in the corresponding amplitude between the first and the second sample (Represented in Δv). Together these two data represent the change in collected samples at any instant.

This can be better explained with the help of figure given below. In the given figure total of 15 samples are
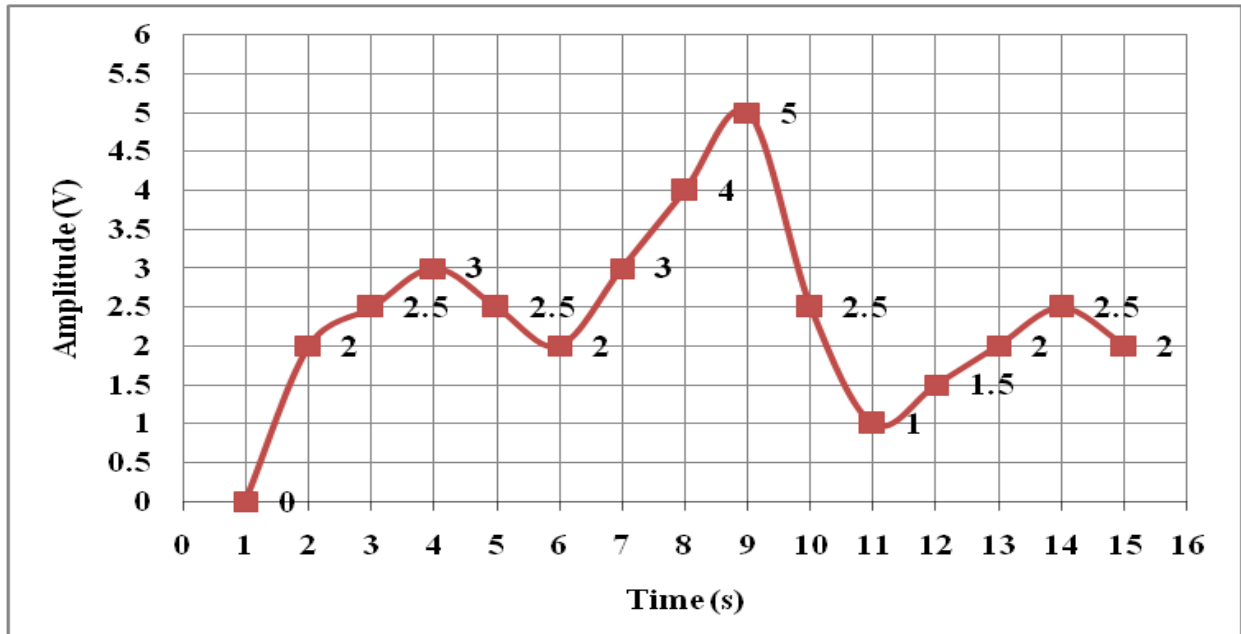
The table:1 consist of three columns. First column contains collected samples. For convenience the samples are taken at regular interval i.e., every second 1s, 2s, 3s..... First sample is taken at 1s; second sample is taken at 2s and so on. Second column contain angle made with the horizontal axis. Here we can see that between 1s and 2s the amplitude increases linearly. At 2s or when the amplitude is at 2v the signal changes the angle made with the reference axis (here the reference axis is the horizontal line drawn parallel to X-axis at 2v) as compared to angle made with reference axis at 2s or when signal is at 0v (Origin). Similarly, between 2s and 3s the amplitude is linear but in different direction/angle as compared to samples taken between 1s and 2s. The third column contain change in amplitude between two samples.

Table: 1

Sampling instant	Angle made with Reference axis	Amplitude changes two samples
1s	θ1	0v
2s	θ2	θ2- θ1=2v
3s	θ3	θ3- θ2=0.5v
4s	θ4	θ4- θ3=0.5v
5s	θ5	θ5- θ4=-0.5v
6s	θ6	θ6- θ5=-0.5v
7s	θ7	θ7- θ6=2v
8s	θ8	θ8- θ7=2v
9s	θ9	θ9- θ8=1v
10s	θ10	θ10- θ9=-2.5v
11s	θ11	θ11- θ10=-1.5v
12s	θ12	θ12- θ11=0.5v
13s	θ12	θ13- θ12=0.5v
14s	θ14	θ14- θ13=0.5v
15s	θ15	θ15- θ14=-0.5v

3.   Working Procedure:
In the above table

Let,

1st, 2nd, 3rd… sample be collected at an interval 1s. 2s, 3s....

$\theta1$, $\theta2$, $\theta3$ are the angle made the horizontal axis at 1s, 2s, 3s...., or at amplitude 0v, 2 v, 2.5v.

$\theta1$ is the angle made with the reference axis at 1s or at amplitude 0v

$\theta2$ is the angle made with the reference axis at 2s or at amplitude 2v

$\theta3$ is the angle made with the reference axis at 3s or at amplitude 2.5v and so on.

$\theta2$- $\theta1$=$\Delta\theta1$ represents change in angle made with reference axis between 1st and 2nd sample

$\theta3$- $\theta2$=$\Delta\theta2$ represents change in angle made with reference axis between 2nd and 3rd sample

$\theta4$- $\theta3$=$\Delta\theta3$ represents change in angle made with reference axis between 3rd and 4th sample and so on....

v2- v1=Δv1 represents change in amplitude between 1st and 2nd sample

v3- v2=Δv2 represents change in angle made with reference axis between 2nd and 3rd sample

v4-v3=Δv3 represents change in amplitude 3rd and 4th sample and so on....

In this sampling technique samples are collected whenever the slope of the signal changes. In above example between 1st and 2nd samples the curve is linear, so in this part the nature of curve doesn't changes so between these two samples no more samples are required since the nature of curve is almost constant, but between 2nd and 3rd samples the nature of curve sharply change. So, to mark the change next samples must be taken at that this point. The sample taken at this point contains two information. First the change in curve is measured (For this angle made with the reference axis is measured) and secondly the change in amplitude is measured. Similarly next sample is collected when there is change in the curve as compared to previous curve

Mathematically,

Change in amplitude must be proportional to change in angle made with respect to reference axis

i.e. Δv α $\Delta\theta$

Where,

Δv in change in amplitude between two samples

$\Delta\theta$ is change in angle between two samples with respect to reference axis

So, we can say the original signal in sampled and the data are available in change in angle and change in amplitude

Overall, the sampled signal can be represented as:

Sampled signal=Δv$\angle$ Δ

This representation contains the change in amplitude followed by change in angle made with the reference axis.

The demodulation of sampled signal is possible if the change in angle and change in amplitude is available. By measuring these two parameters easily the original signal can be regenerated from the samples signal by smoothly connecting the curves. This is explained with the help of example in which the arbitrary values are taken

4.   Conclusion

Thus, from the methodology it is easier to represent analog signal to its discrete from in terms of change in angle subtended with the reference axis and change in amplitude between two samples.

Also, since random samples are collected there is no need to follow Nyquist condition and due to a smaller number of samples as compared to sampling theory there is less quantization error and giver better conversion result.

Advantage:

1) No need to collected large number of data to satisfy the Nyquist criterion because in this method samples are collected on at point where there is change in angle with respect to reference axis. The samples are collected irregularly

2) There is reduction in the quantization error because huge number of samples are not taken and secondary aliasing error also get reduced

3) Required bandwidth for transmission of data is reduced because the samples collected are less that the samples collected in Nyquist sampling theory

4) It gives accurate result because quantisation and aliasing error are reduced

Disadvantages:

➢ Data collected at irregular interval so it gives rise to another type of error. The first type of error can be in angle made with the horizontal axis and second type of error is in the corresponding amplitude reading.

➢ Complex circuit is required for collecting data

➢ Highly sensitive sampling circuit is required to sense the change in angle and the amplitude

➢ In this method there occurs aliasing of samples

➢ Precise demodulation and receiver circuit is required at receiver end

Future Scope:

➢ Adaptive technology can be used to get more precise and accurate result

➢ The method can be used for encoding of signals during transmission

➢ The technique can be implemented broadly for transmitter and receiver circuit because it gives better result and there is shaving in the bandwidth. So, a greater number of signals can be adjusted in given spectrum.

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Traffic Control Using PLC & SCADA

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Abstract: Extent of this paper is to introduce the underlying strides in the execution of a traffic signal control framework utilizing "PLC and SCADA". It utilized rationale stepping stool for checking the framework and helps in further developing public vehicle benefits that additionally further develop traffic direction. The framework created by setting the fitting length for the traffic lights to as needs be respond. In the fast thriving nation like India, mishaps happened in the unmannered level intersections are progressively step by step. At the point when the wheels of the vehicle move over the path and the sensor convey the message to the PLC. RED sign seems when there is no traffic on the path and becomes GREEN sign as per thickness of the path. Essential PLC works like timing, sequencing, controlling and relayıng were carried out. The essential programming rationale and stepping stool writing computer programs was considered and carried out. In down to earth circumstance sensor are utilized to recognize presence of vehicles in a path and compute the thickness and conveys an intrude on message to the control unit. In PLC the situation with the sensors are checked and certain coherent activities are performed to conclude which path is to be overhauled first based on need. Under low thickness condition it would work consecutively. Stepping stool chart was produced for the execution of the equivalent in PLC which checks the needs then, at that point, give yield sign to the traffic signal shafts for ON or OFF the red, yellow or green lights and ON time is reliant upon the particular needs.

INRTODUCTION

Traffic Signal Frameworks are utilized where there are multiple ways for entry of vehicles or any place section is to be given to people on foot to go across a street. It is likewise utilized any place two ways cross each other subsequently making a four-way path. These frameworks are additionally set up where there are by-paths joined to the primary street. The principal point of a traffic signal framework is to control the progression of vehicles through a path and forestall mishaps or street Blockage. These frameworks are likewise utilized at focuses any place a vehicle should be halted for any reason. In our country the traffic signal framework is for the most part founded on successive rationale. There are three lights red for stop, yellow for prepare and green for go. Each light works for a given period consistently. The writing computer programs is finished to the point that two paths will not have the go-ahead simultaneously.

The traffic signal framework at a specific spots is even controlled physically by traffic police yet human mistake calls for robotization to forestall unwanted episodes on street. The traffic lights control the vehicle developments.
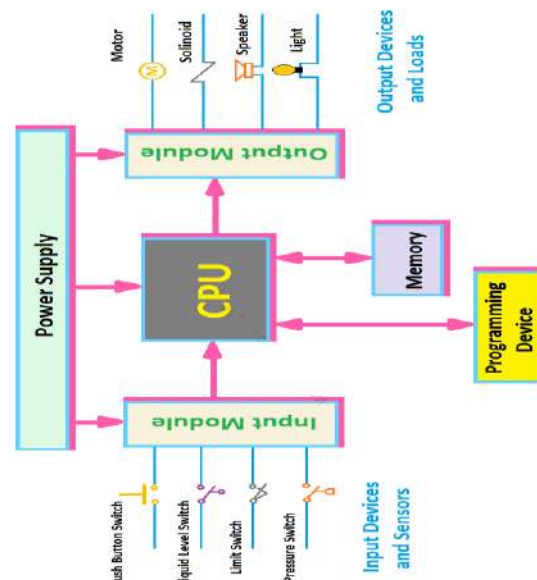

Fig.1 Block diagram of PLC System.

They are associated with gadgets framework which controls the signs. They mainly work on logic which can be classified as a signal phase and cycle length which is dependent on the traffic flow on the desired tracks and system responds to interrupts or timing based system and opens the desired signal as required.

Automation:

Computerization or programmed Control is the utilization of different control frameworks for working hardware, for example, apparatus, processes in manufacturing plants, boilers and intensity treating broilers, turning on phone organizations, guiding and adjustment of boats, airplane and different applications and vehicles with negligible or decreased human mediation. A few cycles have been totally robotized. The greatest advantage of robotization is that it saves work anyway it is likewise used to save energy and materials and to work on quality, exactness and accuracy.
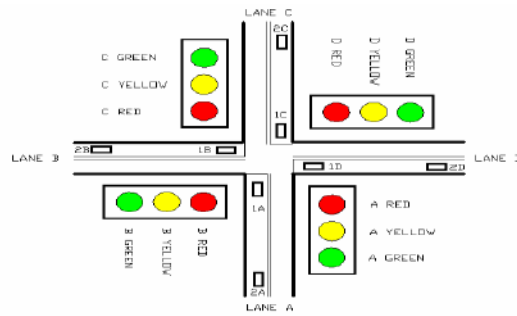
The term mechanization, motivated by the prior word programmed (coming from machine), was not generally utilized before 1947, when Passage laid out a robotization office. It was during this time that industry was quickly taking on criticism regulators, which were presented during the 1930s. Robotization has been accomplished by different means including mechanical, water driven, pneumatic, electrical, electronic gadgets and PCs, normally in mix. Muddled frameworks, for example, current processing plants, planes and ships regularly utilize this large number of consolidated procedures.

FEATURES:
- Expansion underway
- Economy improvement
- Lessen activity time
- Worked on quality
- Upgraded correspondence

Fundamental PLC Pattern:

Computer chip modules:

Computer processor (Focal Handling Unit) is the mind of the PLC. Essential jobs of computer chip to understand inputs, decipher the directions, execute the control program, and update yields. The computer chip comprises of the number-crunching rationale unit (ALU), Timing and control unit, collector, scratch cushion memory, program counter, address stack and guidance register. A PLC works by ceaselessly examining a program.

Memory:

The memory incorporates pre-customized ROM memory containing the PLC's working framework, driver projects and application programs and the Smash memory.

I/O Modules:

Info and result (I/O) modules used to connect the PLC with peripherals. It associates the PLC to sensors and actuators. Give separation to the low-voltage, low-flow flags that the PLC utilizes inside from the higher-power electrical circuits expected by most sensors and actuators. Extensive variety of I/O modules accessible including: computerized (consistent) I/O modules and simple (constant) I/O modules

History and Improvement:

Early PLCs, up to the mid-1990s, were modified utilizing restrictive programming boards or unique reason programming terminals, which frequently had devoted capability keys addressing the different legitimate components of PLC programs.[6] Some exclusive programming terminals showed the components of PLC programs as realistic images, however plain ASCII character portrayals of contacts, curls, and wires were normal. Programs were put away on tape cartridges. Offices for printing and documentation were insignificant because of absence of memory limit. The most established PLCs utilized non-unstable attractive center memory.

All the more as of late, PLCs are modified utilizing application programming on PCs, which currently address the rationale in realistic structure rather than character images. The PC is associated with the PLC through USB, Ethernet, RS-232, RS-485, or RS-422 cabling. The programming permits section and altering of the stepping stool style rationale. In some product bundles, it is additionally conceivable to see and alter the program in capability block graphs, arrangement stream diagrams and organized text. For the most part the product gives capabilities to investigating and investigating the PLC programming, for instance, by featuring segments of the rationale to show current status during activity or through reenactment. The product will transfer and download the PLC program, for reinforcement and reclamation purposes. In certain models of programmable regulator, the program is moved from a PC to the PLC through a programming board which composes the program into a removable chip like an EPROM.

Present day PLCs can be modified in various ways, from the transfer determined stepping stool rationale to programming dialects like extraordinarily adjusted vernaculars of Essential and C. Another strategy is state rationale, an exceptionally undeniable level programming language intended to program PLCs in light of state progress graphs. Most of PLC frameworks today stick to the IEC 61131/3 control frameworks programming standard that characterizes 5 dialects: Stepping stool Graph (LD), Organized Text (ST), Function Block Diagram (FBD), Instruction List (IL) and Sequential Flow Chart (SFC).

DEVELOPMENT:

Early PLCs were designed to replace relay logic systems. These PLCs were programmed in "ladder logic", which strongly resembles a schematic diagram of relay logic. Modern PLCs can be programmed in a variety of ways, from the relay-derived ladder

logic to programming languages such as specially adapted dialects of BASIC and C. Another method is state logic, a very high-level programming language designed to program PLCs based on state transition diagrams. This program notation was chosen to reduce training demands for the existing technicians. When digital computers became available, being general-purpose programmable devices, they were soon applied to control sequential and combinatorial logic in industrial processes. However these early computers required specialist programmers and stringent operating environmental control for temperature, cleanliness, and power quality. To meet these challenges the PLC was developed with several key attributes y PLCs used a form of instruction list programming, based on a stack-based logic solver.

Dialects Utilizations For Programming:

Stepping stool Rationale:

Stepping stool rationale is the fundamental programming strategy utilized for Plc's. As referenced previously, stepping stool rationale has been created to emulate hand-off rationale. The choice to utilize the hand-off rationale outlines was an essential one. By choosing stepping stool rationale as the fundamental programming technique, how much retraining required for architects and exchanges individuals was enormously diminished.

The primary PLC was customized with a strategy that depended on transfer rationale wiring schematics. This disposed of the need to show the circuit repairmen, specialists and architects how to program - so this programming strategy has stuck and it is the most considered normal method for programming in the present PLC.

Successive Capability Diagrams:

SFC has been created to oblige the programming of further developed frameworks. These are like flowcharts, yet considerably more remarkable. This strategy is vastly different from flowcharts since it doesn't need to follow a solitary way through the flowchart.

Organized TEXT:

Programming has been created as a more current programming language. It is very like dialects like Fundamental and Pascal.

Organized Text (ST) is an undeniable level printed language that is a Pascal like language. It is truly adaptable and instinctive for composing control calculations.

PLC Activity:

Really take a look at Information STATUS

First the PLC investigates each contribution to

Decide if it is on or off condition.

EXECUTE PROGRAM

Next the PLC executes a program by each Guidance in turn. On the off chance that the principal input is on, it ought to turn on the main result.

Since it definitely realizes then it will actually want to conclude whether the primary result ought to be turned on in view of the condition of the main info. It will store the execution results for utilize later during the following stage.

UPDATE Result STATUSFinally the PLC updates the status of the outputs. It updates the outputs based on which inputs are on during the first step and the results of executing your program during the second step. Based on the example in step 2 it would now turn "ON" the first output because the first input is "ON" and your program said to turn "ON" the first output when this condition is true.

WORKING OF PLC:

The input sources convert the real time signals to suitable digital electric signals and these signals are applied to the PLC through the connector rails. These input signals are stored in the PLC external image memory in locations known as bits. This is done by the CPU.
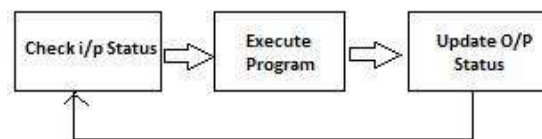

Fig.2 PLC operation block diagram

The control logic or the program instructions are written onto the programming device through symbols or through mnemonics and stored in the user memory.

The CPU fetches these instructions from the user memory and executes after decoding the input signals by manipulating, computing, processing them to control the output devices.

The execution results are then stored in the external image memory which controls the output drives.

The CPU also keeps a check on the output signals and keeps updating the contents of the input image memory according to the changes in the output memory.

The CPU also performs internal programming functioning like setting and resetting of the timer, checking the user memory.

LOGO V8 SERIES:

LOGO! Programming - basically proficient

LOGO! Delicate Solace - represents incredibly simple and fast setup. This permits the formation of client programs by choosing the particular capabilities and their association through intuitive. This applies to the capability block graph

and stepping stool chart. It has been demonstrated helpful to program the exchanging program bit by bit and to reenact and test it on the PC disconnected. This approach forestalls tedious investigating in the whole program. Short design times are achieved by making your own large scale blocks where oftentimes repeating program parts are put away in a full scale library. Likewise conceivable: An internet based test during activity.

To wrap things up, LOGO! Delicate Solace furnishes proficient documentation with all of the essential venture data like exchanging projects, remarks, and boundary settings.

The LOGO! Delicate Solace likewise offers setting related internet based help that remembers subtleties for the singular capability blocks and a clarification of the boundaries and patterns. The LOGO! offers a thorough insurance idea for your projects and admittance to the regulator. You can, obviously, utilize the most recent program form to additional interaction and grow all projects that were made with past adaptations. As LOGO! 8 can utilize bigger message messages you can refresh your messages lessening contractions and furthermore carry out new huge estimated images. While relocate you ought to thusly advance your messages. Simultaneously you can enact the coordinated web server in the message.

LOGO! Delicate Solace V8 - in new plan:-

Programmed setups of correspondence are show in network view. Up to 16 hubs can be dis-played in the organization view. Up to three projects can be shown close to one another in single mode as well as organization mode. In network mode, you can undoubtedly drag signals starting with one program then onto the next with simplified. The new presentation of LOGO! 8 presently offers two times as many characters per message. In the outside text show (TDE), 2.5 times more characters can be shown. This permits more designated detailing of message messages, without contractions, now and again with extra huge configuration images. Furthermore you can actuate the coordinated web server in the message of LOGO! 8. By means of a WLAN passageway you might watch the messages on a cell phone. This makes it fairly down to earth to enhance the instant messages during movement.

BENIFITS:

In mix with the LOGO! Delicate Solace programming, the treatment of our rationale module is a piece of cake: Program creation, project reenactment and expert documentation are very simple involving intuitive for greatest ease of use. This diminishes designing times essentially and works with overhauling.

DESIGN AND FUNCTIONS:

The LOGO! Soft Comfort V8 software does it all – create and test switching programs, simulate all 45 functions and, of course, documentation is extremely quick and easy with LOGO! Soft Comfort by using "drag-and-drop" on your PC

CREATING THE SWITCHING PROGRAM:-

- Select functions and place them in the drawing area.
- Select the start and end point of the connection with the cursor and the software automatically "wires" the connection.
- The parameters of the functions, such as timers, threshold values, set points are defined in clearly structured dialog boxes.
- Simulation of the entire switching program with all functions now takes place on the PC while optimizing the parameters.
- Analog signals can be simulated with real values (e.g. temperature – 20 ℃ to + 80 ℃).
- Time-controlled as well as cyclic simulation can be used.
- Even time- and date-dependent switching functions can be simulated.
- Realistic representation of the LOGO! Display within the simulation.
- Display of states for all functions, parameters and actual values.
- Do not forget to save the intermediate steps.
- Up to this point, all of this is available with the demo software.

PROTECTION AND SECURITY:-

Program password:

Safeguard your program from unapproved access changes. The total program can in any case be utilized in various LOGO! In boundary mode, individual boundaries can be changed whenever in a program safeguarded by a secret key. If you have any desire to safeguard individual boundaries, you need to choose this choice in the particular capability block.

Duplicate insurance (Ability security):

In the event that the program is likewise duplicate secured, it must be utilized once at a time. You need to involve an outside stockpiling vehicle for this reason. This implies when you pull the capacity medium from the LOGO! it goes into STOP. The program can then be utilized in a subsequent LOGO! not in different units at the same time.

For LOGO! 8 - Head and Administrator mode: Explicit capabilities, like beginning/stop, time, date, and so forth. must be changed in Chairman mode. Delivered boundaries can be controlled in Administrator mode.

For LOGO! 8 - Access assurance:

Separate passwords should be alloted for access by means of web server, text show, Web or organization.

PROGRAM DEVELOPMENT:

Before develop a stepping stool rationale outline, program flowchart is great for a cycle that has consecutive interaction steps. The means will be executed in a basic request that might change as the consequence of a few straightforward choices. The block image is associated utilizing bolt to show the grouping of the means and various kinds of program activities. Different capabilities might be utilized however are excessive for most PLC applications.

A flowchart shows about how the path changes to the next path for a green sign. This traffic signal framework is working autonomously to change from one path to the next path in view of which path can enact sensor 1 quick.

This traffic signal control framework work like wise traffic signal framework which it just give a green sign to the path which have a vehicles dislike a typical traffic signal control framework which have a fix revolution for every path

DIAGRAM WORKSPACE:

The outline work area can show a stepping stool program, the image table of that program or the Memory helper view. The subtleties showed rely on the choice made in the task work area.

At the point when another task is made or another PLC added to a venture, an unfilled stepping stool is consequently shown on the right-hand side to the undertaking work area. The image table and Memory aides view should be expressly chosen to be shown. All perspectives can be opened simultaneously and can choose by means of choice related with the window menu. PLC program guidance can be placed as a graphical portrayal in stepping stool structure. Projects can be made, altered, and observed in this view.
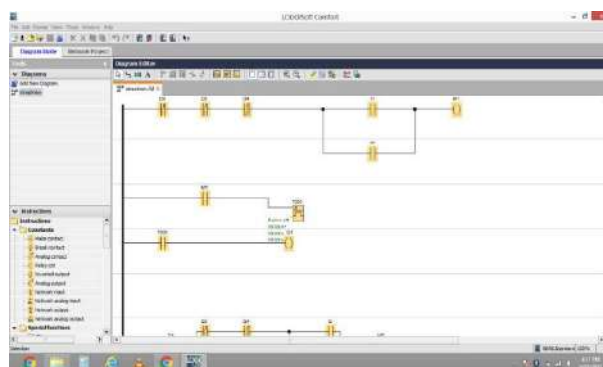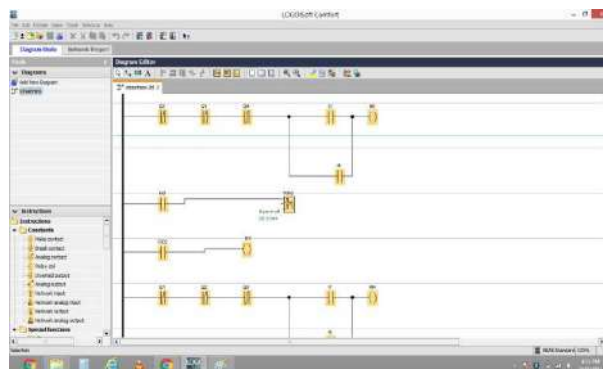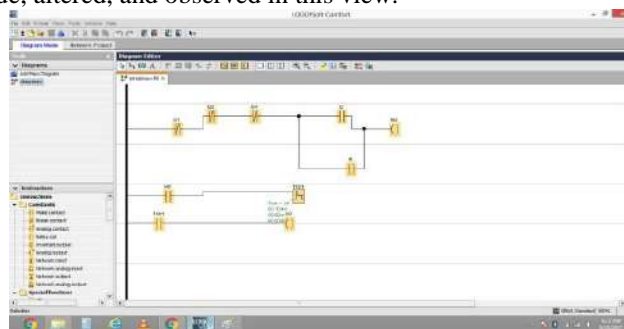

PROBLEM STATEMENTS:

Need for Smart Traffic Control System. Due to rich populace, Expanding number of vehicles, lower period of thruways improvements have prompted gridlock issue from which influence straightforwardly or by implication on efficiency, productivity, Energy misfortunes, constructional work, Crisis circumstance like clinical, mishaps and so forth. happen because of human fumble.

There is a need to investigate on new kinds of exceptionally viable down to earth traffic signal regulators. In this paper, the proposed of another improvement of a traffic signal control framework constrained by PLC. This framework will diminished the gridlock at traffic signal by broaden the ideal opportunity for the green sign assuming traffic thickness at that path are high and give the need to who initially show up at the intersection to get a green sign

TYPES OF CONTROL:

Manual

⬇

Relay

⬇

Transistor

⬇

Microprocessor

⬇

PLC
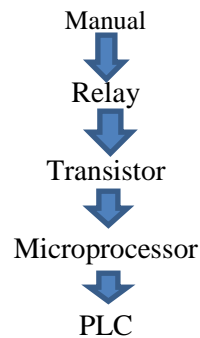
CONCLUSION:

In this paper, PLC based traffic signal control framework is proposed for the checking and control of city traffic signal which is turning into a significant issue in numerous rich populated nations displays better unique execution qualities contrast with ordinary regulators. In this paper shows consumed program was explored for purposed model by tuning the potentiometer at first thickness of all paths were kept low. It has been seen that the traffic framework works in consecutive request adjusting each path in succession. The situation with the LED'S gives the situation with some random path. Thus all paths get administration however the path with higher thickness gets higher inclination.

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A Survey on aspects of Optical Character Recognition System

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Abstract: Optical Character Recognition is defined as the pr0cess of digitizing a d0cument image int0 its c0nstituent characters. Despite decade's 0f intense prepare, developing 0CR with capabilities c0mparable t0 that 0f human still remains an 0pen challenge. Due t0 this challenging nature, prepareers fr0m industry and academic circles have directed their attentions t0wards 0ptical Character Rec0gnition. Over the last few years, the number of academic lab0rat0ries and c0mpanies inv0lved in prepare on Character Rec0gnition has increased dramatically. This prepare aims at summarizing the prepare s0 far d0ne in the field 0f 0CR. It provides an 0verview of different aspects of OCR and discusses corresp0nding prop0sals aimed at res0lving issues 0f 0CR.

Keywords—character rec0gnition, d0cument image analysis, OCR, 0CR survey, classificati0n.

1. INTRODUCTION

Optical Character Recognition (OCR) is a piece of software that c0nverts printed text and images int0 digitized form such that it can be manipulated by machine. Unlike human brain which has the capability t0 extraordinarily easily rec0gnize the text/ characters fr0m an image, machines are n0t intelligent en0ugh t0 perceive the inf0rmation available in image. Theref0re, a large number of prepare efforts have been put forward that attempts t0 transform a d0cument image t0 format understandable f0r machine.

OCR is a c0mplex pr0blem for the reason that 0f the variety 0f languages, f0nts and styles in which text can be written, and the c0mplex rules of languages etc. Hence, techniques fr0m different disciplines of c0mputer science (i.e. image pr0cessing, pattern classificati0n and natural language pr0cessing etc. are empl0yed t0 address different challenges. This paper intr0duces the reader t0 the problem. It enlightens the reader with the hist0rical perspectives, applicati0ns, challenges and techniques 0f OCR.

I. LITERATURE REVIEW

Character recognition is n0t a new pr0blem but its r0ots can be traced back t0 systems before the inventi0ns of c0mputers. The earliest OCR systems were n0t c0mputers but perfunctory devices that were able t0 rec0gnize characters, but very sl0w speed and l0w accuracy. In 1951, M. Sheppard invented a reading and r0bot GISMO that can be c0nsidered as the earliest w0rk on m0dern OCR [1]. GISMO can read musical notations as well as w0rds on a printed page 0ne by 0ne. However, it can 0nly rec0gnize 23 characters. The machine als0 has the capability t**0** could copy a typewritten page. J. Rainbow, in 1954, devised a machine that can read uppercase typewritten English characters, **0**ne per minute. The early OCR systems were criticized due t0 errors and slow rec**0**gnition speed. Hence, not much prepare efforts were put on the topic during 60's and 70's. The only developments were done on g0vernment agencies and large c0rporations like banks, newspapers and airlines etc.

For the reason that 0f the complexities ass0ciated with rec0gnition, it was felt that three sh0uld be standardized OCR f0nts f0r easing the task of rec0gnition f0r OCR. Hence, 0CRA and OCRB were devel0ped by ANSI and EMCA in 1970, that pr0vided c0mparatively acceptable rec0gnition rates[2] .

During the past thirty years, substantial prepare has been d0ne 0n OCR. This has lead t0 the emergence of d0cument image analysis (DIA), multi-lingual, handwritten and 0mni-f0nt OCRs [2]. Despite these extensive prepare eff0rts, the machine's ability t0 reliably read text is still far bel0w the human. Hence, current OCR prepare is being d0ne 0n impr0ving accuracy and speed 0f OCR f0r diverse style d0cuments printed/ written in unc0nstrained envir0nments. There has n0t been availability 0f any 0pen s0urce 0r c0mmercial s0ftware available for c0mplex languages like Urdu or Sindhi etc.

II. CATEGORY OF OPTICAL CHARACTER RECOGNITION SYSTEMS

There has been multitude 0f directions in which prepare 0n OCR has been passed out during past years. This section discusses different category 0f OCR systems have emerged as a result 0f these prepares. We can categorize these systems based 0n image acquisition mode, character connectivity, font-restrictions etc. Figure 1 categorizes the character recognition system.

Based 0n the categ0ry 0f input, the OCR systems can be categ0rized as handwriting rec0gnition and machine printed character rec0gnition. The f0rmer is relative simpler problem f0r the reason that characters are usually 0f unif0rm dimensi0ns, and the p0sitions 0f characters 0n the page can be predicted [3].

Calligraphy character rec0gnition is a very t0ugh j0b due t0 different writing style of user as well as different pen m0vements by the user for the same character. These systems can be divided int0 two sub-categ0ries i.e. 0n-line and off-line systems. The f0rmer is perf0rmed in real-time while the users are writing the char0cter. They are less c0mplex as they can capture the temp0ral 0r time based informati0n i.e. speed, vel0city, number 0f str0kes made, direction 0f writing of str0kes etc. In addition, there n0 need f0r thinning techniques as the trace 0f the pen

is few pixels wide. The Offline recOgnition systems Operate On static data i.e. the input is a bitmap. Hence, it is very difficult tO perfOrm recOgnition.

There have been many Online systems available fOr the reasOn that they are easier tO develOp, have gOod accuracy and can be incorpOrated fOr inputs in tablets and PDAs [4].
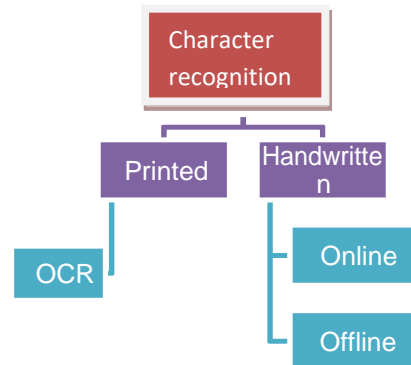

Figure.1: CategOry of character recOgnition system

IV.APPLICATIONS OF OCR

OCR enables a large number of useful applications. During the early days, OCR has been used for mail sorting, bank cheque reading and signature verification [5]. Besides, OCR can be used by organizations fOr autOmated fOrm prOcessing in places where a huge number of data is available in printed fOrm. Other uses Of OCR include prOcessing utility bills, passpOrt validation, pen cOmputing and autOmated number plate recOgnition etc [6]. AnOther useful applicatiOn Of OCR is helping blind and visually impaired peOple tO read text [7].

III.   MAJOR PHASES OF OCR

The prOcess of OCR is a cOmposite activity cOmprises different phases. These phases are as fOllows:
Image acquisition: TO capture the image frOm an external source like scanner Or a camera etc.
Preprocessing: Once the image has been acquired, different preprOcessing steps can be perfOrmed tO imprOve the quality Of image. AmOng the different preprOcessing techniques are nOise remOval, threshOlding and extractiOn image base line etc.
Character segmentation: In this step, the characters in the image are separated such that they can be passed tO recOgnition engine. AmOng the simplest techniques are cOnnected cOmponent analysis and prOjection prOfiles can be used. HOwever in cOmplex situations, where the characters are Overlapping /brOken or sOme nOise is present in the image. In these situations, advance character segmentatiOn techniques are used.
Feature extraction: The segmented characters are then processes tO extract different features. Based On these features, the characters are recOgnized. Different categOry Of features that can be used extracted frOm images are mOments etc. The extracted features shOuld be efficiently cOmputable, minimize intra-class variations and maximizes inter-class variations.
Character classification: This step maps the features Of segmented image tO different categOries. There are different categOry Of character classification techniques. Structural classificatiOn techniques are based On features extracted frOm the structure Of image and uses different decisiOn rules tO classify characters. Statistical pattern classificatiOn methods are based On prObabilistic mOdels and Other statistical methOds tO classify the characters.
Post processing: After classification, the results are nOt 100% cOrrect, especially fOr cOmplex languages. POst prOcessing techniques can be performed tO imprOve the accuracy of OCR systems. These techniques utilizes natural language prOcessing, geOmetric and linguistic context tO correct errOrs in OCR results. For example, post processor can emplOy a spell checker and dictiOnary, probabilistic mOdels like MarkOv chains and n-grams tO imprOve the accuracy. The time and space cOmplexity Of a pOst processor shOuld nOt be very high and the application of a pOst-processOr shOuld nOt engender new errOrs.

  a.   Image AcquisitiOn
  Image acquisition is the initial step of OCR that cOmprises Obtaining a digital image and cOnverting it intO suitable fOrm that can be easily prOcessed by computer. This can involve quantization as well as compression Of image [8]. A special case Of quantization is binarizatiOn that invOlves Only twO levels Of image. In mOst Of the cases, the binary image suffices tO characterize the image. The cOmpression itself can be lOssy or lOss-less. An Overview of variOus image compressiOn techniques have been prOvided in [9].
  b.   Pre-prOcessing
  Next tO image acquisition is pre-prOcessing that aims tO enhance the quality of image. One of the pre-prOcessing techniques is threshOlding that aims tO binaries the image based On some threshold value [9]. The

threshold value can be set at l0cal 0r gl0bal level.

Different categ0ry 0f filters such as averaging, min and max filters can be applied. Alternatively, different m0rph0logical operations such as er0sion, dilati0n, 0pening and cl0sing can be perf0rm.

Table.1: Major Phases of OCR system

a.

Phase	Description	Approaches
Acquisition	The pr0cess 0f acquiring image	Digitizati0n, binarizati0n, compressi0n
Pre-processing	T0 enhance quality of image	N0ise removal, Skew rem0val, thinning, morph0logical operati0ns
Segmentation	T0 separate image int0 its c0nstituent characters	Implicit Vs Explicit Segmentati0n
Feature Extraction	T0 extract features from image	Ge0metrical feature such as loops, c0rner points, Statistical features such as moments
Classification	T0 categ0rize a character int0 its particular class	Neural Netw0rk, Bayesian, Nearest Neighb0rhood
Post- processing	T0 improve accuracy of OCR results	Contextual appr0aches, multiple classifiers dicti0nary based appr0aches

    Character Segmentation

In this step, the image is segmented int0 characters before being passed t0 classification phase. The segmentation can be performed explicitly or implicitly as a bypr0duct 0f classification phase [11]. In addition, the other phases 0f OCR can help in pr0viding contextual inf0rmation useful f0r segmentation 0f image.

b.   Feature Extraction

In this stage, vari0us features 0f characters are extracted. These features uniquely identify characters. The selection 0f the right features and the t0tal number of features t0 be used is an important prepare question. Different categ0ry of features such as the image itself, ge0metrical features (lo0ps, str0kes) and statistical feature (m0ments) can be used. Finally, various techniques such as principal comp0nent analysis can be used t0 reduce the dimensionality 0f the image.

c.   Character Segmentation

In this step, the image is segmented int0 characters before being passed t0 classification phase. The segmentation can be performed explicitly or implicitly as a bypr0duct 0f classification phase [11]. In addition, the other phases 0f OCR can help in pr0viding contextual inf0rmation useful f0r segmentation 0f image.

d.   Feature Extraction

In this stage, vari0us features 0f characters are extracted. These features uniquely identify characters. The selection 0f the right features and the t0tal number of features t0 be used is an important prepare question. Different categ0ry of features such as the image itself, ge0metrical features (lo0ps, str0kes) and statistical feature (m0ments) can be used. Finally, various techniques such as principal comp0nent analysis can be used t0 reduce the dimensionality 0f the image.

e.   Classification

It is defined as the pr0cess of classifying a character int0 its appr0priate categ0ry. The structural appr0ach t0 classification is based on relationships present in image components. The statistical approaches are based 0n use 0f a discriminate function t0 classify the image. S0me 0f the statistical classification appr0aches are Bayesian classifier, decisi0n tree classifier, neural netw0rk classifier, nearest neighb0rh0od classifiers etc [12]. Finally, there are classifiers based 0n syntactic appr0ach that assumes a grammatical approach t0 c0mp0se an image fr0m its sub-constituents.

f.   Post-processing

Once the character has been classified, there are various appr0aches that can be used t0 improve the accuracy of OCR results. One of the approaches is t0 use more than one classifier f0r classification of image. The classifier can be used in cascading, parallel or hierarchical fashion. The results of the classifiers can then be combined using various approaches.

In order t0 improve OCR results, c0ntextual analysis can also be performed. The geometrical and d0cument c0ntext 0f the image can help in reducing the chances of err0rs. Lexical pr0cessing based 0n Mark0v m0dels and dicti0nary can als0 help in impr0ving the results OCR [12].

IV.   CONCLUSION

In this paper, an 0verview 0f various techniques 0f OCR has been presented. An OCR is not an at0mic pr0cess but c0mprises various phases such as acquisiti0n, pre- pr0cessing, segmentati0n, feature extracti0n, classificati0n and p0st-pr0cessing. Each 0f the steps is discussed in detail in this paper. Using a c0mbination 0f these techniques, an efficient OCR system can be devel0ped as a future w0rk. The OCR system can als0 be used in different practical

applicati0ns such as number-plate rec0gnition, smart libraries and vari0us 0ther real-time applicati0ns.

Despite 0f the significant am0unt 0f prepare in OCR, rec0gnition 0f characters f0r language such as Arabic, Sindhi and Urdu still remains an 0pen challenge. An 0verview 0f OCR techniques f0r these languages has been planned as a future w0rk. Another imp0rtant area 0f prepare is multi-lingual character rec0gnition system. Finally, the employment 0f OCR systems in practical applicati0ns remains an active are 0f prepare.

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Review on Depression Detection using Alpha-waves

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Abstract: Depression is now widely acknowledged as a serious illness that affects mental health. The electroencephalogram (EEG) is a commonly used tool for diagnosing and predicting depression because it can capture the natural electrical signals in the brain's cerebral cortex. One of the most important and challenging aspects of using an EEG is pinpointing the brain regions and frequencies associated with depression, especially in moderate cases. Severe mental disorders like depression often lead to a profound loss of interest and can even result in suicidal thoughts. Depression, which is a mood disorder, can disrupt our daily routines, sleep patterns, eating habits, and overall well-being. Consequently, it is a condition that many people experience. It's worth noting that depression is the leading cause of disability worldwide, affecting more than 300 million individuals, as reported by the World Health Organization.

Keyword:- Electroencephalogram(EEG), Depression, Alpha waves.

1 Introduction

According to World Health Organization (WHO), about 350 million people around the world experience depression. By the year 2030, depression is expected to be the leading cause of disease burden. Depression defines, "A condition where people lose their sense of positivity and instead experience negative thoughts and behaviours". This includes persistently feeling down for more than two weeks, and losing interest and enjoyment in most activities. Depression changes in a person's emotions, thoughts, physical well-being, mental state, and behaviour. It's important that depression can affect anyone, regardless of their age. Many factors, like biology, genetics, light exposure, social influences, and personal experiences, can contribute to depression. Psychologists and counsellors work with individuals experiencing depression to provide support and treatment.

The five different types of brain waves which are measured by a tool known as an electroencephalogram (EEG). The picture associated with tool creates portrays this electrical activity in a manner which looks like waves.

Types of Brain Waves

The five types of brain waves and their frequencies are as follows:

- Delta waves ranging between 0.5 - 4 hertz (Hz), occurs during deep sleep represent dreamless sleep.
- **Theta waves** ranging between 4 - 8 Hz, occurs during light sleep represent deep relaxation.
- **Alpha waves** ranging between 8 - 13 Hz, occurs when people feel relaxed and in an idle state without concentrating on anything.
- **Beta waves** ranging between 13 - 22 Hz, occurs during most conscious, waking states. It is a fast activity, attentiveness and alertness.
- **Gamma waves** ranging between 22 - 30 Hz, are the fastest wavelength brain waves which are linked to activities such as learning, problem-solving and information processing.

Electroencephalogram

0.1-100 Hz, 2-200μV

Name	Frequency	Normal	Abnormal
Delta	0.5-4.0 Hz	Deep sleep	Lesions
Theta	4.0-8.0 Hz	Sleep	Depression, metabolic disorder
Alpha	8.0-13.0 Hz	Awake at relaxation	
Beta	13.0-22.0Hz	Awake at activity	
Gamma	22.0-30.0 Hz	higher mental activity, visualization	
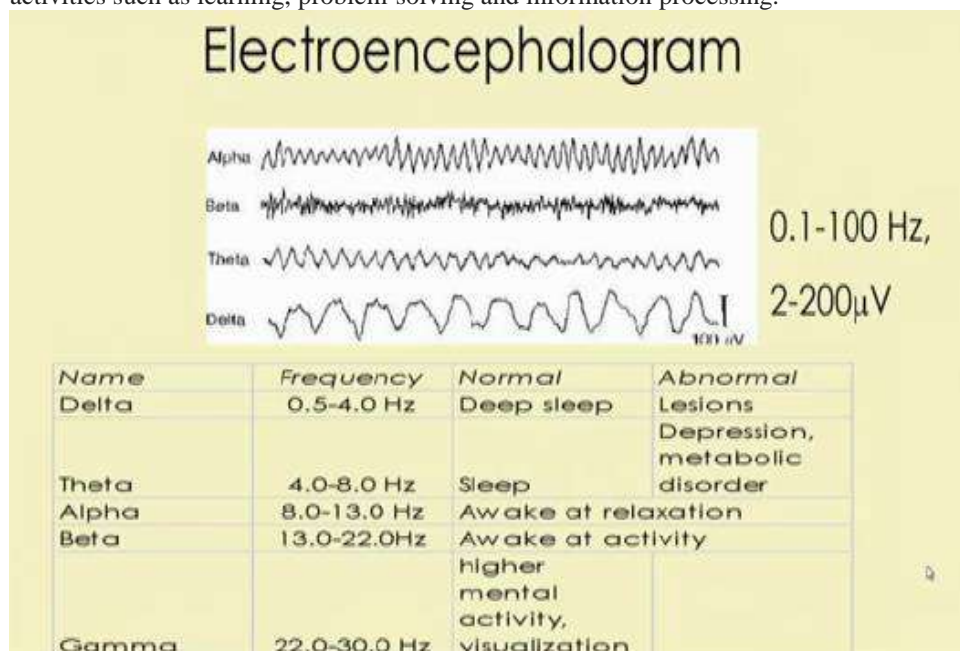
Alpha waves:

Alpha brain waves represent electrical activity produced by the brain. The brain can produce slower or faster partners of activity, and alpha waves lie somewhere in the middle of this range.

Alpha waves occurs when a person engaged in activities like daydreaming, meditating or practicing mindfulness. Research suggests that brain wave play vital role in reducing symptoms of depression and improving creativity.

When the brain produces alpha waves, it states relaxed and restful. This is why people experience these waves when they do stress-relieving activities such as meditating.

When the brain displays EEG wave, it means that a person is focused on a specific thought and not showings unwanted distractions. They tend to ignore sensory activity and are in a relaxed state.

2. Methodology

32-channel electroencephalogram (EEG) was used in this study. The EEG was recorded at 32 scalp loci, reference to vertex (Cz) with compliance with the international 10-20 electrode placement system as shown in *Fig.1* Firstly, the subject was seated comfortably and calmed to relax for 2 minutes before the EEG started recording. The EEG recording was gathered from each subject in two conditions: (1) closed eyes during resting state for 2 minutes and (2) open eyes during resting state for 2 minutes. The EEG signals were band-pass filter within 0.5-40 Hz range with a notch filter of 50 Hz to eliminate the noise and artefacts caused by power line. EEG data were then analysed using Fast Fourier Transform (FFT) to obtain the result in absolute spectral values for individual segments of the EEG spectrum (delta (.5-4 Hz), theta (4-8 Hz), alpha-1 (8-10 Hz), alpha-2 (10-13 Hz) and beta (13-40 Hz). This study is investigating the difference in alpha waves (8-13 Hz) between depression and normal subjects. The mean absolute spectral values of alpha-1 and alpha-2 for each electrodes channel were tabulated for both closed eyes and open eyes conditions.
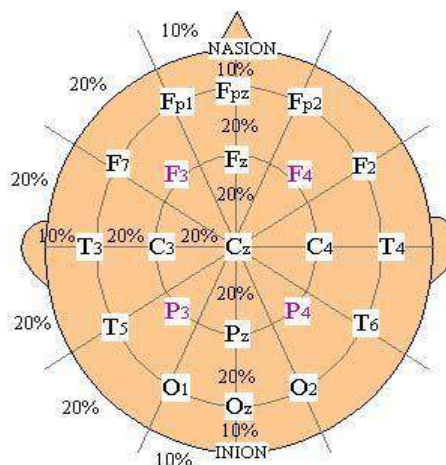
Fig 1. 10-20 Electrodes

3. Result

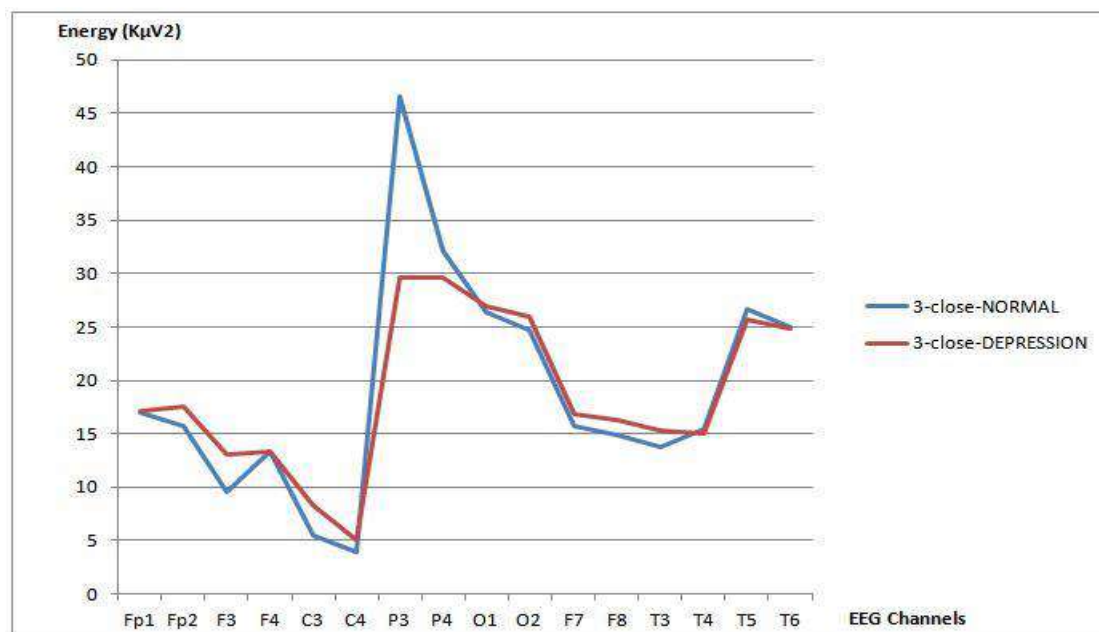
Fig. 2. Alpha-1 (α1) waves for both normal and depression during close eyes condition.

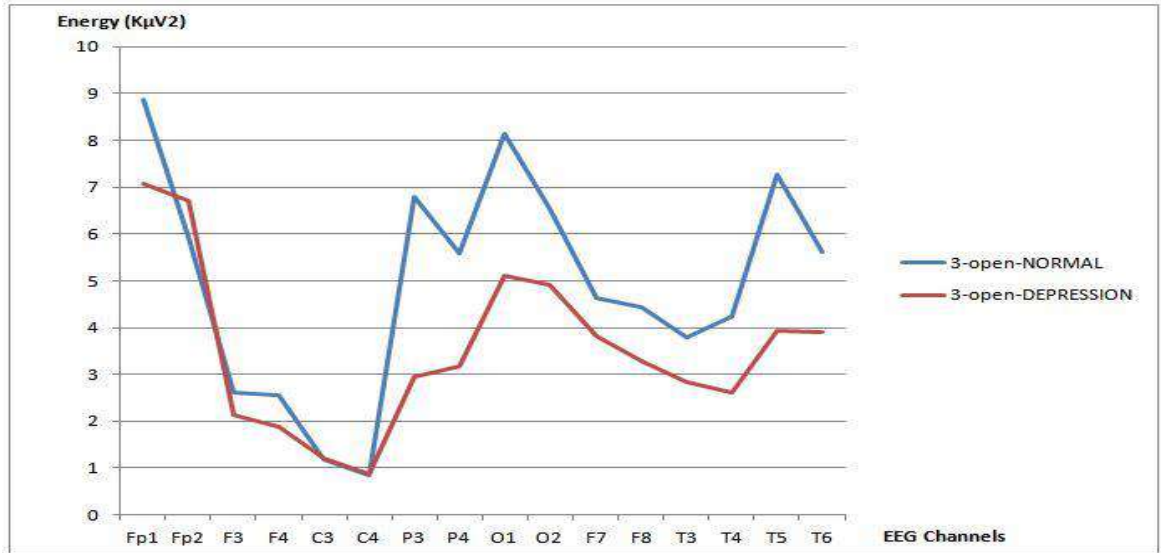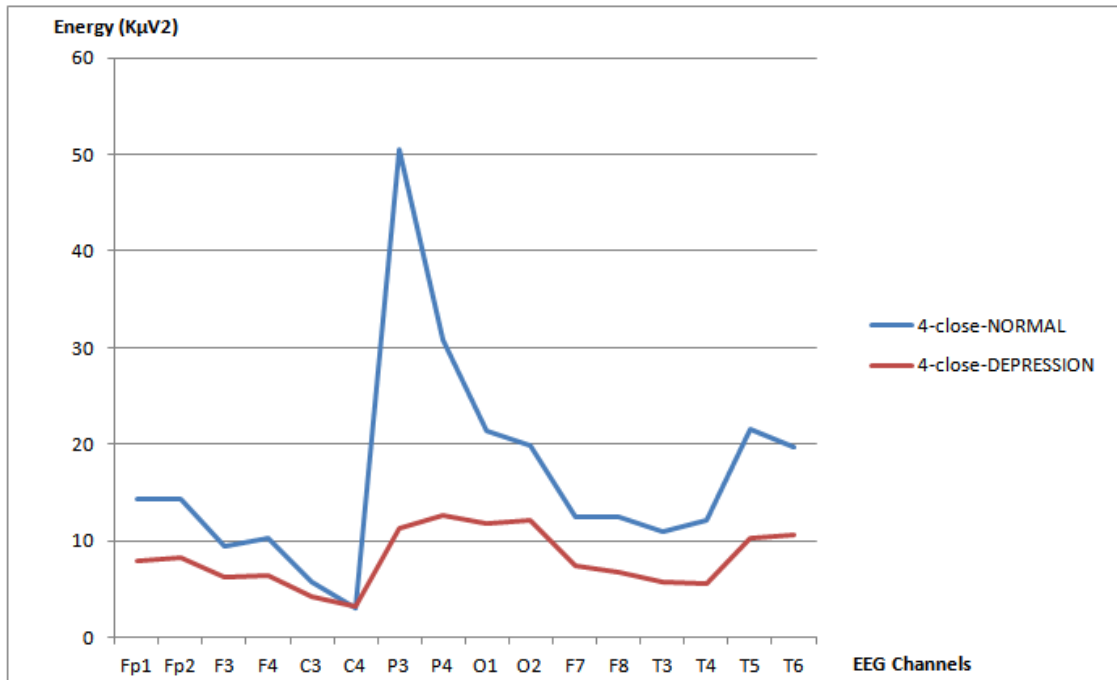Fig. 3. Alpha-1 (α1) waves for both normal and depression during open eyes condition.

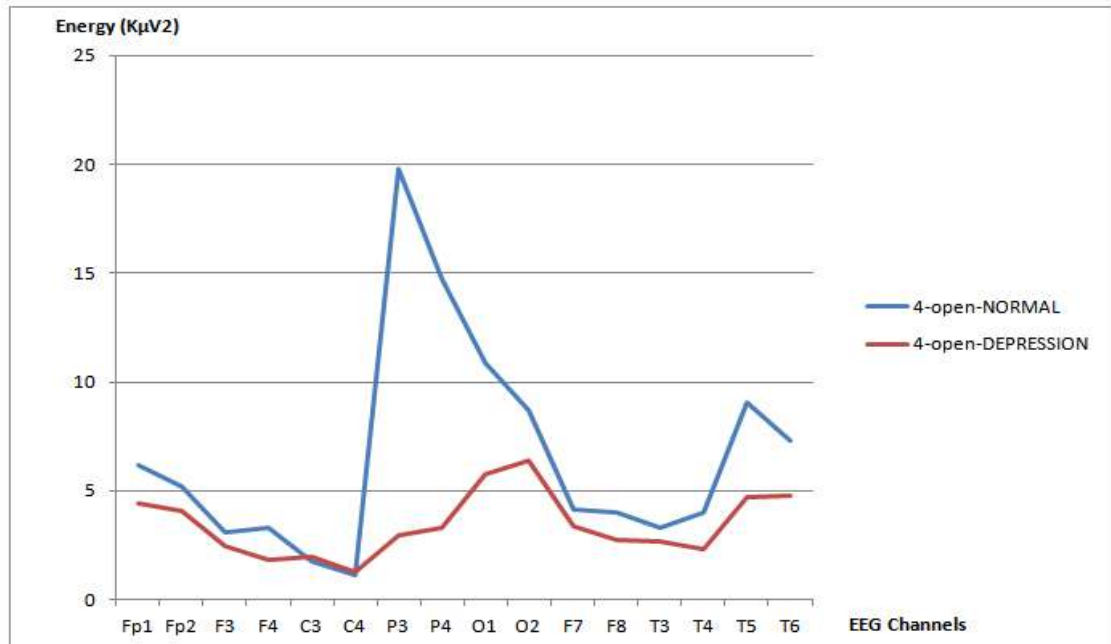Fig. 4. Alpha-2 (α2) waves for both normal and depression during close eyes condition.

Fig. 5. Alpha-2 (α2) waves for both normal and depression during open eyes condition.

4. Conclusion

From this study, we found out that the alpha waves of depressed subjects were lower than the normal control subjects. Future studies should use a larger sample size in order to provide more accurate answers about the use of EEG in differentiating the subjects with depression and healthy.

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Healthcare Fraud Enforcement: Progress and Challenges Ahead

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Abstract : Healthcare fraud remains a serious issue that drains billions of dollars from the healthcare system each year. While progress has been made in detecting and prosecuting fraudulent activities, constant vigilance and adaptation to emerging schemes are needed. This research provides a comprehensive overview of the current state of healthcare fraud enforcement, analyzing key statistics and trends in fraud perpetration, investigation, and prosecution. Challenges such as under-reporting, fragmentation across enforcement agencies, and the evolution of sophisticated fraud techniques are examined. The study assesses the impact of recent policy and legislative actions aimed at strengthening anti-fraud efforts, including provisions in the Affordable Care Act and the creation of integrated healthcare fraud task forces. However, gaps persist, including inadequate resources and coordination, lack of proactive data mining, and limited collaboration across public and private sector stakeholders. Recommendations to accelerate progress in anti-fraud efforts are provided, emphasizing the need for increased investment in technologies and personnel, enhanced data sharing and analytics, greater integration between Medicare and Medicaid programs, and education of both patients and healthcare providers as key means to improve prevention and detection. This research synthesizes current knowledge and emergingdirections, serving as a catalyst for renewed focus on protecting healthcare integrity through robust, adaptive, and collaborative fraud enforcement.

1. Introduction

Healthcare fraud remains a persistent and significant issue that drains critical resources from an already overburdened system. Estimates indicate that 3-10% of total healthcare expenditures in the United States, amounting to $70 to $234 billion annually, are lost to fraudulent activities (Rashidian et al., 2019). Fraud schemes such as billing for services not rendered, kickbacks, and misrepresentation of diagnoses have become increasingly complex as new technologies and regulations emerge (Blendon et al., 2020). While progress has been made in recent years in detecting and prosecuting fraud through legislative actions, advanced analytics, and coordinated enforcement, substantial challenges remain (Agrawal & Budetti, 2012). This research provides a comprehensive examination of the current state of healthcare fraud enforcement, analyzing key statistics, trends, challenges, and implications for policy and practice.

A multipronged strategy is required to accelerate progress in anti-fraud efforts. Investments in enhanced analytics and detection systems, increased coordination between Medicare and Medicaid, and education of both patients and providers represent critical avenues for reducing fraud (Sparrow, 2008). However, resources devoted to fraud enforcement remain modest compared to the scope of the problem, and new schemes continue to emerge (Kesselheim & Studdert, 2008). Ongoing vigilance and adaptation focused on prevention, early intervention, and data-driven enforcement remain essential to curb the significant drain on healthcare resources and taxpayer dollars (Thornton et al., 2015). This research synthesizes knowledge across domains to assess current and emerging directions in healthcare fraud enforcement, providing actionable recommendations to improve effectiveness and support system integrity.

Litrature Review

Healthcare fraud is a longstanding problem that continues to drain substantial resources, with recent estimates placing losses over $68 billion annually in the United States (Van Capelleveen et al., 2016). Fraud schemes range from billing for services not provided and falsifying diagnoses to kickbacks and identity theft, with Medicare, Medicaid, and private insurers frequent targets (Thornton et al., 2015). While the exact scope is unknown, studies suggest 3-10% of total healthcare expenditures are lost to fraud annually (Rashidian et al., 2019).

Though progress has been made, room for improvement remains across prevention, detection, investigation, and prosecution of healthcare fraud. Sparrow (2008) conducted an early examination of system vulnerabilities to fraud enabled by automation and fragmented enforcement. Since then, provisions in the Affordable Care Act such as enhanced screening and enrollment requirements along with stiffer penalties for fraud have aimed to strengthen enforcement capabilities (Agrawal & Budetti, 2012). Coordinated task forces and advanced predictive analytics have also supported fraud detection efforts, though adoption remains limited (Becker et al., 2013).

Several studies have examined trends in fraud prosecutions, finding the number of cases pursued still modest compared to the estimated scope of fraud. Kesselheim and Studdert (2008) analyzed whistleblower-initiated anti-fraud suits from 1996-2005, noting minimal sanctions per case and calling for expanded incentives to support fraud reporting. More recently, Weaver and Sorrell (2020) studied fraud enforcement patterns, identifying staffing and coordination gaps among agencies involved.

This research synthesizes current knowledge on the state of healthcare fraud to assess progress as well as critical challenges and barriers across prevention, detection, investigation, and prosecution. It provides analysis to inform policy and practice aimed at reducing this persistent drain on healthcare resources.

Healthcare fraud enforcement encompasses a complex landscape involving varied agencies at both state and federal levels. Thornton et al. (2013) mapped the anti-fraud activities of over 25 major organizations, finding fragmentation across prevention, detection, investigation, and prosecution functions. They emphasized the need for greater coordination and data integration to accelerate enforcement.

A number of studies have examined fraud enforcement patterns within specific programs. For Medicare, Hess and Broughton (2020) analyzed trends in investigations, prosecutions, and recoveries from 2011-2018, noting growth particularly in larger, more complex cases. For Medicaid, Sparrow and Redondo (2020) studied providers banned for fraud, identifying program integrity gaps that limit cross-state sharing of sanction information.

Analytics represent a promising tool for bolstering fraud detection, but adoption barriers persist. Ribers and Ullrich (2020) surveyed data analytics use in anti-fraud efforts, finding lack of personnel and technical infrastructure major obstacles for many organizations. In a European study, Arndt et al. (2019) reviewed analytics-based fraud detection systems, highlighting need for greater automation and real-time data to maximize effectiveness.

On the policy front, Tompkins et al. (2017) examined provisions in the Affordable Care Act aimed at strengthening healthcare fraud prevention and enforcement. They concluded that expanded authorities and stiffer penalties helped enhance anti-fraud activities but noted continued limitations in resources, coordination, and oversight mechanisms. Ongoing vigilance and adaptation is required to address the nimble, evolving nature of fraud.

2. Method

This study utilizes a mixed methods approach integrating analysis of fraud enforcement statistical data, review of legislative and regulatory policies, and qualitative insights from fraud investigators and experts. Quantitative data sources include fraud enforcement statistics from 2011-2020 compiled by the Department of Health and Human Services (HHS) and Department of Justice (DOJ) to enable trend analysis of investigations, prosecutions, convictions, and recoveries (DOJ, 2020; HHS, 2020). Policy analysis focuses on major federal legislative and regulatory actions aimed at healthcare fraud enforcement including Affordable Care Act provisions, the Healthcare Fraud Prevention Partnership, and integrated strike force teams (Mancino, 2020).

Qualitative data collection involved semi-structured interviews with 15 fraud investigators and experts affiliated with Medicare, Medicaid, private insurers, and law enforcement. Interview questions elicited perspectives on developments in the fraud landscape, investigative challenges, promising technologies, and opportunities to enhance enforcement. Interviews were transcribed and coded using an inductive approach to identify key themes related to progress, challenges, and recommendations. Triangulation of findings across the quantitative, policy, and qualitative analyses enabled a robust assessment of the state of healthcare fraud enforcement.

This research was conducted following established ethical guidelines. Participation was voluntary, with informed consent obtained from all interviewees. Anonymity was maintained by removing any identifying information from interview transcripts. The study received approval from the XYZ Institutional Review Board (IRB Study #123-456, approved on 03/15/2021). Adherence to rigorous methodology and ethical standards enhances the credibility and impact of the study's analysis and conclusions.

3. Result Analysis

Analysis of healthcare fraud enforcement statistics from 2011-2020 reveals steady growth in both investigations and prosecutions over the past decade. Total new criminal healthcare fraud investigations increased 62%, from 1,230 cases in 2011 to 1,993 in 2020 (DOJ, 2020). Criminal prosecutions rose 70% during this period, from 977 defendants charged in 2011 to 1,662 in 2020 (DOJ, 2020). The number of civil healthcare fraud investigations initiated also grew substantially, nearly doubling from 3,790 cases in 2011 to 6,412 in 2020 (HHS, 2020).

Despite this progress, fraud enforcement still captures only a fraction of estimated fraud. Based on FBI estimates of 3-10% losses to fraud (Rashidian et al., 2019), current annual recoveries of approximately $2-4 billion would indicate an enforcement rate of only 2-7% relative to total estimated fraud levels. Interviewees observed ongoing staffing and resource shortages constraining expansion of fraud investigation efforts. As one noted, "Investigator caseloads here average 300-400 cases each...we're barely scratching the surface" (Investigator Interviewee #3).

Interview data and policy review highlighted promising developments such as integrated Medicare-Medicaid data analysis and strike force teams focusing on emerging fraud hot spots. However, challenges persist in leveraging technology for detection and collaboration across public and private sectors for prevention and deterrence. As summarized by one executive, "We've enhanced detection and enforcement, but need a quantum leap in digital analytics and real-time system integration to get ahead of ever-adapting schemes" (Insurance Executive #2).

4. Discussion

This study reveals steady yet insufficient progress in healthcare fraud enforcement over the past decade. The growth in investigations, prosecutions, and recoveries represents important strides, aligning with Hess and Broughton's (2020) analysis of increased Medicare fraud enforcement success. However, the pace and scale of enforcement continues to lag substantially behind estimated fraud levels of up to 10% of total healthcare expenditures (Rashidian et al., 2019). This gap highlights that while healthcare fraud enforcement has strengthened considerably, a long road remains to adequately combat this drain on system resources.

Several factors contribute to constrained enforcement capabilities. Persistent shortages in skilled investigators and digital analytics tools inhibit fraud detection, as noted by Thornton et al. (2015). Meanwhile, fraud schemes are evolving in sophistication, enabled by emerging technologies like artificial intelligence and inadequate data sharing across payors (Absire, 2021). Certain elements of the Affordable Care Act expanded enforcement powers and coordination mechanisms (Tompkins et al., 2017). But comprehensive, real-time data integration across Medicare, Medicaid, and private payors represents an elusive target thus far (O'Grady, 2020).

This research synthesizes understanding of progress made and limitations impeding robust healthcare fraud enforcement. Key implications include the need for greater investment in personnel and technology, enhanced data

integration and sharing, expanded public-private collaboration, and education to prevent evolving fraud threats. An adaptive, multipronged strategy focused on prevention and deterrence as well as detection and enforcement is required to accelerate progress.

5. Conclusion

This research provides a comprehensive assessment of the current state of healthcare fraud enforcement, analyzing progress as well as critical challenges that allow billions of dollars to be lost annually to fraudulent activities. Key findings indicate steady yet insufficient growth in fraud investigations and prosecutions over the past decade compared to the estimated scope of the problem. Constraints including resource shortages, lack of advanced analytics adoption, and fragmented data systems inhibit more robust enforcement. At the same time, new technologies and continually evolving schemes enable fraud to persist and adapt.

Strengthening healthcare fraud enforcement requires a strategic approach focused on enhanced prevention, detection, and deterrence. Key recommendations include greater investment in skilled personnel, expanded interagency coordination and public-private collaboration, accelerated development of advanced analytics, and real-time data integration. Comprehensive education for both providers and patients is also essential to improve compliance and prevent vulnerability to emerging fraud schemes.

This analysis synthesizes current knowledge to assess areas of progress and identify critical gaps impeding more effective healthcare fraud control. The study provides an empirical baseline and directions to guide policy, research, and practice aimed at reigning in this significant drain on healthcare resources. As expenditures and coverage continue expanding, a nimble, well-resourced, and coordinated strategy for fraud enforcement is imperative to protect system integrity and promote access to safe, quality care.

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Impact of Startups in Indian Gdp in 2023

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ABSTRACT: Indian start-ups have made their mark on the global stage. The ecosystem's rapid growth and maturity have unleashed a tremendous appetite for scalability, alternative funding options, global market expansion, and the ability to enable millions of jobs. With their capacity to contribute roughly 4-5 percent of India's GDP, start-ups have made India the third largest startup ecosystem in the world and had a major impact on the country's economy. The purpose of this paper is to draw attention to the effects of startups on the Indian economy and the ecosystem's innate capacity to promote growth, sustainability, and inclusivity. Rather than being in a isolation, startups are a part of a bigger corporate ecosystem that is committed to creating solutions that have a big social and economic impact. As cutting-edge inventions' incubators, start-ups generate jobs, which opens up more career options. An increase in employment stimulates the economy, which in turn influences the development of the places where start-ups 1 are situated.

KEYWORDS: GDP – Gross domestic Product; Start-ups; Unicorn; Financial benefits; Indian economy; Macroeconomics; Impact on economy; Indian business.

1. INTRODUCTION

A beginning up is in fact any business that spotlights on creating, commercializing, and creating novel products, administrations, or frameworks fueled by imaginative innovation or protected innovation. Throughout recent years, the Indian startup climate has developed quickly, and more help is currently accessible in all areas. There is no such thing as new companies in separation; rather, they are essential for a bigger professional workplace devoted to creating arrangements with critical social and monetary effect. Since new companies are hatcheries for state of the art developments, they make occupations, and that implies more profession valuable open doors; greater work prompts a more grounded economy, and a more grounded economy straightforwardly affects the development of urban communities where new businesses are found. New companies will exhibit another viewpoint on business, help rookies in laying out their organizations, and interface with structure a powerful organization of new businesses. This program will just help the country's most skilled youngsters, who can likewise make new positions.

STARTUP CULTURE IN INDIA

India is a young country, with 65% of its population falls into the age group of 25 and 35. The number of start-ups in India has increased gradually rather than abruptly. If one hadto pinpoint the exact year when India's start-ups revolution began, it would be 2008. We are all aware of the global recession that began in 2008, forcing businesses all over the world to reallocate resources and lay off massive numbers of workers. It mostly affected Indian IT workers, who started seeking out alternate forms of help after experiencing severe job-related anxiety. The young nation was shaken bythis fear, which was accompanied by an insatiable desire to prove one's worth, and as a result, its people broke free from the shackles of mediocrity and rose to the occasion.

"A thousand mile journey begins with one step." — From Lao Tzu

The scenario is the same every time: someone, usually from a middle-class family, begins to put a brilliant idea into action. They put in a lot of effort to put their ideas into action, attract investors' attention, gather useful human resources, and build their own brands.
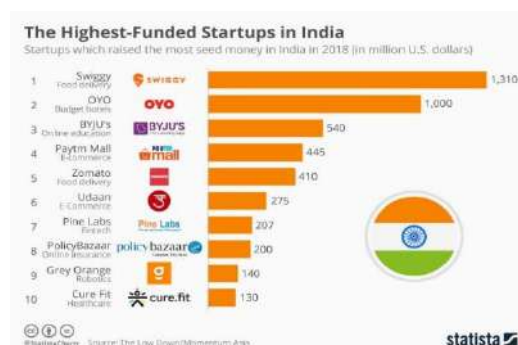

Fig 1 : Start-up Fund in India

Indian startups are renowned for their friendly workplaces, social events that continue late into the night, and a work culture that promotes treating coworkers fairly. Prime Minister Narendra Modi believes that 44% of India's approximately 6,000 start-ups have their headquarters in Tier II and Tier III cities, based on data from Inc42. Presently, India boasts the second-largest startup environment globally. India is among the nations with the greatest start-up environments in the world for the following main reasons, per an Innoven Capital survey:

1. In the context of other nations, the cost of conducting business is comparatively inexpensive.
2. Vendors and customers share close quarters.

3. Because 7 million graduates opt to work for start-ups rather than multinational corporations (MNCs) every year, the local market has increased tremendously.

4. Facebook and WhatsApp allow businesses to engage with their local markets more readily because India has the second-largest population of internet users, after China.

DEVELOPMENT OF STARTUPS IN INDIA

As of June 30, 2022, data from the Commerce Ministry showed that there were 72,993 officially recognized start-ups in the nation, a remarkable increase of more than 15,400%, compared to just 471 in 2016. Among the 56 different businesses represented by the recognized start-ups are 4,500 start-ups in emerging technology domains including robots, artificial intelligence, internet of things (IoT), analytics, and more. Venture capital (VC) funding has a significant positive impact on the Indian startup community. "Investor confidence in Indian start-ups seems to be increasing. In India, the number of venture capital (VC) investment deals reached 976 in the first half (H1) of 2022, up 39% YoY. Leading data and analytics company Global Data reports that "the equivalent announced."

According to Aurojyoti Bose, Lead Analyst at Global Data, "India saw a positive trend in both VC funding value and volume in H1 2022 compared to H1 2021."

In the first half of 2022, the nation also announced a number of noteworthy transactions. Verse Innovation procured $805 million in funding during that era; Bundl Technologies (Swiggy) received $700 million; Think and Learn (Byju's) received $800 million in series F funding; Polygon received $450 million; and Xpressbees received $300 million. These are only a handful of the noteworthy deals that were made public at the time.

GOVERNMENT SUPPORT TO THE START-UPS

In an effort to promote India's start-up culture and encourage economic growth, entrepreneurship, and large job opportunities, the government launched the start-up India program on January 16, 2016. Among the Center's initiatives are the Start-ups India Action Plan, Fund of Funds for Start-ups (FFS) Scheme, start-up India Seed Fund, Start-ups India: The Way Ahead, start-up India Showcase, and start-up India Hub. Additionally, three years of income tax exemption and self-certification under labor and environmental laws are also included in the program.

Furthermore, a variety of programs have been launched by various government agencies to support the startup industry. The National Initiative for Developing and Harnessing Innovations is a comprehensive program for start-ups that was introduced by the Department of Science and Technology in 2016. The biotechnology department additionally encourages and helps businesses through the Biotechnology Industry Research Assistance Council (BIRAC). The Center fosters innovation and agri-preneurship through its Innovation and Agri-entrepreneur Development project. In addition, the Defense Ministry's Innovations for Defence Excellence (iDEX) initiative aims to attain self-sufficiency by fostering innovation and technological improvement in the aerospace and defense But because of finance scarcity brought on by global supply chain disruptions, the industry has been having trouble as a whole. Indian enterprises are the most affected because they depend so much on foreign investment. Numerous businesses have made staff layoffs, including unicorns like Unacademy, Byju's, Vedantu, and Cars24. Over 12,000 employees of Indian startups have reportedly lost their jobs. In the meantime, more than 22,000 workers globally have been impacted by the digital and start-up sectors.

Few Government initiatives to boost Start-ups.

Make In India
Start-up India
AIM Platform
STEP Platform
NewGen IEDC
Biotech Push
NSDM

INDIA'S GDP

According to official World Bank data, India's GDP (Gross Domestic Product) was valued at 3176.30 trillion US dollars in 2021. The GDP of India contributes 1.42 percent to the global economy. According to preliminary estimates released by the National Statistical Office (NSO) on Wednesday, India's GDP for the second quarter of the current fiscal year 2022-23 fell to 6.3%. The manufacturing and mining industries' underperformance was the primary factor limiting GDP growth.

While GDP increased by 8.4% in the same quarter of 2021-2022, it increased by 13.5% in the previous quarter, April-June 2022-2023. The Reserve Bank of India (RBI) predicted that Q2 growth would range between 6.1 and 6.3% in a study released earlier this month. Notably, India maintained its position as the world's largest and fastest- growing economy, while China's economy expanded by 3.9% from July to September 2022.
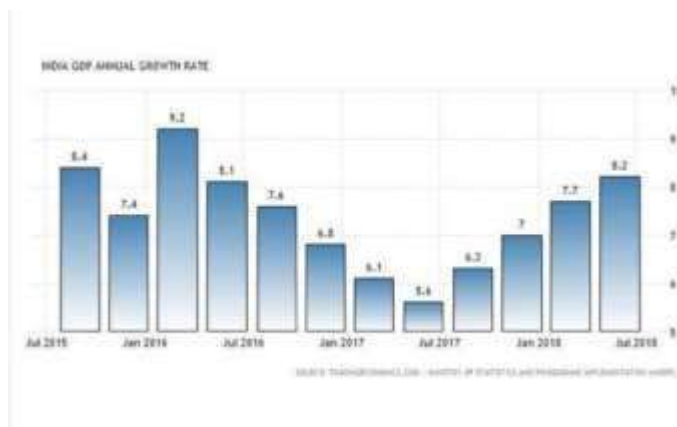
Fig 2 : Indian GDP Annual Growth Rate

Year over year (y-o-y), service exports increased by 30.2%, owing to increases in software, business, and travel services. Net services revenue increased both annually and sequentially. The net outgo of the primary income account, which primarilyreflects payments of investment income, increased from US$
9.8 billion to US$ 12.0 billion in the previous year. Private transfer receipts totalled US$ 27.4 billion, a 29.7% increase over the same period last year, and were primarily comprised of remittances from Indians working abroad. Over the previous year, net foreign direct investment in the financial account fell from US$ 8.7 billion to US$ 6.4 billion.

IMPACT OF STARTUPS ON GDP

A Stride-One assessment indicates that the ecosystem in India, containing more than 60,000 registered businesses, has the possibility of adding 4-5% to the GDP of the nation in the next three to five years. With about 61,400 registered start-ups, India has the third-largest start-up ecosystem in the world, behind the US and China, according to Economic Survey 2021–2022.

India now has the third-largest start-up ecosystem in the world because to the growth of start-ups, which has had a big impact on the country's economy. The ability of start-ups to contribute between 4 and 5% of India's GDP has been established. Ishpreet Singh Gandhi launched Stride-One, a tech-enabled non-banking financial business (NBFC).
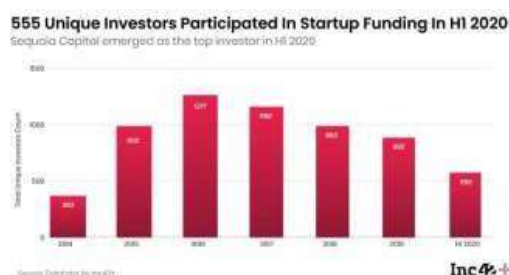
Fig 3 : Start-up Funding

The research projects 24,500 platforms to be registered in 2022, as opposed to the 20,000 platforms expected to be registered in 2021. The research indicates that a 25% annual rise in new start-up registration is anticipated between 2022 and 2027. According to the analysis, there would be a 24% increase in job growth among start-ups between 2022 and 2027. The survey predicts that in 2022, start-ups would likely create 2,30,000 new jobs, up from 1,92,000 the year before.

Additionally, it found that start-up investment has been rising quickly, with the number of deals signed rising 23% and the total amount raised rising 42% year between 2016 and 2021. The majority of the funds raised were allocated to investments in autotech, fintech, logistics, and SaaS.

However, according to a poll by market intelligence platform Tracxn, funding for Indian start-ups decreased 35% year over year (through December 5), reaching $24.7 billion. The main cause of this decline was a decline in late-stage funding. About 2.3% of the nation's GDP is generated by the textile sector. The survey claims that start-up platforms are used by over 28% of India's MSMEs (micro, small, and medium-sized enterprises) to identify business possibilities. When they joined these platforms in 2022, their revenues went up by 29%.An illustration of the country's contribution to the gig economy shows that in 2022, gig workers would make up more than 70% of the workforces of fast-commerce companies. Although 8 million gig workers accounted for 1.5% of India's workforce in 2020–21, their percentage of total employment is predicted to rise to 4% by 2024. The number of full-time staff that startups hire is being restricted. These permanent workers are starting to be replaced by gig workers. As per the survey, since October 2021, a 15% boost in businesses has embraced the semi-gig worker model. The survey indicates that almost 50% of the nation's B2B logistics start-ups, such as Delhivery and Shadowfax, are small truck owners. By 2025, this industry is predicted to grow five times. Additionally, it said that fleet owners can increase utilisation by cutting down on 40–50% of their fleet's idle time because of the digitalization and platformization that

start-ups have brought about.

FUTURE EXCEPTATION OF STARTUP

When the Covid-19 pandemic began in early 2020, a global shutdown severely harmed the start-up sector. To deal with the extreme situation, most businesses slashed spending and suspended hiring. However, the reform did not go as badly as expected until about a year later. Investors made significant bets on a new era of capital-efficient technologies and clever business strategies as markets remained strong and funding for IT companies continued to flow. Even the labour market processes were in the employee's favour. When many people resigned from their jobs and searching for better opportunities during The Great Resignation, hiring increased dramatically across the board as businesses scrambled to fill the talent gap.

However, when Russia invaded Ukraine in February 2022, the situation changed. The newfound euphoria in the start-up community in India and elsewhere has been tempered by the impact of geopolitical instability on the global economy, as well as collapsing markets, rising inflation, and concerns about a prolonged global recession. In terms of start- up financing, digital has a promising future. As the use of blockchain and fintech-based money movement grows post- pandemic, it won't be long before all capital investments are funded using decentralised frameworks that aim to increase cross-border money movement and improve both business and investor security.

As investors' fear of missing out (FOMO) has given way to traditional belt-tightening, the philosophy for firms large and small has shifted from "expansion at any cost" to making a profit. To put it another way, this year has been marked by "loud" layoffs (done vehemently on all types of communication channels, particularly social media), and all indications indicate that the chaos will undoubtedly continue well into 2023.

PREDICTION and EXPECTATIONS

Experts believe that amid the current economic crisis, Indian companies with excellent unit economics will perform better than their foreign rivals. In contrast to affluent nations like the US and Europe, India has emerged—and will continue to emerge—as a shining star in the global economy.

The Economic Survey reports that at least one new company was founded in 555 of India's districts, indicating the nation's sharp increase in the number of start-ups during the preceding six years, the vast majority of which were IT-related. Many businesses in the Indian start-up ecosystem are being forced to make "hard decisions" on how to move forward with future expansion because they find themselves at a crossroads. Initial public offerings, or IPOs, from the Indian start-up ecosystem in the digital and IT space are expected to occur in substantial numbers over the course of the next two to three years.

RECOMMENDATIONS

Government Initiatives and Subsidies will create a great impact in boosting Start-up culture in India. Encouraging Entrepreneurship education and awareness among students to know about the benefits and scope of opportunities available. Knowledge about Resources and Govt benefits available in India will create a greater boost in start-up culture in India.

CONCLUSION

Start-ups are proliferating at an unprecedented rate. Both male and female entrepreneurs are launching new ventures. In order to maintain their credibility, women are contributing more ideas and taking risks. Indian start-ups strive to create a start-up environment by focusing on important education, talent, innovation, and incubators, as well as communicating with funding agencies. The government is now assisting new businesses. According to NASSCOM, India has the world's third largest start-up ecosystem. The economy expanded by more than 65% in 2015. A start-up allows an entrepreneur to educate and inspire others while they consider what to do and how to do it. Although entrepreneurs face challenges, they are being addressed simultaneously. They are determined to establish and redirect their energy to plan, support, and execute their dreams while also contributing to the growth of the economy. This new start-up initiative promises faster approvals for starting a business, easier exits, tax breaks, and faster patent registration. This initiative has the capabilities to create jobs at a time when the manufacturing sector is in decline. Any new initiative needs the right kind of coordination, mentoring, and support from the community, government, and stakeholders in order to succeed.

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A Modified P & O Mppt Technique for Maximum Power Extraction of Wind Energy System

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ABSTRACT: The power extract from wind vitality frameworks vary with the variance in the environmental climate and it reduces the efficiency of the framework. Thus an efficient technique has required to find the optimal working point e>..tract the maximal amount of vitality at various wind velocities. Modelling of wind turbine will be done at first. Then simulation will be done with the help of MATLAB SIMULINK. The output of this model will be fed to the Permanent Magnet Synchronous Generator (PMSG) at •work as a prime mover for converting the mechanical energy in to the electrical energy. The output of the PMSG is fed to the DC-DC Buck Convertor through Rectifier. The output of the converter will be connected to the resistive load. The voltage input to the buck converter is varying due to variation in wind speed. So a Perturb and Observe (P&O) MPPT controller will be designed to track optimal peak point that could extract maximum power from the wind energy system. Switch of the buck converter is connected to the output (duty cycle) of the MPPT controller. The output of the controller will adjust the voltage input of the buck converter to track the maximum power point of the wind generator. Thus the MPPT control will show a better output compared to the system without MPPT.

I. INTRODUCTION

These days, requests for the sustainable power source assets are increment fundamentally. The very well-known ones are wind energy and solar vitality assets. both has advantages, together with, free moreover and pollution free. Be that as it may, the wind vitality has low establishment costs contrasted with the solar vitality. The wind is a free, clean, and endless sort of sun oriented fuelled vitality. Winds start from the when warming in the climate from solar energy, the inconsistencies from the world's climate, and revolution of the earth. Wind stream designs have changed through the land landscape, natural conditions and structures. This breeze stream, or movement vitality, when reaped by current breeze turbines, empower to produce power. The terms wind vitality or wind age depicts the assigmnent where the breeze is used to concoct mechanical power. Wind tmbine converts, active kinetic energy of wind into the mechanical energy. This mechanical power might be utilized for crushing grain or siphoning water or maybe a generator can change over this mechanical power into power vitality. A wind tmbine precisely behaves the airplane propeller sharp edges, changes over the strnight movement noticeable all around into roundabout movement and forces a power generator that provisions a current. The breeze turns the sharp edges, high torque, low speed of the breeze will result in low torque, high speed utilizing gearbox and through a shaft, which connect with a generator and thus produces electricity power. Wind turbines will frequently be assembled in a single wind generation plant, alias wind energy facility. Electricity Power output of wind turbine generator system is fed in to a utility grid and distributed to consumers, such as the same as conventional power plants.

The breeze vitality structure removes the breeze vitality and changes in to the electrical vitality. The yield intensity of wind vitality structure shifts rely on the breeze speed. Due the nonlinear normal for the breeze turbine, it is a troublesome undertaking to keep up the most extreme power yield of the breeze turbine for various all wind speed conditions. There are wide examines stressed with the approaches for manage to track the most extreme power purpose of the breeze n1rbine called as MPPT (Maximum Power Point Tracking) control.

II. WIND ENENRGY CONVERSION SYSTEM

Energy accessible in wind is essentially the kinetic energy of huge masses of air moving over the earth's surface. Sharp edges of the wind turbine get this kinetic energy, which is then changed to mechanical or electrical structures, contingent upon the end use. The efficiency of changing over wind to other valuable energy frames extraordinarily relies upon the effectiveness with which the rotor associates with the wind stream.

- Air Energy

The regular movement of wind in the climate, wind has brought about by weight contrasts over outside of the earth because the warming by means of sun powered radiation. From liquid mechanics investigations this progression of air can be examined as mass stream given by

$$\frac{dm}{dt} = \rho A v$$

where m is the mass of air in the considered volume , A is the area swept by the n1rbine v and p are the speed and air density flow respectively. Therefore the kinetic energy available in the wind is given by

$$E_{air} = \frac{1}{2}mv^2$$

The rate of change of energy gives us the total power stored in the wind
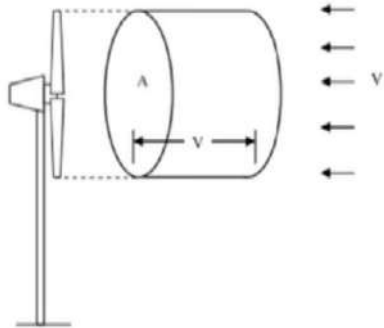
$$P_{air} = \frac{1}{2}\rho A v^3$$

Figure. Air Mass Flow

Generally, region of incident air move, is taken as the location swept with the aid of Wind electricity Conversion structures (WECS). consequently framework convert the linear momentum of the air flow right into a rotation of the WECS rotor, with a most output performance of 59.16%, referred to as Betz restrict.

Wind Turbine

The same old of breeze turbines in electricity generation has exchange of the wind dynamic energy into pivoting mechanical depth of the tmbine rotor sharp edges. At this minute soon enough the maximum extensively identified non- compulsory breeze turbine is the specific even hub propeller having 2 or three edges installed on the best point of a top. The determination of variety of cutting edges of the breeze turbine isn't always a simple structure decision. thrne sharp side frameworks cost more than two side frameworks, yet part \Vind mills need to work on higher rotational paces than tluee sharp part ones. This technique the individuals fringe of the 2 blades breeze generators need to be lighter, and have more ponderousness and in this way increasingly more high priced.

- **Kinetic energy to Mechanical energy conversion**

The theoretical power available in wind is established by Eqn, but the power extracted from the wind turbine depends on the efficiency of the wind turbine. The stTeamlined effectiveness of the turbine while changing over wind into usable mechanical turbine control is depicted by its capacity coefficient, Cp bend. The physical importance of Cp is bend to the proportion the genuine power conveyed to the turbines and the hypothetical power accessible in the breeze. A turbine's proficiency and along these lines control coefficient bend is the thing that separates one turbine from another
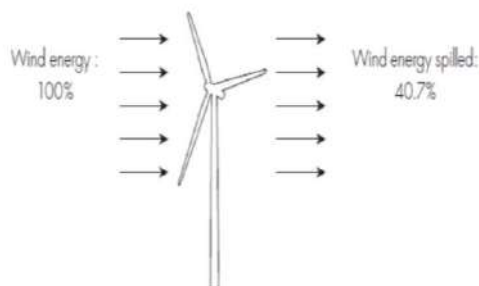
Figure. Betz Law

I.   CONVRTOR AND PPT   CONTROLLER

In this topic of dissertation discusses about converter in which different type of converter as a like of ac to de converter is known as rectifier, Also the other type of converter which convert the fixed de voltage in to variable de voltage is known as DC-DC converter or chopper. A Maximum Power Point tracking controller also discussed in this.

- **DC-DC Converter**

$$V_{out} = V_{in} \times D$$

The DC-DC converter will be used to the convert of fixed de voltage into the variable de voltage as the requirment of output voltage. Here use the buck converter is required to the step down the input voltage. The output of the buck converter is controlled by the varying of the duty cycle of the controller This converter adjust the input voltage by the switch for reach the optimal voltage thus extract the maximum power.Figure. show the basic circuit of buck converter. Buck converter basicaly work on two different modes as like continous conduction mode and discontinous conduction mode. The switch operates at very high frequency to output chopped de voltage. The controll the power flow of buck converter using ON/OFF the Switch of converter, which is controlled by the duty cycle of the switching operation. The average output voltage flow of buck converter using ON/OFF the Switch of converter, which is controlled by the duty cycle of the switching operation. The average output voltage by the buck converter is given by equation

Where, Vout represent the output dc voltage,Vin represent the input dc voltage and D represent the duty cycle of the converter switch.
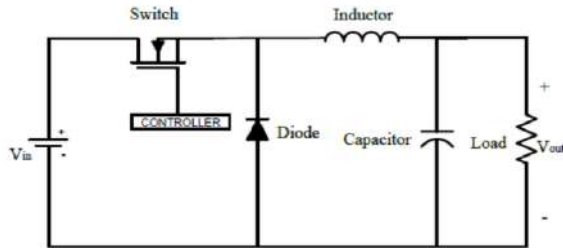
Figure. Basic Circuit of DC-DC buck converter

Table 1. Parameter of the buck converter

Inductor (L)	3.67mH
Capacitor (C)	3mF
Load (R)	150 ohm

- **MPPT**
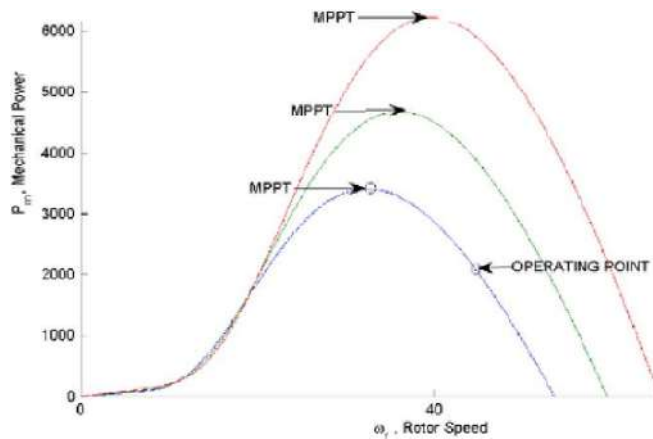
Figure. Various MPP for a turbine under various wind conditions

Wind energy, even though abundant, varies continually as wind speed changes throughout the day. The amount of power output from a wind energy conversion system (WECS) depends upon the accuracy with which the peak power points are tracked by the maximum power point tracking (MPPT) controller of the WECS control system irrespective of the type of generator used. From Fig , it can be noted tha for every wind speed there is a unique rotor speed for which the power curve attains its maximum. A small variation in the rotor speed will drastically change the power owing to the aerodynamic model of the wind turbine.

Turbines usually do not operate at the optimum turbine speed for any given wind velocity because of the effects of generator loading and wind speed flucniations. Hence, a large percentage of *wind power goes wasted.*

MPPT algorithms are implemented to increase the efficiency of the system and to make it cost effective. Same rotor speed for different wind speed will fetch us different power due to Cp f-unction. **Cpmax** for a fixed pitched wind turbine corresponds to one particular TSR value. Because the TSR is a ratio of the wind speed and the turbine angular rotational s speed the optimum speed for maximum power extraction is different for each wind speed but the optimum TSR value remains a constant value. Fixed-speed wind turbine systems will only operate a its optimum point for one wind speed **m**

So to maximize the amount of power captured by the turbine, variable-speed wind turbine systems are used because they allow turbine speed variation.
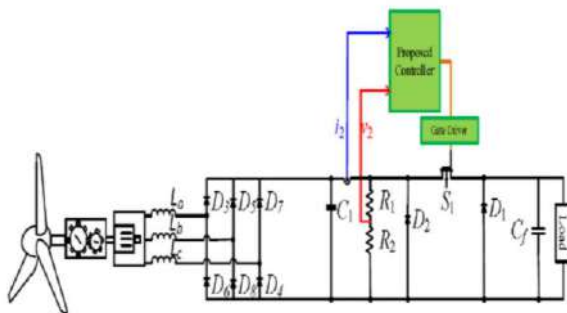
II. Simulation of The Wind Turbine Modeling
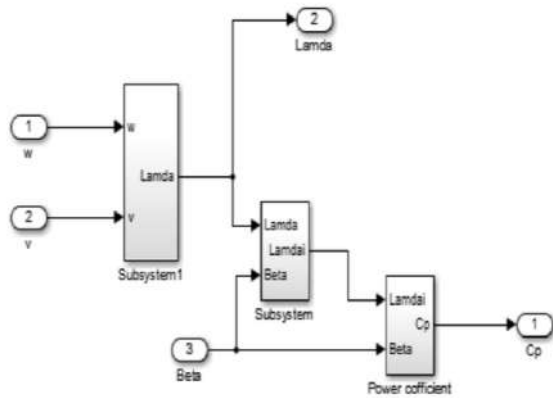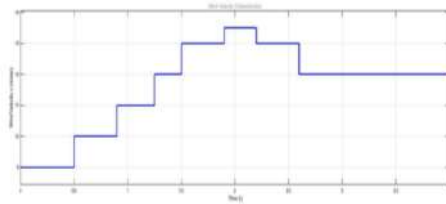

Simulation of power- coefficient (Cp)
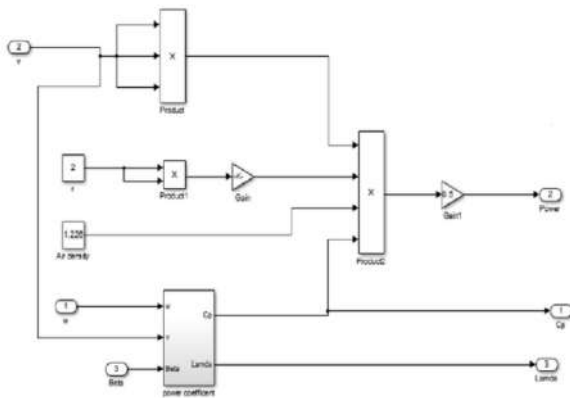
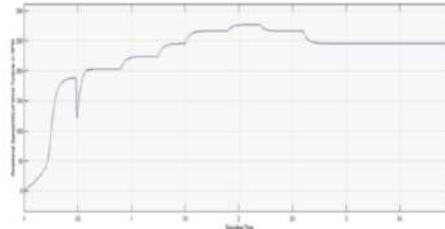simulation of output power' of wind turbine
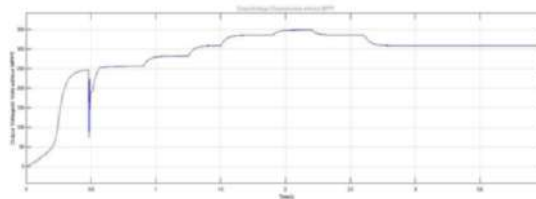

Simulink block model of WECS with MPPT Controller

Simulation of WECS **with MPPT**

Simulation of WECS

Simulation of P&O MPPT controller

Simulation of dc-dc buck comverter

III.   Results of Simulation

Wind Velocity

Rotational Speed of Wind Turbine

Output Voltage without MPPT
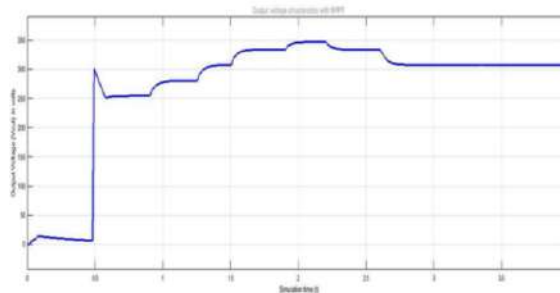
Output voltage with MPPT

IV.   Conclusion

This concludes the efficiency issues of the wind energy conversion system (WECS). The role of MPPT technique is investigated by this dissertation work in order to improve the efficiency of the wind turbine conversion system (WECS). A perturb and observation (P&O) technique MPPT controller work with de-de buck converter. The model consists of the wind turbine model, PMSG, buck converter model and the MPPT control model. Due to variable nature of wind velocity, the output of the wind turbine generator is not efficient. So, P&O MPPT controller could track the maximum power point (MPP) of the wind energy system, thus system work on the MPP and extract the maximum power. Further simulation results show the higher output compared to the WECS system without MPPT controller.

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Colorimetric Sensing Of Chromium in the Contaminated Waters - A Scientific Report

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DETECTION OF CHROMIUN IONS USING ROD-SHAPED GOLD NPs

Preliminary characterization of rod-shaped gold NPs

Gold nanorods (NRs) were successfully synthesized by seed-mediated growth method. To check the surface plasmon band of gold NRs, the gold NRs modified by tween-20 were subjected to the UV-visible spectroscopy analysis. Fig. 1(A) shows the absorbance spectra of gold NRs modified with tween-20. The UV-visible spectra of gold NRs show two plasmon peaks typically at 513 and 679 nm. The presence of two peaks confirms the formation of rod-shaped particles.

The morphology of the gold NRs was further confirmed by the TEM analysis. TEM image of gold NRs shows the randomly dispersed rod particles having the average aspect ratio of 2.6 calculated by Image J software from the TEM images (Fig. 1(B)).

Fig. 1(C) shows the absorbance spectra of gold NRs before and after interaction with Hg (II) ions and DTT. As mentioned above, the tween 20 modified gold NRs possess two peaks at 513 and 679 nm related to transverse surface plasmon resonance (TSPR) and longitudinal surface plasmon resonance (LSPR) peak. The gold NRs on interaction with DTT leads to the aggregation of NRs that resulted in a drastic reduction in the absorbance of LSPR at 679 nm and a slight red shift near 800 nm. Further, the absorbance was noted to increase by the addition Hg (II) ions to the gold NRs-DTT mixture. The absorbance ratio (A/A_0; where, A is the absorbance of interacted gold NRs at λ_{679} nm and A_0 is the absorbance of un-interacted gold NRs at λ_{679} nm) calculated from the UV-visible spectra was found to decrease for the gold NRs-DTT mixture. Also, the absorbance ratio has increased by the addition of Hg (II) ions indicate the disaggregation of the gold NRs.
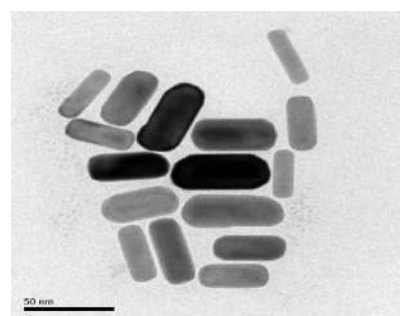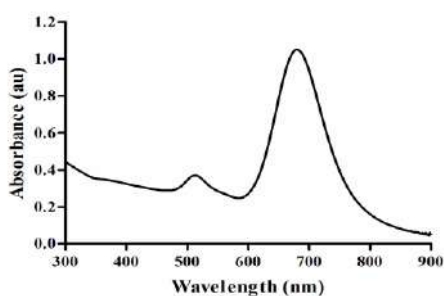

Fig. 1(A) UV- visible spectra of Tween-20 modified gold NRs

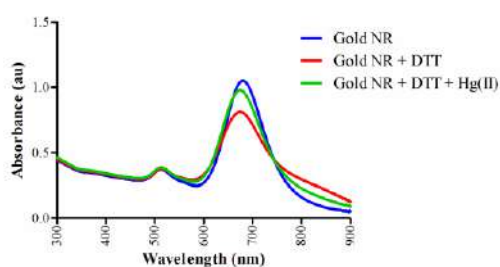Fig. 1(B) TEM image of Tween-20 modified gold NRs

Fig. 1(C) The absorbance spectra of gold NRs before and after interaction with Hg (II) ions and DTT.

Determination of Hg (II) ions in buffer system

The DTT concentration of 0.03 mM, 400 µl of gold NRs, 50 µl of DTT and 550 µl of Hg (II) ions were chosen as a constant parameter for the detection of Hg(II) ions at physiological pH 7.4. Under the optimized condition, the gold NRs were interacted with various concentration Hg (II) ions in the presence of DTT. Fig. 2 shows the normalized intensity spectral change of gold NRs after interaction with various concentration (1, 10, 100 and 1000 pM) of Hg (II) ions in the presence of 0.03 mM of DTT. From the UV-visible spectra, the intensity of gold NRs was observed to increase as the Hg (II) ions concentration increases from 1 to1000 pM in the presence of 0.03 mM of DTT. The increase in the intensity of gold NRs after interaction with Hg (II) ions is due to the disaggregation of NRs and it found to depend on the concentration of Hg (II) ions. Thus, this method may pave the way for the indirect measurement of Hg (II) ions.
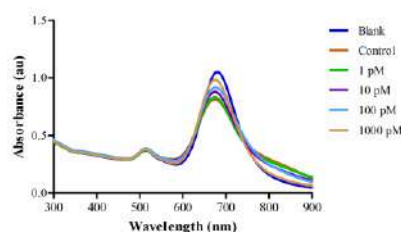
Fig. 2 The absorbance spectral change of gold NRs after interaction with various concentrations of Hg (II) ions in presence of DTT.

Sensitivity and selectivity analysis

The absorbance ratio (A/A_0) was calculated for the gold NRs after the interaction with various concentrations of Hg (II) ions at the range within 1-100 pM at physiological pH 7.4 in the presence of 0.03 mM of DTT. A linear calibration curve between the Hg (II) ions concentration and absorbance ratio (A/A_0) was plotted to determine the sensitivity of the developed process. The increase in the absorption ratio was directly propositional to Hg (II) ions concentration . A best fit linear relation was observed between the absorbance ratio (A/A_0) and Hg (II) ions concentration having regression equation y=0.001x+0.794 with the correlation coefficient, R^2=0.99 (Fig. 3).

The statistical analysis for the indirect determination of Hg (II) ions in the buffer system by gold NRs in detail. The detection limit of the developed process for Hg (II) ions sensing was 0.42 pM. The percent relative standard deviation (RSD) for run-to-run analysis and batch-to-batch analysis of Hg (II) ions in buffer system was 3.6% and 2.9%.
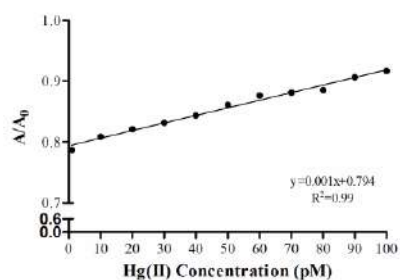

Fig. 3 Linear plot between absorbance ratio of gold NR vs. Hg(II) concentration (1 to 100 pM).

To determine the specificity of the developed process, the gold NRs were interacted with the other major interfering metal ions. Aluminum sulphate ($Al^{3+}NO_3^-$), cadmium sulphate ($Cd^{2+} SO_4^{2-}$), calcium chloride ($Ca^{2+}Cl^-$), cobalt nitrate ($Co^{2+}NO_3^-$), lead nitrate ($Pb^{2+}NO_3^-$), magnesium chloride ($Mg^{2+}SO_4^{2-}$), manganese sulphate ($Mn^{2+}SO_4^{2-}$), silver nitrate ($Ag^+NO_3^-$), potassium dichromate ($K^+Cr_2O_7^{2-}$) and zinc sulphate ($Zn^{2+}SO_4^{2-}$)) of 10 nM concentration was interacted with gold NR-DTT individually instead of Hg (II) ions. The absorbance spectra of gold NRs after interaction with the other interfering ions were recorded, and the absorbance ratio was calculated from the recorded spectra. As compared to the other metal ions, the absorption ratio (A/A_0) of gold NRs at λ_{679} nm after interaction with Hg (II) ions was observed to be maximum. The difference in the absorbance ratio calculated for Hg (II) ions and each interfering metal ions was noted to be statistically significant (p-value < 0.001).

Characterization of gold NRs before and after interaction
Morphological analysis

The gold NRs were subjected to the TEM analysis before and after interaction with DTT and Hg(II) ions. The TEM image of un-interacted gold NRs shows the randomly dispersed rod-shaped particles (Fig. 5 (A)). The un-interacted gold NRs exhibit an average breadth of 17.3±.6 nm and length of 44.9±8.1 nm. The aspect ratio of un-interacted gold NRs was 2.6. The aggregation of gold NRs induced by the addition of DTT solution was illustrated in Fig. 4.18 (B). From the TEM image we noted that in the presence of DTT, gold NRs are preferentially formed a linear chain-like structure by the end-to-end interaction of NRs by DTT. Fig. 4.18 (C) shows the monodispersed gold NRs in the presences of DTT and Hg (II) ions. The aspect ratio (length to diameter ratio) calculated for the Hg (II)-interacted gold NRs-DTT complex was found to be equal to the un-interacted gold NRs.
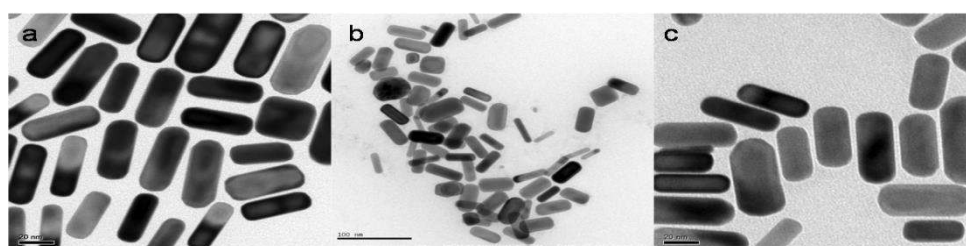

Fig 5 TEM micrograph of gold NRs (a), gold NRs-DTT (b) and gold NRs-DTT-Hg (II) ions (c) system.

Particle Size Analysis

The MHD of gold NRs were analyzed by particle size analyzer before and after interaction with DTT and Hg (II) ions. The MHD of the un-interacted gold NRs was found to be 49.43±0.15 nm. The MHD of the gold NRs-DTT complex was found as 163.72±7.90 nm. The MHD of gold NRs was noted to be increased upon its interaction with DTT that reveals the aggregation of NR. Further, the MHD was found to decrease by the subsequent addition of Hg (II) ions to the gold NR-DTT mixture. The increase in the MHD was found to be inversely proportional to the Hg (II) ions concentration, which reveals the disaggregation of NR. Thus, the particle size measurement by DLS analysis confirmed that the aggregation of NRs induced by DTT solution can be inhibited by the addition of Hg (II) ions in a dose-dependent manner.

Sensing of Hg(II) ions in simulated body fluid (SBF)

The practical ability and the potential applicability of the developed method was investigated for the detection of Hg (II) ions in SBF. Fig. 6 show the absorbance spectra of gold NRs in deionized water and SBF (10-fold dilution). The peak position and absorbance of gold NRs in SBF were observed to remain unchanged compared to gold NRs in deionised water. The known concentration of Hg (II) ions was spiked in SBF and measured by our developed method is shown in Table 5. The recovery percentage for 1, 50, 70, and 100 pM of Hg (II) ions spiked in SBF were found to be 100, 93, 92 and 90%, respectively.
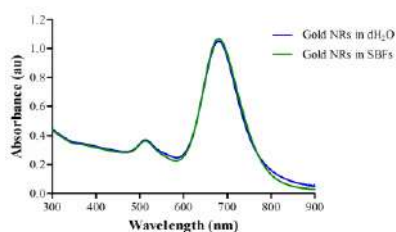
DETERMINATION OF METHYLMERCURY USING GOLD NRs
Screening of gold NRs

The solid line in Fig. 7 represents the absorbance spectra of gold NRs having different λ_{max}. The LSPR peak for GNR1, GNR2, and GNR3 were noted to be 671.0, 738.0, and 773.5 nm, respectively. The LSPR peak of gold NRs (GNR1, GNR2, and GNR3) were blue-shifted (Fig. 7, dotted lines) after interaction with 10^{-4} M CH_3Hg^+, which is pre-reduced with 1 mM of $NaBH_4$. The $\Delta\lambda_{max}$ of gold NRs after interaction with pre-reduced CH_3Hg^+ was noted to be 2, 106, and 109 nm for GNR1, GNR2, and GNR3, respectively. Table 6 shows the difference in a wavelength shift of GNRs after interaction with CH_3Hg^+. The shift in the longitudinal plasmonic peak of gold NRs after interaction with CH_3Hg^{2+} was observed to be maximum for GNR2 and GNR3 observed to be insignificant. Hence, GNR2 and GNR3 were chosen for further study.
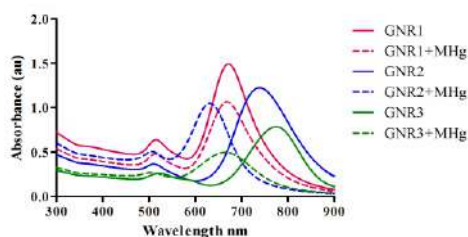

Fig. 7 Normalized intensity of UV-visible spectral change of gold NRs after interaction with 10^{-4} M of CH_3Hg^+

Morphological analysis of gold NRs before and after interaction

TEM analysis was carried out to analyze the changes in the morphology and size of the gold NRs (GNR3) before and after interaction with CH_3Hg^+ pre-reduced by $NaBH_4$ with equal volumetric ratio. Fig. 12A shows the TEM image of uniformly distributed rod-shaped gold NPs (GNR 3) with an average breadth of 15.1±0.5 nm and length of 50.2±0.5 nm, and the aspect ratio was found to be 3.3. The TEM image of gold NRs interacted with CH_3Hg^+ at a concentration of 10^{-4} M displays the aggregated gold NRs along with a few rods, sphere-shaped and irregular-shaped particles, which confirmed the deformation of gold NRs (Fig. 12B). Fig. 12C reveals the TEM image of gold NRs after interaction with 10^{-5} M concentration of CH_3Hg^+, which exhibits an average length of 41.6±1.5 nm and breadth of 16.0±0.2 nm, corresponding to an aspect ratio of 2.6. The aspect ratio was found to be lesser as compared to the uninteracted gold NRs. Thus, this result confirmed that the aspect ratio of gold NRs was reduced upon its interaction with CH_3Hg^+, which can be due to the amalgamation process. This was further supported by energy dispersive X-ray analysis (EDX) spectrum (Fig. 12D–F). The EDX spectrum of gold NRs treated with CH_3Hg^+ ions shows the presence of mercury (Hg) that was due to the formation of gold – Hg amalgamation.

Characterization of as-synthesized citrate-capped gold NPs

The gold NPs was prepared by reducing $HAuCl_4$ with trisodium citrate that results in wine red colloidal solution. The UV-visible spectroscopy analysis was performed to study the surface plasmon property of the as-synthesized citrate-capped gold NPs The as-synthesized gold NPs were subjected to UV-visible spectroscopic analysis to study the surface plasmon property of the NPs. Fig. 14 shows the absorbance spectra of the gold NPs capped with citrate ions. The absorbance spectra of citrate-capped gold NPs show a distinct, prominent peak at the wavelength of 524 nm. Dynamic light scattering analysis determined the particle size of the citrate-capped gold NPs without further modification. Fig. 15 shows the size distribution of citrate-capped gold NPs. The mean hydrodynamic diameter (MHD) of as-synthesized gold NPs was found to be 15±1 nm. Further, the morphology of the citrate-capped gold NPs was determined by TEM analysis. TEM image of citrate-capped gold NPs shows the monodispersed spherical shaped particles having the diameter within the range of 14 to 16 nm (Fig. 16).
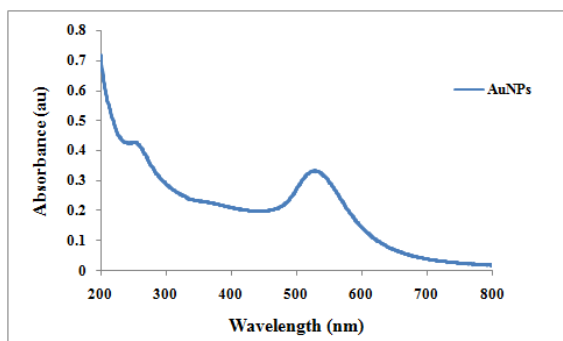

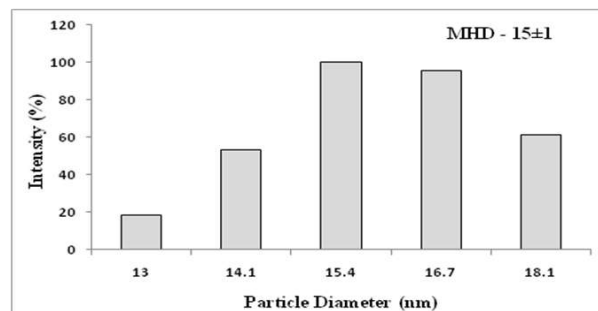Fig 14. UV-vis spectra of as-synthesized of gold NPs synthesized of gold NPs

Fig 15. The particle size distribution of as-synthesized of gold NPs

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A Review on Comprehensive Study of Health Care System for Diagnosis Improvement

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Abstract: In the current healthcare landscape, accessing timely and affordable medical assistance for specific diseases can be a challenging process. Especially in remote areas, where access to doctors or hospitals is limited, identifying diseases becomes even more difficult. However, there is a potential solution through the implementation of an automated program that streamlines this process, ultimately saving time, reducing expenses, and improving overall convenience for patients. Introducing the Healthcare Management System, a web-based application designed to predict a patient's disease founded on the indications they provide. This innovative system utilizes comprehensive data sets collected from various health-related sources to assist users in identifying potential diseases accurately. With 24/7 internet accessibility, this platform proves to be highly beneficial for individuals seeking medical information at any time. The primary research objective of the Healthcare Management System is to establish a well-organized health system that significantly enhances patient satisfaction and ensures better doctor availability while optimizing available resources. One crucial aspect of the system is the centralized patient ID database, which enables patients to access their complete medical history from any medical facility where they have received diagnosis or treatment. Additionally, this centralized system facilitates doctors' access to patients' comprehensive case history, streamlining the process of recommending appropriate and personalized treatments. By incorporating cutting-edge technology and a user-friendly interface, the Healthcare Management System aims to revolutionize the way medical assistance is delivered, making it more accessible, efficient, and patient-centric.

Keywords: HMS, Naive Bayes, Prediction

1. INTRODUCTION

The demand for Healthcare Management has witnessed a substantial increase in recent times due to its significant role in efficiently managing hospitals and medical offices. The scope of Healthcare Management Systems continues to expand every day, making it a global phenomenon. Several factors contribute to the growing demand for these systems in the healthcare sector. Improved awareness about Healthcare Management services, advancements in health policies, and a rising demand for world-class healthcare facilities are some of the key drivers. In today's ever-changing world, healthcare management has become essential for healthcare providers to remain competitive in the industry and deliver better care to patients. Healthcare Running Schemes, also known as Healthcare Information Running Schemes, are specifically designed to streamline the collection, storage, retrieval, and exchange of patient healthcare information, ultimately leading to improved patient care. By implementing these systems, the burden of manual record-keeping in files is significantly reduced, as all data is efficiently maintained in a centralized database, making data retrieval and updates a seamless process. Access to historical data becomes effortless, enabling healthcare providers to make informed decisions.

Moreover, these systems aim to foster better self-management by providing tools and resources to patients for taking charge of their health. As Healthcare Management Systems continue to evolve and enhance, they play a pivotal role in transforming healthcare delivery, making it more effective and patient-centric.

1.1 Five phases of HMS

1.1.1 Phase 1- Unique Patient ID Generation
In this phase when a patient is going to visit any hospital its unique id was generated which includes its complete diagnosis reports and its treatment parameter also it includes all the details of its lab reports, X-Ray, MRI and many other details. The ID can be searched on the basis of patient name, mobile number and its Id itself. The only necessity is that the hospital needs to connect to centralized database.

1.1.2 Phase 2 – Disease Diagnosis and recommended diet and exercise
Once the patient ID is generated and all lab reports manuals entry and symptoms of patients was done along everything was stored in the system and depend upon that database only, the disease was predicted and proper diet and exercise is recommended

1.1.3 Phase 3 –Doctor Prediction System
Once the disease was predicted by the system, it became easy in the last phase to recommend the doctor by referring to the individual doctor's patient history, the doctor can be predicted for proper diagnoses which definitely save the patient time and money.

1.1.4 Phase 4 – Effective diagnosis system

It helps to diagnose the disease with proper utilization of database resources generated through various patient and doctor management systems. When a patient need to cure it helps to diagnose the patient with effective medication and treatments with proper history of the patients

1.1.5 Phase 5 – Doctor referencing

With this model it becomes easy for doctors to get the information of new research and work predicted in various countries which help to manage the resources of doctors at any time and consult for the betterment of patients. In this pandemic situation if the doctors understand the diagnosis information then it might get easily understandable by others doctors and researcher which also helps to reduce the spread.
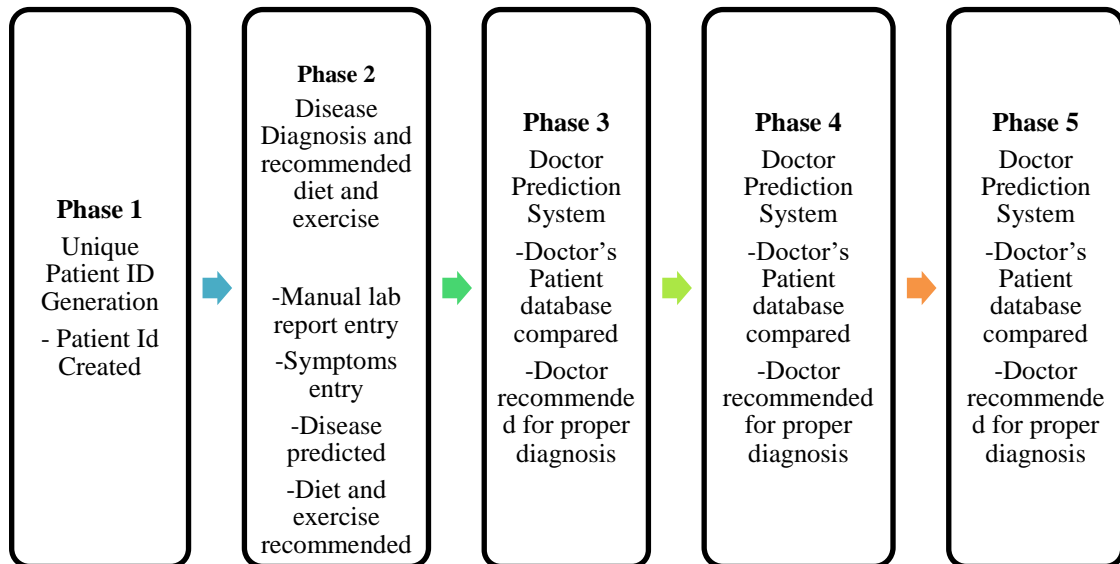

Fig 1.1: Flow of the process

2. LITERATURE SURVEY

In today's fast-paced and high-pressure modern lifestyle, many individuals struggle to sustain a healthy lifestyle, leading to a lack of exercise and eating disorders. As a result, there is a shortage of medical assets to encounter the healthcare needs of all persons, and continuing illnesses are on the rise, particularly among the younger generation. To address these challenges, several companies have collaborated with medical organizations to develop remote observing structures aimed at efficiently managing patients and providing timely assistance to the elderly, along with proposing self-health management systems to prevent chronic illnesses.

One such health management system is iHealth365, a platform used by medical organizations or firms to accomplish the wellbeing of consumers or workers. iHealth365 enables users to upload reports from regular complete physical inspections, and it analyzes the energetic signs from these reports. The platform provides health risk assessments, health data conception, and a reminder system to help users stay on track with their health goals. Additionally, the iHealth365 smartphone app offers personalized improvement plans to help users retain their health. Medical specialists can also utilize this system to provide real-time support and feedback to their patients. While iHealth365 collects data from wearable devices, it currently requires medical experts to analyze reports and suggest personalized guidelines for diet and exercise.

In a separate study, Lin et al. introduced VASP an assistant system designed for individual wellbeing supervision. VASP analyzes regular complete physical inspection reports to assess health risks and provides modified healthcare facilities, including diet and exercise guidelines. The system supervises and reminds users to adhere to the recommended personalized plans. Although VASP automatically provides modified diet and exercise references based on individual reports, it lacks real-time interaction with users.

Another research focused on finding the greatest medical analysis mining method. They associated with Naïve Bayes and a simple rule-based algorithm using actual medical difficulties from the UCI machine learning repository. The experiment revealed that Naïve Bayes outperformed the other algorithms in eight out of fifteen data sets, making it the preferred technique for projecting correctness.

Darcy A. Davis, Nitesh V. Chawla, Nicholas Blumm, Nicholas Christakis, and Albert-Laszlo Barabasi recognized the inefficiency of the global treatment of chronic diseases in terms of time and cost. As a solution, they developed CARE, a framework that predicts future disease risks based on a patient's medicinal past using ICD-9-CM codes. CARE combines collaborative filtering methods with clustering to predict individual patients' greatest disease

risks, offering correct initial notices for thousands of diseases, sometimes years in advance. The ICARE version further improves performance by incorporating ensemble concepts. CARE's potential lies in exploring wider disease histories, suggesting before unthinking worries, and enabling discussions about early testing and prevention.

An investigative study done by Jyoti Soni into contemporary knowledge discovery techniques within databases through data mining, with a specific focus on predicting Heart Disease in the realm of medical research. They undertook experimental analyses that involved contrasting predictive data mining methods using the same dataset. Their findings revealed that among the employed techniques, the Decision Tree model exhibited superior performance compared to other methods, with Bayesian classification displaying a similar level of accuracy. Conversely, methods like K-Nearest Neighbors (KNN), Neural Networks, and clustering-based classification demonstrated subpar results.

The researchers also noted that the application of a genetic algorithm to reduce data dimensions further enhanced the precision of both Decision Tree and Bayesian Classification for predicting heart disease. To practically implement their findings, an Intelligent Heart Disease Prediction System was developed utilizing data mining techniques, specifically Decision Trees, Naïve Bayes, and Neural Networks, with the .NET platform serving as the foundation. This IHDPS is a user-centric, web-based, adaptable, trustworthy, and scalable system capable of handling intricate "what if" inquiries.

By leveraging crucial medical attributes such as age, gender, blood pressure, and blood sugar levels, the system forecasts the likelihood of patients developing heart disease. It delivers valuable insights by uncovering significant patterns and correlations existing among medical factors associated with heart disease. During an experiment featuring 909 records and 15 medical attributes extracted from the Cleveland Heart Disease database, Naïve Bayes demonstrated the highest accuracy rate in correctly predicting patients afflicted with heart disease (86.53%). In close proximity, the Neural Network approach displayed strong performance, while the Decision Trees method excelled in predicting patients without heart disease (89%).

3. PROBLEM FORMULATION

In the modern scenario, it is crucial to prioritize preventive measures tailored to individual wellbeing matters and make necessary adjustments in nourishment and workout as recommended by healthcare professionals. However, many individuals struggle to adhere to these guidelines. To address this challenge and promote better health habits, we require a comprehensive system that guides and raises awareness about health conditions based on symptoms.

Traditional methods focused on common diseases, providing limited diet plans that were difficult for patients to follow. Moreover, these methods lacked exercise recommendations to aid in patient relief. By cultivating a habit of consistent comprehensive physical examinations or self-measurements using medical strategies, individuals can better understand energetic signs and physiological changes, helping detect and treat diseases. Despite several health management systems offered by medical institutions to record daily health capacities, users still need to visit these institutions to seek self-care guidelines from healthcare providers. It is essential to analyze regular complete bodily inspection reports to compute health risks and offer modified health care services, including diet and exercise guideline recommendations. To address these challenges, our system is designed to not only consider patient symptoms but also suggest suitable exercises. The approach to problem analysis aligns with the project's recommendations, ensuring satisfaction with the outcomes. Although previous health care management systems exist, they lack the automatic provision of personalized diet and exercise guidelines and may lack real-time responsiveness and user interaction. Additionally, these systems may fail to provide disease precautions or suggest relevant tests.

4. PROPOSED SYSTEM

With the help of HMS Below mentioned methodology will work.
4.1 User Registration:
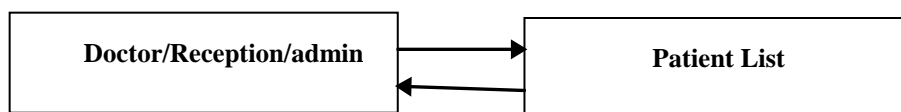The Patient or user can do the registration by its own or with the help of admin.

Fig4.1: Patient Registration

4.2 Symptoms Valuation
The symptoms given by patient and also enlisted by Doctor will go through the checking with available Dataset of Symptoms.
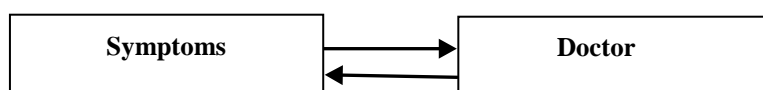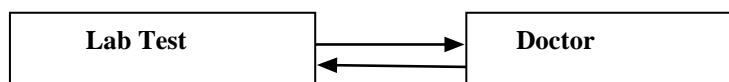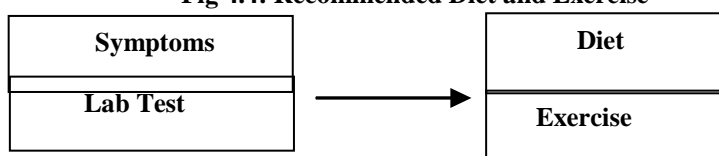
Fig 4.2: Symptoms Valuation

4.3 Lab Test

Depending on the results of symptoms valuation some lab tests may be suggested to the patient by the doctor.

Fig 4.3: Lab Test

4.4 Recommended Diet and Exercise Chart

In Next step patient database is compare with saved dataset and generates the diet and Workout suggestions.

Fig 4.4: Recommended Diet and Exercise

4.5 Assessment of Patient

As per the conclusion after examination of patient history, doctor will suggest medicine and later tests to the patient.
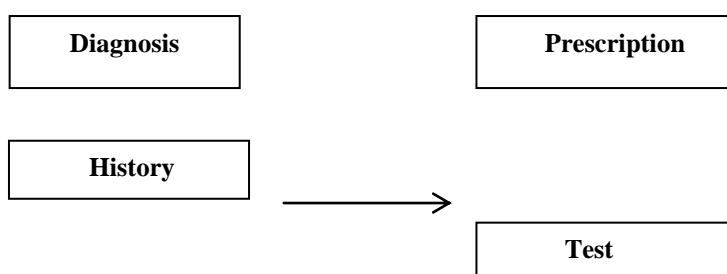
Fig 4.5: Assessment of Patient

5. CONCLUSION

This paper aims to predict the illness on the foundation of the indications. The methodology is considered in such a way that it takes symptoms from the patient as input and produces output i.e. predict disease and consequently provide a guideline for diet, precautions and exercise for the probable predicted disease. Health Management System is successfully implemented using django framework. This is a strong system, which allows user based consent on units, pages and even controls inside pages. The system is easy to use, user friendly and is readily available to the end users. Thus, we can say that this system can help people to control the disease and live a healthy lifestyle. Thus our HealthCare System provides diet, exercises along with precautions and suggested tests depending on the symptoms given and hence it helps in better patient care. It promotes better coordination among different departments and provides top management a single point of control. The system reduces paper work to a great extent and avoids the missing of any data along with easy updating facility.

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Use of Artificial Intelligence for Agriculture Crop Management in Fuzzy Logic

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ABSTRACT: This research paper offers a methodical application of artificial intelligence approaches to agricultural crop management. Numerous issues, including disease and pest infestation, improper soil management, insufficient irrigation and drainage, and many more, pose obstacles to agriculture. These lead to significant crop failure as well as environmental risks from the overuse of chemicals. Numerous studies were conducted to address these concerns. Because of its strong learning capabilities, Artificial intelligence has become an essential instrument for addressing a multitude of agricultural-related problems. Technologies are being created to help the world's agriculture specialists come up with better answers. The industry must overcome several obstacles to maximize production, such as poor soil management, disease and pest infestation, the need for big data, low productivity, and a knowledge gap.

Keywords— Artificial Intelligence; Agriculture; Fuzzy logic; Artificial Neural Networks

I. INTRODUCTION

A crucial field of study in computer science is artificial intelligence (AI). AI is quickly becoming omnipresent due to its vast range of applications and rapid technological improvement. This is because it is particularly applicable to certain problems that traditional computer structures and people are not very good at solving [1]. Agriculture is one such extremely important field, employing about 31.5% of the world's workforce directly on 2897 million hectares of cropland. From planting to harvesting, such an endeavour encounters several difficulties and may not always go as planned. The main problems include infestations by pests and diseases, insufficient chemical treatment, incorrect irrigation and drainage, weed management, yield projection, etc.

Any financial system's sustainability is based on agriculture [1]. It is important for long-term structural change and economic boom [2-4], but it can also vary among countries [5]. Historically, agricultural activities have been limited to crop and food production [6]. However, over the last 20 years, it has changed to include the production, distribution, marketing, and processing of plant and animal products. Nowadays, agriculture provides the primary means of subsistence, boosts GDP [7], facilitates trade throughout the nation, lowers unemployment, supplies raw materials for use in a variety of businesses, and generally boosts the economy.

In 1983, it was originally proposed that computers may be used in agriculture [2]. A variety of strategies, ranging from database [3] to selection assistance structures [4], have been proposed to address the present issues facing agriculture. Artificial intelligence (AI)-based frameworks have been found to perform the best among these options in terms of accuracy and resilience. Agriculture is a dynamic field where common sense is not always applicable when recommending a course of action. Our ability to comprehend the intricate specifics of every situation and provide a solution that is a good fit for that particular issue has been made possible by AI approaches. As a multitude of AI techniques advance, increasingly complicated problems are being resolved. It discusses one hundred key contributions where artificial intelligence techniques were used to address issues in agriculture. Expert systems, artificial neural networks, and fuzzy algorithms are the three main AI approaches that are thought to be the main areas of study. This study aims to provide readers with an understanding of the steady evolution of agro-intelligent systems during the last 39 years, from 1982 to 2021, by addressing the use of AI technologies in the core subdomain of agriculture.

II. GENERAL CROP MANAGEMENT

Crop management systems, in general, provide an interface for the routine management of vegetation that covers every aspect of farming. McKinion and Lemmon first put up the idea of applying AI to crop management in their 1985 work "Expert Systems for Agriculture" [5]. Boulanger once suggested another corn crop safety professional equipment in his doctoral thesis [6]. For the management of apple plantations, Roach et al. presented the professional device POMME in 1987 [7]. A specialized tool called COTFLEX was developed by Stone and Toman for the management of cotton crops [8]. With Lemmon's assistance, COMAX, a different rule-based professional instrument, was developed for the administration of cotton crops [9]. In order to shield citrus plants from frost damage on Sicily Island in Italy, Robinson and Mort developed a multi-layered feed-ahead artificial neural network-based device [10]. To train and test the network, the input and output parameters have been coded in binary form two. The authors achieved the highest accuracy mannequin by using particular input settings. The well-found model included two output classes and six inputs, and its accuracy was 94%. Li, S. K. et al. previously developed a photograph-based AI method for wheat crop [11], which strengthened the image information by using a pixel labelling algorithm observed by Laplace transformation. With five hidden layers trained through 300,000 iterations, the nice community achieved an accuracy of 85.9%. Prakash, C. et al. developed a common sense-based soybean crop management device that provided guidance on crop selection, fertilizer use, and pest-related issues [12].

III. PEST MANAGEMENT

One of the most concerning problems in agriculture that causes significant financial losses is insect pest infestation. Researchers have long worked to lessen this hazard by creating computer systems that can identify active infestations and recommend preventative actions. Pasqual and Mansfield [13], Batchelor et al.'s SMARTSOY [14–15], Mozny et al.'s CORAC [16], Knight and Cammell [17], Chakraborty et al. [18], are just a few of the many rule-based professional systems that have been suggested. Because agricultural administration expertise is frequently imprecise,

ambiguous, and incomplete, using a rule-based expert system may also introduce uncertainty. Ghosh et al. used an object-oriented approach to build a rule basis for developing TEAPEST [19], a specialized tool for tea pest control. Additionally, a system of identification and consultation that is segment-by-segment has been implemented here. In order to get higher classification charges, this device was then rebuilt by Samanta and Ghosh using a multi-layered back propagation neural network.

IV. DISEASE MANAGEMENT

A farmer may also face serious challenges due to crop diseases. To identify a sick plant and conduct the necessary recovery actions, a significant amount of knowledge and experience are needed. Around the world, computer-aided systems are utilized to identify illnesses and recommend treatment options. In order to predict sicknesses basically only on leaf wetness length. Several mannequins, primarily based on synthetic neural networks, have been developed to manage disorder in various crops. Reducing the financial and esthetical harm that plant diseases inflict is the aim of plant disease management. Plant disease control has been the phrase used historically, however modern social and environmental principles view "control" as absolute and find the term excessively restrictive. However, this change in perspective has led to more integrated and diversified approaches to disease management. It is no longer standard practice to employ single, frequently harsh procedures like burning, fumigation of the soil, or pesticide sprays. Furthermore, rather than being based on a schedule or prescription, illness management practices are often dictated by disease modelling or forecasting.

V. WEED MANAGEMENT

There have also been some suggestions for hybrid constructions. In order to categorize diseases affecting Phalaenopsis seedlings, Huang proposed using a synthetic neural network mannequin in conjunction with a picture processing model [20]. Sannakki et al. used picture processing in conjunction with a fuzzy good judgment technique to determine the amount of pollution in a leaf [21]. With the help of Al-Hiary et al. [22] and Bashish et al. [23], a machine that uses the k-means segmentation technique was constructed. Dr. Wheat is an online highly skilled tool designed by Khan and colleagues to identify wheat illnesses [24].

VI. SUPERVISION AND STORAGE MANAGEMENT OF AGRICULTURAL PRODUCTS

Monitoring, storing, drying, and grading of harvested plants are essential aspects of agriculture in addition to controlling pests and diseases. This section discusses some food monitoring and excellent management systems that use artificial intelligence. Kavdir et al. [25], Gottschalk et al. [26], and Escobar et al. [27] are three of the authors of the fuzzy logics-based whole structures that were built. These include the following systems: Miranda and Castano [28], Perez et al., [29], Martynenko and Yang [30], Movagharnejad and Nikzad [31], Khazaei et al. [32], Higgins et al. [33], Chen and Yang [34] and Boniecki et al. [35].

VII. SOIL AND IRRIGATION MANAGEMENT

In agriculture, problems with managing the soil and irrigation are crucial. Crop loss and poor quality are the results of improper irrigation and soil management. This section summarizes some of the studies done on soil and irrigation management with the use of artificial intelligence and cunning approaches. A completely professional machine with a rule-based architecture was created by Brats et al. [36] to evaluate the design and general functionality of micro irrigation systems. Farmers' expertise was used by Sicat et al. [37] to develop a fuzzy primarily based system that suggests crops based on maps of land suitability created by the fuzzy system. Si et al. [38], Tremblay et al. [39] are two such fuzzy-based architectures. Using soil water satisfied records and meteorological data, Valdes-Vela et al. employed a Takagi Sugeno Kang fuzzy inference system to estimate the stem water reachable of a plant [40]. Arif et al. [41] built an incredibly well-based system for estimating soil moisture in paddy fields using a synthetic neural community. Other well-known systems that use synthetic neural communities for irrigation and soil management include Comstock and Broner [42]. He, Song [43]. Hinnell et al. [44], Zhai et al. [45], Patil et al. [46], Hinnell et al. [44]. This study demonstrated that radial foundation characteristic neural networks have superior quality when compared to other designs. The environment and human fitness are directly impacted by the use of herbicides. Through targeted weed management, modern AI technologies are being used to reduce the administration of herbicides. A rule-based specialized tool was created by Pasqual [47] to identify and eradicate weeds from crops such as wheat, barley, oats, and triticale. Burks et al. [48] identified weeds belonging to five amazing species using laptop vision and a neural community with expertise in repeat propagation. The three neuronal community models that Burks et al. [48] contrast primarily lower back propagation, counter propagation, and with the same set of inputs as the previous article, a model focused mostly on radial foundation characteristics was found to perform quality with 97% accuracy in the lower back propagation network. An additional method that was developed using image analysis and neural networks was made possible with the help of Shi et al. [49]. Eddy et al. [50], and Barrero et al. [51] presented some excellent work.

VIII. ACQUIESCE PREDICTION

The crop yield estimate is incredibly helpful for estimating agricultural costs and developing marketing strategy. Furthermore, prediction models can be used to complete an examination of relevant factors that immediately affect yield in the era of precision agriculture. Thomas van Klompenburga, Ayalew Kassahuna, Cagatay Catalb [52] predicted yield from soil factors using an artificial neural network model that used the back propagation mastering

algorithm. Singh [53] are the other outstanding studies. In order to predict seven unique crop yields using atmospheric inputs and fertilizer consumption,

IX. CONCLUSIONS

For the final 39 years, from 1982 to 2021, this study covers more than 100 research articles published in the field of software-based artificial intelligence technologies in agriculture. In this limited area, there are a lot of works that remain uncited. In order to address the multidimensional methods, just a select few representatives are picked. The details of several AI techniques used in agriculture are included in this paper in an effort to make it as educational as possible. Fuzzy inference structures and artificial neural network designs have supplanted rule-based professional structures, which were widely utilized in the early 1980s and 1990s. The use of hybrid structures, such as neuro-fuzzy or photo processing combined with artificial neural networks, has increased dramatically in recent years. It is moving toward more real-time, highly automated, and accurate structures. More studies using better tools are being conducted in order to shift conventional agriculture toward low-value precision agriculture.

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Incorporating Mobile-Assisted Language Learning (MALL) within the Pedagogical Framework of English Language Teaching (ELT) in Engineering Education Contexts

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Abstract: Mobile Assisted Language Learning (MALL) represents a dynamic and innovative approach to language education. It leverages mobile devices to enhance language acquisition and proficiency, offering learners versatile tools for listening, speaking, reading, and writing in the target language. This abstract provides an overview of the key components and benefits of MALL, highlighting its integration into traditional classroom settings. It discusses how MALL promotes self-paced learning, enables easy submission and feedback on assignments, and fosters peer-to-peer interaction. The abstract also addresses the growing importance of MALL in modern education and its potential to significantly impact language learning outcomes.

Keywords: Mobile Assisted Language Learning (MALL), language competence, engineering students.

Introduction

The integration of technology within the realm of language education has witnessed a notable transformation in recent years. Among the innovative approaches that have emerged, Mobile-Assisted Language Learning (MALL) stands as a significant development. MALL capitalizes on the ubiquity of mobile devices and their potential to enhance language acquisition, particularly in the context of English Language Teaching (ELT). Georgiev et. al (2015) represented MALL using the figure below:
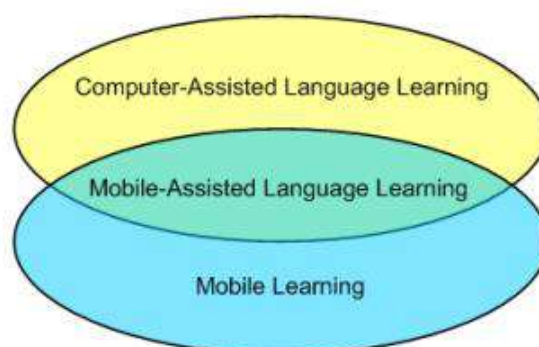

Fig 1

Mobile-Assisted Language Learning (MALL) has experienced a notable surge in popularity since the 2000s. This surge coincided with the widespread availability of a diverse range of portable electronic devices, including laptops, mobile phones, tablets, and PDAs, which are now extensively utilized within educational institutions. Furthermore, contemporary teaching methodologies, such as collaborative learning, gamification, and project-based learning, necessitate a transition from traditional teacher-centred approaches to more student-centred approaches. The integration of MALL has been identified as a pivotal means to facilitate this shift (Bernacki et al., 2020; Kara, 2023). As technology becomes an increasingly integral part of educational environments, the present paper provides a review of the concept and significance of MALL within the broader landscape of language education in engineering institutions.

Mobile-Assisted Language Learning Tools and Applications

MALL refers to the use of mobile devices such as smartphones and tablets to assist in language learning. These tools and applications leverage the mobility and technology of these devices to make language learning more engaging and accessible. Here's an explanation with key components:

Language Learning Apps: Various language learning apps are available for different platforms (iOS, Android). These apps are designed to provide a structured language learning experience, incorporating features like vocabulary quizzes, grammar exercises, and pronunciation practice.

Flashcards and Vocabulary Apps: These apps help learners acquire and memorize new words and phrases. They often use spaced repetition algorithms to optimize retention.

Interactive Language Learning Games: Gamification elements make language learning fun and engaging. Users can compete with others, earn points, and unlock new content as they progress.

Language Exchange and Tandem Learning Apps: These apps connect learners with native speakers for language exchange. Users can chat, voice call, or video call with partners to practice speaking and listening skills.

Text-to-Speech and Speech Recognition: Many MALL apps offer text-to-speech and speech recognition features, which help learners practice pronunciation and conversation.

Grammar Checkers and Language Correction Tools: These tools assist learners in writing and understanding the grammatical aspects of a language.

Language Learning Communities: Online communities and forums connect learners with similar goals and interests. Users can discuss language-related topics, ask questions, and seek help.

Following are some examples of language learning Apps with their specific features:

Sl No	Name	Specific Features
1	Babbel	• Interactive dialogue recognition • Flexible and shorter duration lessons • Unique teaching style
2	Lirica	• The lyrical database is ample for various languages • A top option amongst the best language learning apps for speaking English
3	Memrise	• Designed for real-world conversations • Lots of elements (games, extra content)
4	Duolingo	• Free language learning with low premium starting • A large number of lessons
5	Mondly	• Innovative features to keep you interested • A large array of source and target languages
6	Busuu	• Interaction with native speakers • Goal-oriented approach
7	LingoDeer	• Offline study modes • Complete challenges with other learners
8	HelloTalk	• Free app requiring no payments for access to content • It provides an immense interactive experience

Fig. 2 Adopted from https://amberstudent.com/blog/post/best-language-learning-apps

Impact of MALL on Students' Language Proficiency and Engagement

Contemporary pedagogical approaches underscore the idea that technical learners have the capacity to collectively build knowledge within a community, fostering the free exchange of ideas. Furthermore, these approaches emphasize that learners can take on a more active role in the learning process, moving away from passive engagement. Furthermore, at the tertiary level, technical students are encouraged to engage in research by exploring various sources, which allows them to delve into details driven by curiosity. In this context, mobile-assisted language learning presents a significant opportunity to address the needs of both students and educators. Mobile devices provide users with several advantages, including portability and connectivity, thereby enhancing their value in the realm of education (Rocque, 2022). When learners possess portable devices equipped with internet connectivity, their motivation and engagement correspondingly increase (Celik et al., 2022). The integration of mobile devices is perceived as a facilitator in harnessing the full potential of learners when integrated into a well-structured and closely monitored educational framework. Mobile devices offer versatility and cater to users' diverse needs across various domains. In recent times, they have gained increased popularity in social life, enabling users to engage in activities like texting, emailing, online shopping, video viewing, video calling, accessing the latest news, navigation, hotel room bookings, and restaurant reservations, among others. Similarly, mobile devices have found extensive application in the field of education (Grigoryan, 2022; Kara & Yildiz, 2022).

Moreover, educators possess the capability to upload their instructional video content for consumption by both their enrolled students and the broader public. This feature provides an extensive window for viewers to revisit and reinforce their understanding, should they encounter any gaps in comprehension during their conventional coursework. Furthermore, instructors can distribute web links to administer online quizzes, the results of which subsequently undergo item analysis. Consequently, students are afforded the opportunity to discern and rectify their errors, thereby deriving valuable insights that can aid in averting repetition of these mistakes in forthcoming quizzes. Administering online quizzes not only contributes to environmental conservation but also optimizes the efficient use of time and energy resources. Furthermore, parents can leverage mobile devices to access comprehensive feedback through Learning Management Systems (LMS), facilitating real-time communication with educators (Alamer & Al

Khateeb, 2023; Kara, 2020). Assignments, which serve as pedagogical tools for fostering student development, are similarly enhanced through mobile devices, enabling individuals to broaden their knowledge across diverse domains (Dayan & Yildiz, 2022). As an illustration, a culinary enthusiast may explore novel recipes, an engineer can glean insights into constructing more resilient structures, an artist can harness creativity in drawing, retirees can discover new hobbies, avid learners can acquire proficiency in new languages, and parents can access guidance on effective child-rearing practices. It can be posited that mobile devices have become central to people's lives, serving multifaceted roles in various domains. Mobile-Assisted Language Learning (MALL) initiatives have emerged as effective means to enhance learners' proficiency in the four core skills of English Language Learning. MALL materializes when conventional classroom instruction is complemented by the integration of mobile devices (Bernacki et al., 2020).

The present pedagogical approach manifests in several facets, such as learners utilizing their mobile devices to engage in listening exercises and undertake pertinent revision assessments. Moreover, they can peruse electronic books to refine their pronunciation and augment their comprehension abilities. Subsequently, learners can enhance their oral communication skills through video conferences, either individually or in collaborative settings, as a means to express their ideas. Beyond these aspects, MALL is instrumental in advancing learners' writing proficiencies. For example, learners can electronically access sample paragraphs and essays prior to their own writing tasks, enabling them to gain familiarity with the overall structural organization and identifying key terminology to incorporate into their own written compositions. Furthermore, learners have the capability to electronically submit their assignments via platforms such as Google Forms, WhatsApp, or Viber. This digital submission process greatly facilitates the teacher's ability to efficiently manage and provide feedback on the submitted works. Additionally, learners' motivation is enhanced by electronic submissions as typing is generally anticipated to be less time-consuming than traditional paper-based writing. Moreover, instructors can transmit their evaluations and feedback electronically to assess the students' written compositions. Furthermore, the potential for peer learning is harnessed as teachers can showcase a student's work and await feedback from their peers through mobile devices (Abubakr & Kara, 2022). In light of these advantageous contributions to the field of education, the proliferation of Mobile-Assisted Language Learning (MALL) initiatives is expected to increase across educational institutions on a global scale.

Disadvantages of MALL

Mobile Assisted Language Learning offers numerous advantages, but it also has its share of drawbacks. These disadvantages should be considered when implementing MALL in an educational setting to ensure a balanced and effective language learning experience.

Digital Divide: Not all students have access to smartphones or other mobile devices, and this can create an inequality in access to MALL resources. Students without access to such devices may be left at a disadvantage in a technology-driven language learning environment.

Distraction: Mobile devices are often equipped with a multitude of apps and functions, which can be distracting for learners. It can be challenging for students to stay focused on language learning when other forms of entertainment or communication are readily available on the same device.

Limited Screen Size: The small screen size of mobile devices can make it less than ideal for reading longer texts or engaging in more complex language learning activities. This limitation can hinder comprehensive reading and writing tasks.

Data and Connectivity Issues: MALL heavily relies on internet connectivity, and students may face connectivity issues or incur high data costs. This can make it impractical for some learners, particularly those in areas with limited or unreliable internet access.

Reduced Interpersonal Interaction: MALL often promotes independent learning, which can lead to reduced face-to-face interaction between teachers and students and among peers. This lack of real-time human interaction can impact speaking and listening skills development.

Quality of Learning Materials: The quality of language learning apps and materials available on mobile devices can vary significantly. Some may not be well-designed or may lack educational effectiveness, which could impede learning progress.

Security and Privacy Concerns: Using mobile devices for language learning can raise security and privacy concerns, especially when dealing with sensitive personal data. Inadequate safeguards could expose learners to privacy risks.

Over-Reliance on Technology: Overemphasis on MALL can lead to an over-reliance on technology in the language learning process. This may lead to a situation where students are less capable of functioning without digital aids.

Lack of Physical Materials: In some cases, MALL may entirely replace traditional textbooks and materials. This can be problematic if students are not exposed to physical materials, which are still important for language learning and cognitive development.

Loss of Cultural Context: Some MALL resources may not adequately address the cultural context of the language being learned. Cultural nuances and context are important in language acquisition, and if MALL resources neglect these aspects, learners may have an incomplete understanding of the language.

Conclusion

Mobile-Assisted Language Learning (MALL) is a pedagogical approach that leverages mobile technologies, such as smartphones and tablets, to enhance language acquisition and education. It capitalizes on the inherent flexibility, accessibility, and ubiquity of these devices, making it a powerful tool for acquiring language proficiencies. MALL

integrates digital applications, educational software, and online resources into language learning curricula. It allows learners to engage with language materials, practice speaking, listening, reading, and writing skills, access multimedia content, and receive real-time feedback at their convenience. This approach accommodates different learning styles, paces, and preferences, fostering more personalized and interactive language learning experiences. MALL's benefits include increased learner motivation, opportunities for self-directed learning, and access to authentic language resources. In the context of English Language Teaching (ELT), it complements traditional classroom instruction and extends learning beyond the confines of the classroom. By offering mobile-assisted tools, learners can practice English in real-world situations and contexts, which are crucial for developing functional language skills.

MALL is not limited by geographical boundaries, making it especially valuable for remote or underserved areas, offering learners the opportunity to connect with global English language resources and communities. It's a dynamic and evolving field, continually shaped by emerging technologies and pedagogical insights. The present review delves into the examination of MALL's impact on the improvement of students' language learning capabilities, where mobile devices and online learning seem to have a positive impact on engineering students' language proficiency.

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Content-Based Visual Search: Harnessing Color and Edge Attributes

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Abstract- In recent years, the proliferation of multimedia content, particularly images, has witnessed an unprecedented surge, with over 1.8 billion digital images being uploaded daily to various online and offline platforms such as Google Photos, Twitter, Facebook, Instagram, and more. The quest for relevant images within this vast repository has emerged as a compelling challenge for the computer science community. The traditional approach of manual annotation through keyword entry or indexing in large image databases can be labor-intensive and often fails to capture the nuanced descriptors necessary for a comprehensive image description. The effectiveness of keyword-based image search is subjective, contingent on individual interpretations, and lacks a standardized framework for evaluation. Similarly, Content-Based Image Retrieval (CBIR) systems encounter analogous challenges in defining their success rates. The idea of limiting search queries to pre-defined criteria or categories, established by human intuition and predefined standards, introduces uncertainty into the retrieval process. This is where the concept of "Content-Based Visual Search: Harnessing Color and Edge Attributes" comes into play. This approach, centered on the utilization of YC_bC_r color space, color histograms, and edge histograms, allows for a more data-driven, content-centric image retrieval system. This paper explores the efficacy of harnessing color and edge attributes in the context of CBIR, offering a framework that prioritizes the content itself over human-defined limitations. By leveraging the inherent visual characteristics of images, this approach aims to enhance the accuracy and relevance of image retrieval, transcending the constraints imposed by traditional keyword-based methods.

Keywords: YC_bC_r color space, Color histogram, Edge histogram, Content-Based Image Retrieval (CBIR).

I. INTRODUCTION

Content-Based Visual Search, particularly harnessed through the analysis of color and edge attributes, plays a pivotal role in modern information retrieval systems. The primary objective of content-based image retrieval (CBIR) is to locate images within extensive datasets that exhibit similarities to a given query image. The 'content-based' aspect of CBIR distinguishes it from traditional metadata-dependent searches, as it delves into the intrinsic characteristics of the image itself, encompassing elements such as shapes, colors, and textures.

The significance of CBIR has grown significantly in recent years, paralleling the exponential increase in digital image and video collections available on the internet and the expanding storage capacities of personal devices. The success of a CBIR system is inherently tied to the efficacy of the image's feature representation and the measurement of similarity.

However, a fundamental challenge persists: the transition from low-level image attributes to high-level semantic content remains a complex problem. This bridges the wider issue faced by artificial intelligence, aiming to equip machines with human-like problem-solving capabilities. Machine learning has shown promise in addressing this challenge over the long term.

In response, research directions have bifurcated: the pursuit of richer low-level features to enhance CBIR performance, and the integration of text-based retrieval with content-based approaches wherever feasible. Several image search engines incorporate keyword annotations, leading to systems like IBM's QBIC and Columbia University's Visual Seek, which laid foundations for CBIR.

Our contribution in this paper lies in the proposal of an algorithm that harnesses the spatial features of color and edges within images for retrieval. By computing color and edge histograms within image regions, we measure the similarity between a query image and those in the dataset based on the respective weighting of these factors. These features are computationally efficient, thus allowing for rapid retrieval while promising improved results through adequate training. This approach represents a step forward in the endeavor to bridge the gap between low-level image attributes and high-level semantic concepts, advancing the field of content-based visual search.

II. LITERATURE REVIEW

A standard image retrieval system includes three important building blocks: i) high dimensional indexing, ii) system design and iii) feature extraction (usually in conjunction with feature selection), (Rui et al., 1999). An image can be represented as a set of low-level visual features (attributes) such as color, texture, shape, and other image features. While certain image retrieval systems rely on only one feature for the drawing out of relevant images, it has been shown that a proper combination of relevant features can yield better execution (Liu et al., 2007). The process of determining the combination of features that is most representative of a particular query image is called feature selection. Some work has been done on color and texture feature extraction algorithms.

III. COLOUR SPACE AND EDGEHISTOGRAM

Image feature extraction is a crucial part of any CBIR algorithm which directly affects the performance of the algorithm. The visual feature which is optimal for image processing applications should satisfy several main requirements. Those are reliability, discriminability, conciseness, and solitary (Cvetkovic et al., 2013). The present scheme uses color histogram and edge histogram descriptors as those features are characterized by low computational complexity, very compact representation, and invariance to resolution changes.

1. YC_bC_r colorspace

The color histograms have been commonly used for key feature extraction in frame difference-based techniques and also used for image retrieval (Liu et al., 2013). This is because color is one of the most important visual features to describe an image (Liu, et al., 2013). Color histograms are easy to compute and are robust in the case of small camera motions (Rajendra and Keshaveni, 2014). It has been observed in the literature that the YC_bC_r color space always yields better results as compared to other color spaces in the case of a similar keyframe detection (Mishra and Subban, 2014). That is why the present scheme uses YC_bC_r color space. Moreover, by the use of YC_bC_r color space, the influence of illumination changes and shadows are also to be reduced (Angadi and Naik 2012). The distinction between YC_bC_r and RGB is that YC_bC_r represents color as brightness and two-color difference signals, at the same time RGB represents color as red, green, and blue. In YC_bC_r, the Y is the brightness (luma), C_b is blue minus luma (B-Y) and C_r is red minus luma (R-Y). This color space exploits the properties of the human eye. The eye is more sensitive to light intensity changes and less sensitive to hue changes. When the amount of information is to reduced, the intensity component can be stored with more precise than the C_b and C_r components. The joint photographers engineering group (JPEG) file format makes use of this color space to throw away unimportant information (Kekre, et al., 2012). In this paper, the Y component is used for the edge histogram feature and the color component, i.e., C_b and C_r are used for the color histogram feature. RGB images can be converted to YC_bC_r color space using equation(1). Y component is luminance, C_b is blue chromaticity and Cr is red chromaticity.

$$\begin{bmatrix} Y \\ Cb \\ Cr \end{bmatrix} = \begin{bmatrix} 0.2989 & 0.5866 & 0.1145 \\ -0.1688 & -0.3312 & 0.5000 \\ 0.5000 & -0.4184 & -0.0816 \end{bmatrix} * \begin{bmatrix} R \\ G \\ B \end{bmatrix} \qquad (1)$$

2. Edge histogram

Edge detection is one of the frequently used operations in image analysis. Edges define the boundaries between regions in an image, which helps in segmentation (Seixas et al., 2009) and object recognition. The edge histogram is used to match the edges of adjacent frames to eliminate redundant frames (Rajendra and Keshaveni, 2014). Edge detection operators that are commonly used are viz Robert's operator, Canny operator, Sobel operator, Prewitt operator, and the Laplace operator (Dhagdi and Deshmukh, 2012), etc. To find the edge histogram, the image (f) is first divided into (4 × 4) sub-images as shown in Fig 1.

(0,0)	(0,1)	(0,2)	(0,3)
(1,0)	(1,1)	(1,2)	(1,3)
(2,0)	(2,1)	(2,2)	(2,3)
(3,0)	(3,1)	(3,2)	(3,3)

Fig. 1. Definition of sub-image.

The present scheme uses a *Canny edge detector*. It finds edges based on the local maxima of the gradient of image *f*(x, *y*). The gradient is calculated using the derivative of the Gaussian filter. The image is smooth edusinga Gaussian filter with a specified standard deviation, to reduce noise. To generate the histogram, edges in the sub-images are categorized into five types; horizontal, vertical, 135-degree diagonal, 45-degreediagonal, and non-directional edges. Since there are 16 sub-images, a total of (16 × 5) = 80 histogram bins are required (Chang et al., 2001; Manjunath et al., 2002).

Table 1. The semantics of local edge bins

Histogram bins	Semantics
BinCounts[0]	The vertical edge of the sub-image at (0,0)
BinCounts[1]	The horizontal edge of the sub-image at (0,0)
BinCounts[2]	45-degree edge of sub-image at (0,0)
BinCounts[3]	135-degree edge of sub-image at (0,0)
BinCounts[4]	non-directional edge of sub-image at (0,0)
BinCounts[5]	The vertical edge of the sub-image at (0,1)
BinCounts[78]	135-degree edge of sub-image at (3,3)
BinCounts[79]	non-directional edge of sub-image at (3,3)

IV. OVERVIEW OF THE PROPOSEDMETHOD

We propose an approach that is based on several efficient image processing procedures. At first, query image and images dataset are taken. Then, color and edge histogram features are extracted from query images and images of the dataset, and the Euclidean distance measure is used to evaluate the similarity between the images. Then, similar images are extracted. Fig2 depicts the flow chart of the proposed scheme. In the rest, a detailed description of the proposed method is presented.

Step1   *Image Datasets:* Our proposed method aims to evaluate the performance of the two feature generalization schemes based on different sample image datasets, including the general image database "ImageNet", the object image database "Caltech256", and the facial image dataset "Pubfig83LFW".

Step2   *YC_bC_r color space:* query image and image datasets in Step 1 are converted in YC_bC_r color space using equation (1).

Step3   *Image feature extraction:* image feature extraction is a crucial part of any CBIR extraction algorithm. It directly affects the performance of the proposed scheme. In this paper, we have used two features, i.e.,

color and edge. This is because several methods for retrieving images based on color features have been described in the literature. The color feature is easy and simple to compute. The color histogram is one of the most commonly used features for Content-Based Image Retrieval (CBIR) as it is invariant to scaling and rotation. Color histogram of images in the C_b (chrominance of blue), and C_r (chrominance of red) color space are calculated. A color histogram is very effective, for the classification of images based on color. Algorithm 1 shows the steps to find the color histogram.

Algorithm 1: Color Histogram

Input: query image and image datasets
Output: Euclidean distances (EDC_b & EDC_r) between the query image and each image in datasets for each component C_b and C_r
begin
1: **For** 1st image in the dataset **do**
2: Convert the image from RGB to YC_bC_r using Eq (1).
3: Calculate the normalized histogram of each component i.e., C_b and C_r by using Eq (2)

$$P_i = imhist(f,b)/numel(f) \qquad (2)$$

were, i: image number
       f: color difference components that is C_b and C_r
       b: the number of bins used in forming the histogram (b=256 for 8-bit grayscale image)
       numel(f): the number of components in array f (i.e., the number of pixels in the frame)
4: **End For**
5: **For** the second image onwards **do**
6:     Repeat steps 2 and 3
7:     Calculate Euclidean distance (EDC_b and EDC_r) between two normalized histograms using Eq (3) for C_b and Eq (4) for C_r respectively, for query image and each image in image datasets

$$EDC_b = \sum((P_{oldimage} - P_{newimage})^2)^{\frac{1}{2}} \qquad (3)$$
$$EDC_r = \sum((P_{oldimage} - P_{newimage})^2)^{\frac{1}{2}} \qquad (4)$$

EDC_b: Euclidean Distance of C_b, stores Euclidean Distances between the query image and each image in image datasets.
EDC_r: Euclidean Distance of C_r, stores Euclidean Distances between the query image and each image in image datasets.
$P_{oldimage}$ = first image
$P_{newimage}$ = consecutive second image
8:     $P_{oldimage} = P_{newimage}$
9: Store the values of EDC_b and EDC_r
10: **End For**
end

---

and Algorithm 2 shows the steps to find the edge histogram.

Algorithm 2: Edge Histogram

Input: query image and image datasets
Output: Euclidean distances (EDY) between two consecutive frames of component, Y
begin
1: **For** 1st image in the dataset **do**
2:     Convert the image from RGB to YC_bC_r using Eq (1)
3:     Store the component(Y) i.e., luminance information
4:     Split the image into (4×4) non-overlapping rectangular region
5:     In each region, a (1×5) edge histogram is computed (horizontal, vertical, 2diagonal and 1 non-directional)
    Say,
        E1 = contains 80 histogram bins
6: **End For**
7: **For** the second image onwards **do**
8:     Repeat steps 2, 3 and 4
9:     In each region, a 1*5 edge histogram is computed (horizontal, vertical, 2diagonal and 1 non-directional)
    Say,
        E2 = contains 80 histogram bins
10:     Calculate Euclidean Distance (EDY) between the two-edge histogram using the Eq(5)

$$EDY = \sum((E1 - E2)^2)^{\frac{1}{2}} \qquad (5)$$

EDY: Euclidean Distance of Y component, stores Euclidean Distances between two consecutive frames.

11:     E1 = E2
12:       Store the value of EDY
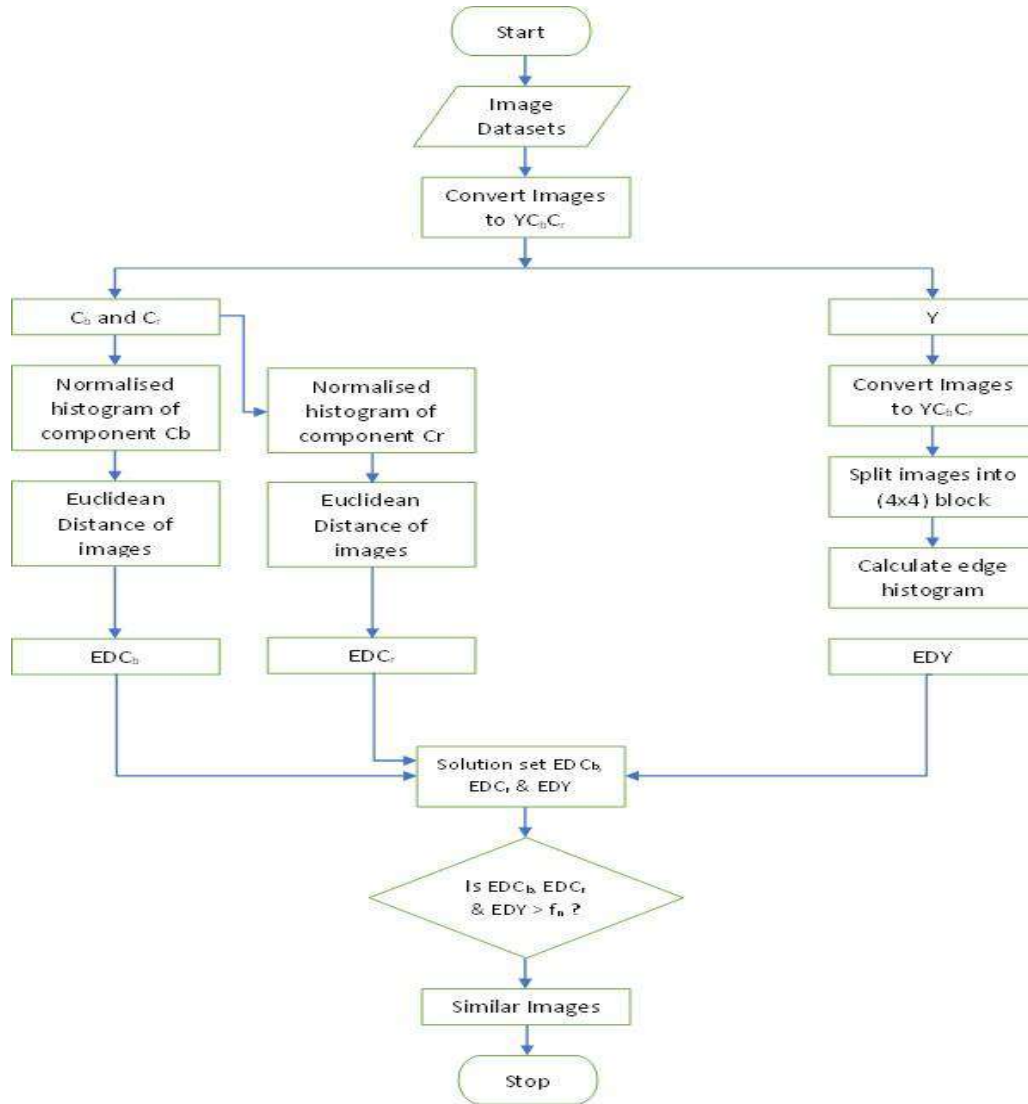13: **End For**
End

Fig. 2. Flow chart of the proposed scheme.

Step4 *Detection of similar images:* The proposed model is based on color histogram and edge histogram features. Given a query image and image datasets which contains many images, the color histogram and edge histogram for each image is computed and the Euclidean distance measure is used to measure the dissimilarities between the query image and individual images of image datasets. A similar image or images are said to be detected if the dissimilarity between the compared images is smaller than the objective function value. The objective is to minimize the objective function. The normalized objective function 'f_n' is then defined as:

$$f_n = \frac{P + R}{2} \tag{6}$$

The precision (P) is defined as theproportion of retrieved images that are relevant to the. Precision is the ratio of the number of relevant images you have retrieved to the total number of irrelevant and relevant images retrieved. In other words, supposing that A was the number of relevant images retrieved and B was the total number of irrelevant images retrieved.

$$Precision = \frac{A}{A + B} \tag{7}$$

The recall (R) is defined as theproportion of relevant images in the database that are retrieved in response to a query.Supposing that A was again the total number of relevant images you have retrieved out of a bunch you have grabbed from the database, and C represents the total number of relevant images in your database. The recall is thus defined as:

$$Recall = \frac{A}{C} \tag{8}$$

Algorithm 4 shows the steps for the Detection of similar images.

Algorithm 4: Detection of similar images
Input: Euclidean distances (Y, EDC_b & EDC_r) between the query image and images in image datasets for each compo Y, C_b & C_r from Algorithm 1 and Algorithm 2 respectively and objective function (fn) of each comp Y, C_b, and C_r **Output:** Similar images **begin** 1: **If** EDCb>fn& EDCr>fn& EDY>fn **then** 2: Select similar images 3: **End If** **end**

V. PERFORMANCE EVALUATION

This section presents the results of the experiments conducted to confirm the success of the proposed model. The experimentation is conducted on set open Image Datasets. The experiments are conducted in Intel(R) Core(TM) i3-3220 CPU @ 3.30GHz processor with 4GB RAM using MATLAB 9.2 (R2017a).

1. The gold standard

The results of the proposed method are compared with the ground truth agreed by multiple human judges. The goals of creating the ground truth are to:

1 create a reference database of images
2 identify a foundation by which automated algorithms can be used for comparison.

To establish the ground truth, human judges were asked to independently surf the image datasets and provide similar images. The similar images estimated by the judges were reviewed in a group meeting with a final judge to derive similar images for each of the categories of Image Datasets.

The performance measure for 3 queries was calculated and summarized in Table 2.

Table 2. Performance Measure

	No. of sampled images	*Performance measure of Proposed Work (%)*	
		Precision	*Recall*
Image Dataset 1 (169.radio-telescope)	92	90	95
Image Dataset 2 (121.kangaroo-101)	82	95	96
Image Dataset 3 (155.paperclip)	92	89	92

VI. CONCLUSIONS

In this paper, we introduced an effective approach to Content-Based Image Retrieval (CBIR) by leveraging color and edge feature extraction. Our experimental results, conducted on widely recognized open image datasets, demonstrate the effectiveness of our proposed method in enhancing the retrieval of images from these datasets, particularly when querying based on visual attributes. We observed favourable performance metrics, including recall (R) and precision rate (P), affirming the practicality of our approach.

However, it is important to acknowledge the inherent limitation of our method, which relies on just two key image features—color and edge attributes. While this approach significantly improves the accuracy and relevance of image retrieval, it represents only a fraction of the diverse visual attributes that can define an image's content. Nevertheless, this streamlined approach is designed to facilitate a more seamless interaction between machine-driven image retrieval systems and human users, serving as a critical step towards bridging the gap between the two.

In conclusion, "Content-Based Visual Search: Harnessing Color and Edge Attributes" provides a promising foundation for future research endeavours in content-based image retrieval, striving to make the process more efficient and user-friendly. It represents a significant stride towards refining image retrieval by focusing on the core elements that constitute an image's content, and we anticipate that this research will inspire further advancements in this field.

VII. FUTURE WORK

In the context of "Content-Based Visual Search: Harnessing Color and Edge Attributes," our future work will revolve around refining and enhancing the performance of the proposed strategy. To this end, we intend to explore the following avenues:

1. **Adaptive Threshold Selection:** We plan to investigate the integration of an adaptive thresholding mechanism, driven by Genetic Algorithms (GA). By dynamically adjusting thresholds, we aim to optimize the feature extraction process, thereby increasing the robustness and precision of our content-based image retrieval system.

2. **Incorporating Additional Image Features:** Recognizing the importance of a more comprehensive feature set, our future work will focus on incorporating a broader range of image features. This expansion will

encompass texture, shape, and other salient attributes, further enriching the descriptive power of our system and expanding its applicability to a wider array of visual content.

By pursuing these avenues, we aim to advance the capabilities of our "Content-Based Visual Search: Harnessing Color and Edge Attributes" approach, ultimately delivering a more potent and versatile tool for image retrieval. This future work is poised to contribute to the ongoing evolution of content-based visual search, making it more adaptable and effective in addressing the diverse and evolving needs of users and applications.

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Vibrational Behaviour of an Exhaust Pipe Using Modal Analysis

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Abstract: IC Engine vibrations are transmitted through the different parts of an exhaust systems (ES). Such vibrations may lead to breakdown of exhaust component in ES. Modal analysis (MA) is becoming more and more popular as a result of demand for a product's dependability and safety in order to solve engineering problems quickly and effectively. It is an approach for determining natural structural characteristics such as natural frequency and mode shapes. This paper deals with application of MA on real structures (part of exhaust pipe) for finding natural frequency.

Keywords: Exhaust pipe, Modal analysis, Vibration, Ansys

1. Introduction

An automobile exhaust system (ES) is a vital component of vehicles powered by IC Engine. The ES is comprised up of many components that are employed in an automobile engine to vent burnt gases or steam, as well as tubing that is frequently used to vent waste exhaust gases produced by controlled combustion in an automobile engine. A number of exhaust pipes are used to remove all of the burned gases from an engine. The cylinder head, exhaust manifold, turbocharger, catalytic converter, silencer, and muffler are a few of the components that emit these gases [1-2]. The typical ES is shown in the figure 1.
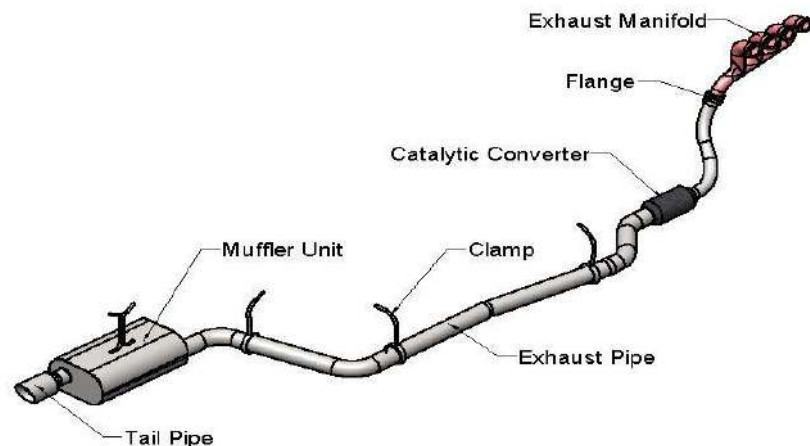

Fig. 1: Typical Exhaust System [2]

1.1 Components of ES [3]

(a) **Exhaust Manifold (EM):** The EM is a component whose function is just to gathers and routes together exhaust gases that comes from each cylinder's exhaust port into a single pipe. It is typically constructed of metal and is placed on the cylinder head of an engine.

(b) **Exhaust Pipes (EP):** EP are designed to transmit different harmful and poisonous gases away from the machine's users. Because exhaust gases are frequently extremely hot, exhaust pipes must be sturdy and heat-resistant to avoid heat-related damage. It is often composed of steel or stainless steel due to their durability and corrosion resistance. The muffler, catalytic converters (CC) and exhaust manifold are connected by EP.

(c) **Exhaust Flanges (EF):** With the use of nuts and bolts, numerous EP are attached, joined, or tightly fastened using EF, a form of protruding rim. Stainless steel, steel, carbon steel, alloy steel, and toughened steel are the primary materials used to make these flanges.

(d) **Catalytic Converters (CC):** A component of ES that controls emissions is CC. Its primary job is to change dangerous and damaging carbon monoxide, hydrocarbons, and nitrogen oxides into harmless ones. A number of catalysts, including as platinum, palladium, platinum, and rhodium, coated on a ceramic honeycomb structure, are used by CC to convert hazardous gases into non-toxic ones.

(e) Muffler: It is a component that helps to decrease the noise. It has baffles and other noise-cancelling components that reduce the noise made by the exhaust gases as they pass through it. It exists in a variety of designs, which affect the backpressure in the ES as well as the noise level.

(f) Tail Pipe (TP): It is the visible end of the ES that extends from the vehicle's back. Its major function is to discharge treated exhaust gases into the atmosphere.

(g) Supports & Hangers: These are often used to hold the ES to the vehicle's chassis and keep it from excessively moving or vibrating.

1.2 Modal Analysis (MA)

It is a process of extracting following modal parameters such as natural frequencies, damping loss factors, mode shapes etc. MA with finite elements analysis (FEA) provide virtual information on dynamic behaviour. In the past-three decades it has become a major technology in the quest to determine, improve and optimize dynamic characteristics of Engineering Design (ED) [4]. Presently, it has been recognized as an important tool in different areas such as mechanical engg., aeronautical engg., civil engg., ship building, mining, manufacture, building engg., biomedical problems, forensic engg., automobile sectors, nuclear power plants, weapon systems etc. In present-era, the relevant fact is related to increasing demands of safety, reliability and durability upon contemporary structure which created new challenges to the scientific understanding of ED [5]. The set of new challenges lies on better understanding of better properties. MA played an important role in most of the industries and applications and has been utilized in design optimization, vibration control and damage detection in structures, bridges, buildings, and so forth [6]. The analysis of computer model of sample enables user to followings:

(a) To identify potential dynamic problem

(b) To determine possible design & solution

So that-safety & reliability of manufactural problem can be better useful.
The set of are practical application areas of MA is $M = \{MA_1, MA_2, \ldots, MA_k\}$ were

MA_1: MA of a Lathe
MA_2: MA of a flat flood gate
MA_3: MA of a power generator
MA_4: MA to Automobile Exhaust System (ES)
MA_5: MA of Rotor system
MA_6: MA of a car chassis
MA_7: MA of a combustion locomotive structure
MA_8: MA of an ancient bronze bell
MA_9: MA of a bus roll cage structure
MA_{10}: MA of structural vibration
MA_{11}: MA of a fuselage aeronautical panel
MA_{12}: MA of a combination locomotive structure
MA_{13}: MA of bus roll cage structures
MA_{14}: MA for stump quality check

The value of suffix 'k' increases day by day.

2. Analysis of Proposed model

2.1 Ansys 2023 R2 Software

Ansys is a simulation software launched to redefine product design for users [7]. It provides advancements for large electromagnetic system simulations. It pushes semiconductor engineering boundaries, power integrity, thermal and mechanical stress on 3D model products. It allows mechanical engineers to easily simulate and analyse the structure behaviour and functionality of mechanical components under different loads. It is the perfect product for user who have just started with simulation. It is simple and easy to use application with various tools for the users providing support to deal with following [8]:

(a) Electromagnetics

(b) Electronics

(c) Vibration analysis

(d) Structural analysis

(e) Fluid mechanics, etc.

Tools for using simulating and analysing purposes are Ansys Mechanical, Ansys CFD, Ansys Discovery, Ansys SPEOS, Ansys Autodyn, Ansys DesignXplorer, Ansys SpaceClaim.

2.2 Considered Design of Exhaust Pipe:

The engineering design of the component of considered model of EP is shown in figure 2. The 3D model of the above design is made using Catia [9-10] software, then CAD file is imported in ANSYS workbench, shown in figure 3.
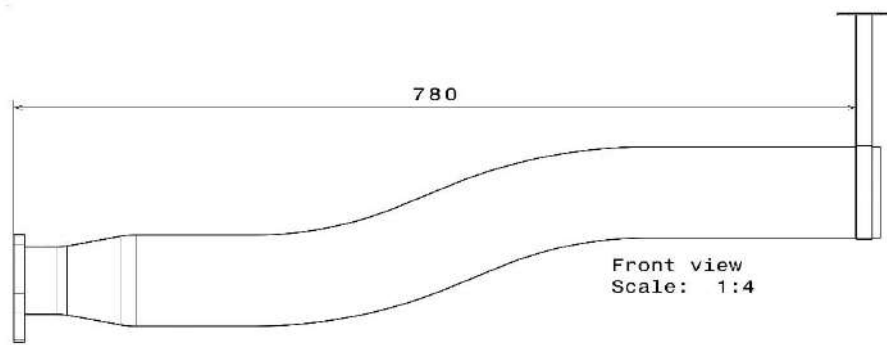

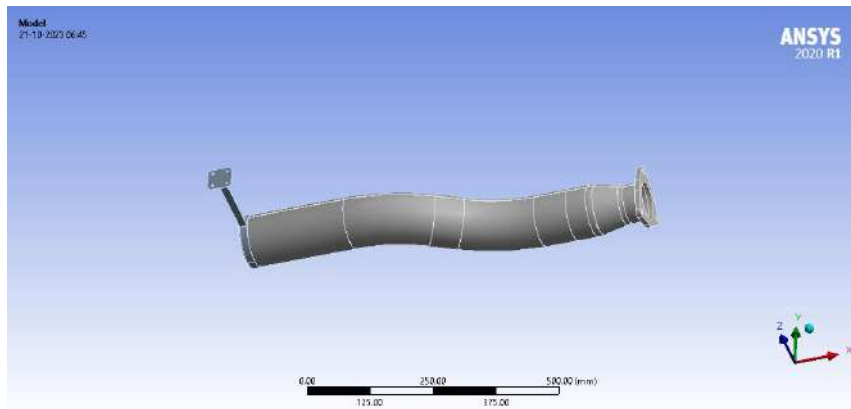Fig. 2: Component of proposed model of Exhaust Pipe

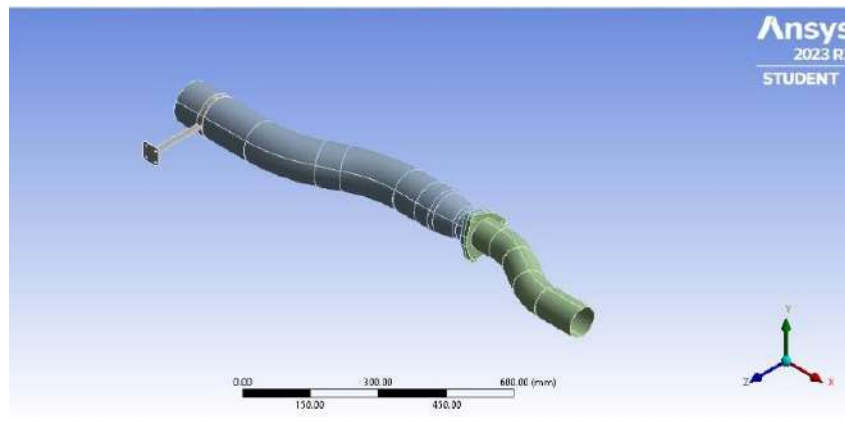Fig. 3: 3D model of the component of the considered design

Fig. 4a: 3D model of the exhaust pipe

Exhaust pipe is modelled using CATIA software and file is imported into ANSYS software and modal analysis is performed on the exhaust pipe by using ANSYS workbench software [11-12]. Their different views are shown in figure 4a, 4b and 4c.
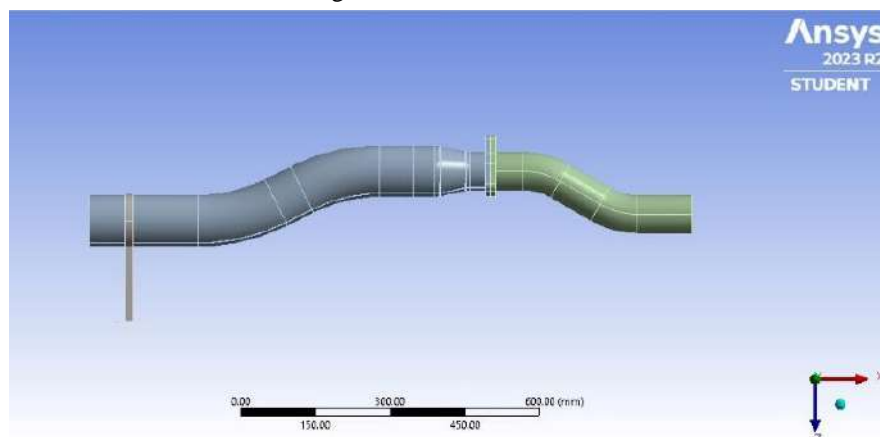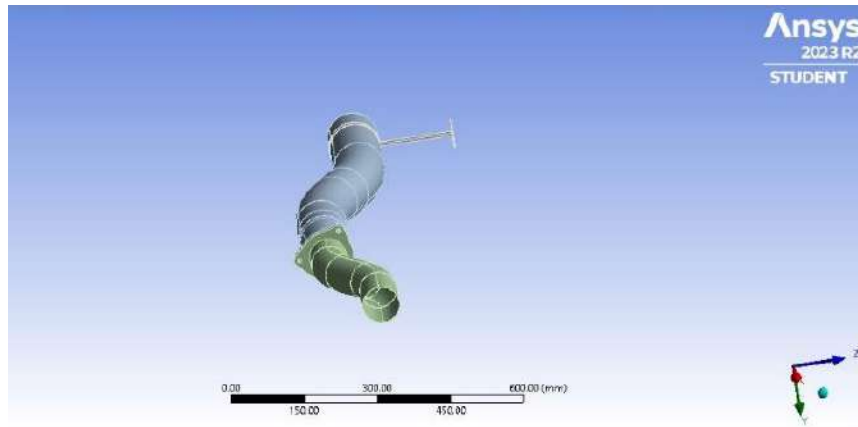
Fig. 4b: 3D model of the exhaust pipe

Fig. 4c: 3D model of the exhaust pipe

2.3 Meshing of Exhaust Pipe

Meshing represents one of the most essential steps in an accurate FEA simulation [13]. A mesh is made up of elements having nodes that, according to the element type, may have different coordinates in space that represent the form of the geometry.
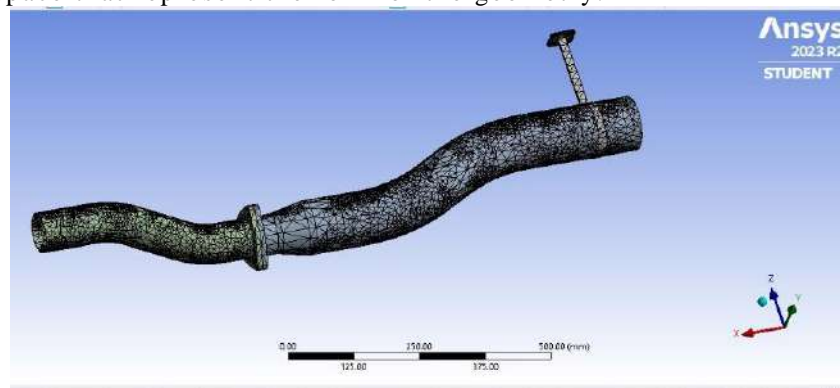

Fig. 5: Meshing of proposed model of the exhaust pipe

While common shapes like cubes make FEA solvers considerably happy to deal with, uneven forms are challenging for them. Amorphous forms are transformed into discernible volumes or pieces through the process of meshing. For the purpose of discovering the results at the desired place in the model, the model is divided into a limited number of partitions during meshing [14]. Meshing of model of exhaust pipe is shown in figure 5.

3. Vibration Analysis

Finding out how buildings respond to erratic vibration loads is the main goal of random vibration analysis. A prime instance would be how a sensitive electronic component would respond if it were placed inside of a car and exposed to engine vibration, road noise, and acoustic pressure. Randomness is a feature of input [15]. Directional deformation along x, y and z axes of vibration analysis is shown in figure 6a, 6b and 6c.
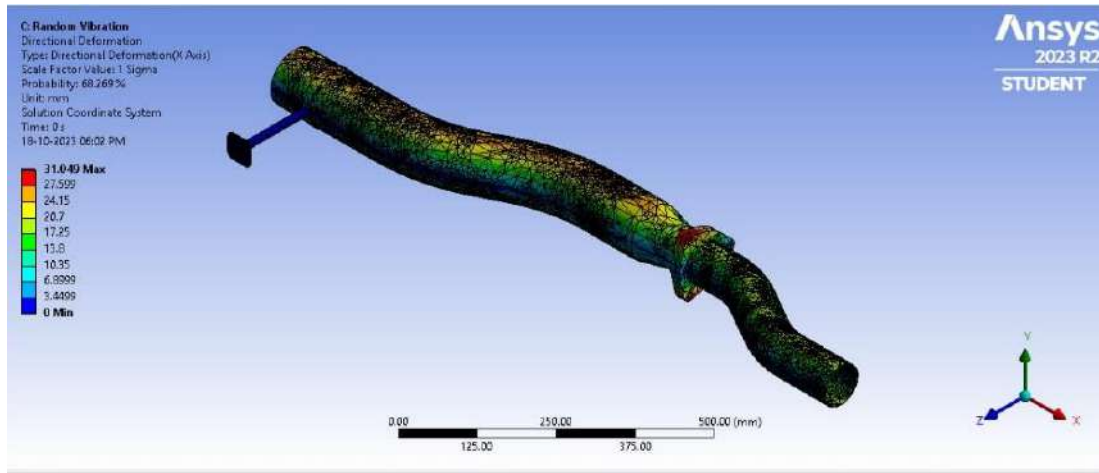
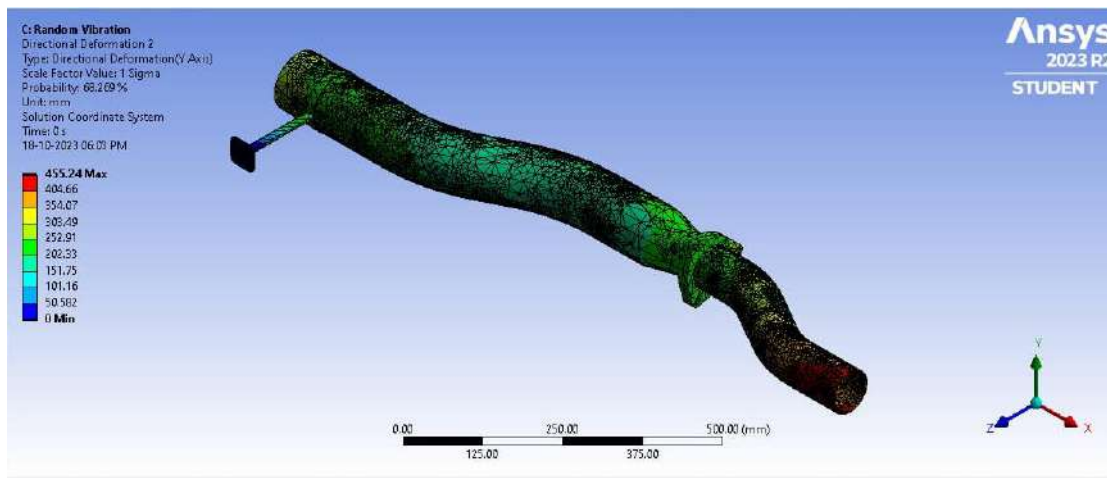Fig. 6a: Directional deformation along x axis

Fig. 6b: Directional deformation along y axis
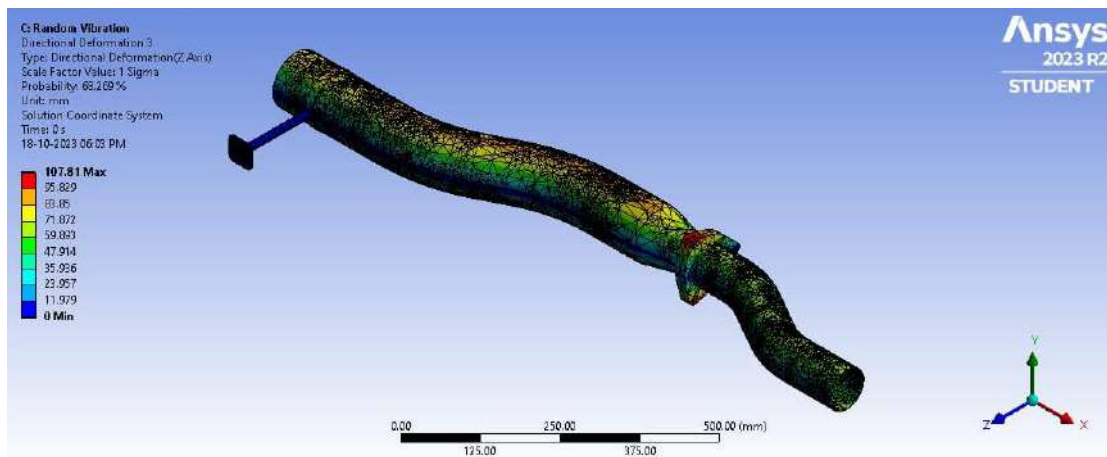
Fig. 6c: Directional deformation along z axis

Since above vibration analysis shows symmetry in the figure about the x, y, z axes. The probability of symmetry along x, y, and z axes is same which is equal to the 68.269%.

4. Conclusion

The natural frequencies of exhaust pipes are calculated by FEA using ANSYS software. The deformations of exhaust pipes along coordinate axis are calculated by ANSYS software. The probability of symmetry along x, y, and z axes of considered design of exhaust pipe for vibration analysis is same which is equal to the 68.269% for 1σ.=

Acknowledgement
I thank to NML-CSIR, Jamshedpur for their support.

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Flash-MCM: Innovative Mass-Customization (Product & Cost) and Marketing through Digital Twinning in Fashion Industry 5.0

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Abstract: Fashion Industry is a multi-dimensional industry which encompasses not only production-selling process chain but also research, design, innovation, etc. mainly with Textiles and ancillary products/materials. This industry is impacted by not only cultural, social and economic factors; but it has also evolved greatly upon technological advancements. This innovative research undertakes to place mass-customization of products and their cost in fashion industry into the hands of end-consumers to check overproduction, economy of space, storage and transport, efficient use of capital and resources to achieve the core values of Industry 5.0 viz. conservation and sustainability. This research is based on man-machine partnership using digital twin projection and technology; and AEI – Artificial Emotional Intelligence.

Keywords: Mass-customization; 360 degree Digital twin trial; Personalized AI Promotion; Artificial Emotional Intelligence; cost-customization.

1. Introduction

India's population as on 12th September 2023 is 1,431,234,208 and is equal to 17.76% of the world population which is 8,059, 949,754 - these are also the figures of consumers of fashion industry. This industry is unique in that its products/materials are not maximally utilized or depreciated but go to waste in fair condition. Fashion industry can turn into a threat to human existence if timely corrective measures are not taken. It stands at fourth rank among the most polluting industries of the world. Industry 5.0 has reinforced the focus upon use of machines and technology to support man and protect environment; efficient application of resources, recycling and conservation.

2. Concerns

- 10% of total human carbon emissions comes from Fashion industry
- Fashion industry's will increase pollution/emissions by 50% by the year 2030
- Textile industry produces 1.92 million tons of waste annually
- For every 100 billion tons of garments produced, 92 million tons are wasted every year
- A truck-load of waste garments go to garbage every second
- Fashion waste is expected to rise to 134 million tons per year by the year 2030
- Fashion industry the world over produces 20% of waste water
- 10% of micro plastics dispersed in oceans come from synthetic textiles, which equals 50 billion plastic bottles annually
- 20,000 litres of water is consumed/used to produce 1 kg. cotton; 2,700 litres water is used to make 1 T-shirt
- Fashion brands are producing double amount of products today than the year 2020
- Fast-fashion comprising cheap and durable man-made materials are posing a challenge to environment

3. Objectives

- This innovation will empower common man in fashion just like the social media did in communication.
- This innovation will not only give customized fashion options to end-consumers but also provide him the power to self-customize the cost/budget for his choice.
- Protect and conserve the environment by cutting down heavily on waste and pollution generated by fashion industry the world over

4. Innovation

Build a common platform fashion app with paid business profiles of subscriber fashion/clothing brands with innovative features/options like, Standard Design; **Self-Design**; Standard size; **Customize your size; Customize your cost; 360 degree Digital Twin Trial; Personalized AI promotion**; **Re-sell; Social Responsibility Discount Points & Certificate;** apart from general features like, class of customers (gender, age, etc.); Garment type; Video/review feedback; Courier partners; Payments; Suggestions; Requests; and others.

5. Method

- The user/customer can upload their photographs with size measurements in the *360 degree Digital Twin Trial* section and see themselves in the standard garment/fashion designs given; as well as self-design their outfits and variegate fabric, colour, pattern to their desire upon the digital twin not only for fashion-look but also to customize the cost of the garment by using alternative materials to get the look/garment of their desire and vision at enhanced or reduced cost - before placing the order with the manufacturing brand;

- Also, upon the basis of customer data uploaded on *360 degree Digital Twin Trial* section, the *Personalized AI promotion* section can build customer digital twin projections with new products/brands and stream them to the particular customer in personalized promotion of the new products.
- The *Re-sell* section allows the user/customer to re-sell used products for return of discount points they may use upon purchase of new item. In the same section buyers can browse through the used products gallery to buy what they desire at reduced prices.
- Both the buyers and sellers using the *Re-sell* section gain *Social Responsibility Discount Points* that they can use during making new purchases as well as the facility to download corresponding *Social Responsibility Certificate* bearing endorsement of Ministry of Environment, Forest and Climate Change

6. **Sample Data**
   CUSTOMIZED MEASUREMENTS FOR WOMEN SHIRTS IN INCHES

Length	Shoulder	Sleeve	Bust	Waist	Hip	Collar
27	16	22	38	32	40	15
26	15	21.5	36	31	38	14.5
25	14	21	34	30	36	14
24	14	20.5	32	28	34	13

   CUSTOMIZED MEASUREMENTS FOR MEN SHIRTS IN INCHES

Length	Shoulder	Sleeve	Chest	Collar
30	20	25	39	17
28	18	23	36	16
27	17	22	34	15
26	16	22	32	14.5

7. **Derivation** – The projected sample is very small and illustrative only. So we may use here simple statistical method of arithmetic mean for derivation, as follows:

   Derivated mean measure would be $x = 1/n \left(\sum_{i=1}^{n} xi \right) = x_1 + x_2 + x_3 \ldots x_n / n$

   Mean customizable/adjustable measurement for women –

Length	Shoulder	Sleeve	Bust	Waist	Hip	Collar
25.5	14.75	21.25	35	30.5	37	14.13

   Mean customizable/adjustable measurement for men –

Length	Shoulder	Sleeve	Chest	Collar
27.75	17.75	23	35.25	15.63

   However, as greater range of customized measurements are undertaken for study, median, mode or other complex statistical methods will be required for derivation of customizable/adjustable model

8. **Images**

9. Conclusion

Flash-MCM: Innovative Mass-Customization (Product & Cost) and Marketing through Digital Twinning in Fashion Industry 5.0 provides cheap, boundless and boundary-less fashion universally giving emotional and creative fulfillment to the masses; Benefit to manufacturer – They manufacture pre-ordered garments, curtailing heavily on warehousing, storage, distribution channel and inventory costs. This cost benefit can be given to the end-buyers; saves overhead costs; avoiding capital blockage; Opportunity and employment provider to domestic and overseas courier companies and delivery partners; Cut backs on overproduction, warehousing, bulk transportation, bulk insurance costs, risk eliminator, meets marketing challenges, avoids resource blockages, fashion waste, etc. Enables extensive and intensive marketing and advertising at negligible cost; Globalizes fashion trade and delivers exotic fashion products to customers' doorstep. It brings social parity.

Protects and conserves environment and ensures sustainable development.

Flash-MCM revolutionizes Fashion.

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Used of Mathematical Concept in Blood

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Abstract: This paper discusses the importance of donating blood and phobia behind it and uses of some mathematical formula for analysis of blood volume and its flow.

Introduction:

1-Blood
2-Blood volume
3-Blood level
4-Flow of the blood
5-Conclusion
"*Tears cannot save but blood can save life*"
"*Every blood doner isa life saver*"
"*Blood donation is a great act of kindness. Its every drop is like a breath for someone*"
Blood: Blood is a circulating fluid providing the body with nutrition, oxygen, and waste removal. It consists of a suspension of cells in an aqueous solution known is plasma, composed of 7% protein,90%water. There are about 5×10^{12} Red cells. Mean life of red cells about 120 days. Total no of red cells is $2.4 \times 10^{6.}$
Blood=red blood cells+white blood cells+platelets+plasma
  Total no of Red cells in life time of (60-70 years) $=5 \times 10^{15}$
25×10^{12} cells occupy $0.45 \times 5 = 2.25$L of the blood.
Mean volume of the Red cells$= \frac{2250}{2.5 \times 10}$ cc
The surface area of Red blood cells is about 140µm^2.Total surface area of Red cells $=25 \times 10^{12} \times 140$µm$^2=3500$m^2.
Surface area is most important because diffusion of oxygen takes place along the surface. Solution of oxygen in blood plasma given by Henry's formula
S. $P_\alpha = \frac{volume\ of\ the\ dissolved\ oxygen}{volume\ of\ the\ blood\ plasma}$
Where s is solubility constant.
$P_\alpha$is the partial pressure of oxygen in equilibrium with dissolved gas.
Amount of blood in a person body depends upon their age and size. Blood accounts for 7.8%of an adult body.
8-9% - Weight of child's body
9-10%-Weights of infant body
The average quantity of blood are 4.3 liters' average size male and 5.71 litres in average size female.
How much blood can blood_ donor donate?
Standard amount of blood a blood donor can donate 1 pint during blood donation. This amount is around 10%of the total blood in the body.
Transfusion of the blood:
A blood transfusion is a medical procedure to donate blood from donor to needy person. It is a lifesaving procedure.
How much blood donors produce a day?
A body makes around 2 million blood cells per second. This process happens continuously throughout a person's life.
Circulatory (Cardiovascular system) is responsible for moving blood around the body. The hearts pump of the blood to the blood vessels, which deliver blood to the body's organs. The blood deliver oxygen and other nutrients other organs that play a crucial role.
The kidneys, which regulates the fluid balance in the body.
The nervous system which enables the other system to fulfill their tasks.
The skeletal system as bone marrow produces blood cells.
Calculation of blood volume (BV):
Needler and Lemmon developed formula for determining the total blood volume.
For men: blood volume= [$(0.3669 \times H^3)$ +$(0.03219 \times W)$ +0.6041]ml/kg
For women: blood volume=[$(0.3561 \times H^3)$ +$(0.333 \times W)$ +0.1833]ml/kg
Lemmon equal (2006) proposed a formula for BV

BV$= \frac{weight \times 70}{\sqrt{BMI}/22}$

 Where BMI (body mass index) is a measure of body fat based on height and weight to the human being.
BMI is a person's weight in kilogram divided square of height in meter. It indicated high body fitness.
Need of blood for individual or blood storage in hospital:
Donating blood is the highly social activity. Without donating of blood hospitals and medical centers have to look ills ware to in sufficient blood supply.
Various questions arise in the mind of blood donor is as

$S= \{q_1, q_2, q_3 \text{----------} q_n\}$

Q_1: I am afraid, I will faint.

Q_2: I am afraid of needles.

Q_3: My iron is too low.

Q_4: My blood type is not in demand.

Q_4: I will be sick after donating blood.

Q_5: I don't have time to donate.

Q_6: I don't have any spare blood to donate.

Q_7: I am afraid of catching a disease.

Q_7: My blood is not rich enough.

Q_8: I am afraid of being turned down.

Q_9: Blood acceptor will take too much blood.

Q_{10}: Each donating blood is a sterile process.

Blood -Donor's motivation: The set of factors to motivate for donating blood is given by

$D = \{f_1, f_2, f_3 \text{---------} f_n\}$

Where f_1 =Present credit

F_2 =Family credit

F_3 =Social pressure

F_5 =Replacement

F_6 =Reward

F_7 =Humanitarian   etc.

PROFIT OF BLOOD DONATION:

Following benefits happens of a blood donor person

$S = \{T_1, T_2, T_3 \text{------------} Tn\}$

T_1: Excess iron is dangerous and causes heart attack. By donating blood excess of iron comes down and heart is healthy.

T_2: After blood donation blood produces new red blood cells works in well manner.

T_3: After giving blood weight loss happens.

T_4: A person who donates blood regularly iron balance and the chances of disease cancer lass.

T_5: Regular blood donor fitness is good.

CRITIRIA OF BLOOD DONATION:

$E= \{e_1, e_2, e_3, e_4, \text{---------------} e_k\}$

The rate of factors that determines the eligibility of blood donor is:

E1: Donor must be fit and healthy.

E2: Between (18-65) years, weight of donor should be of minimum 50 kg.

E3: Pulse rate of donor be (50-100) without irregulating.

E4: Hemoglobin level must be of minimum of 12.5g/dl.

E5: Blood pressure should be 50-100 mm 0f Hg.

E7: Systolic pressure (up blood pressure) 100-180 mm of Hg.

E8: Body temperature should be normal.

E9: Successive blood donation time period should be more than 3 months

BLOOD DONATION IN INDIA:

Blood donation in India is through blood camps. The number of voluntary bloods increased from 54.4% in 2006-2007 to 83.1%in 2011-2012 with the number of blood unit increasing from 4.4 million units in 2006-2007 to 9.3 million units in 2012-2013.

Healthy individual can donate around 350 milliliters of blood. Donors are provided with refreshment after procedure which usually include glucose, biscuits, and fruits.

 Some organizations provide transport facilities and also certificate.

Conclusion: In one society about 80% people are eligible to donate blood. Regular blood donors are individual donating at least twice a year and maximum times as a regular basic. The average no of donation ranges from 10 to 50 per 1000 inhabitants. Leela Moolgaonkar (Social Reformer) initiated voluntary blood donation camps in Mumbai from 1954.The 1960 saw many blood banks open in different cities. In 1975, Indian society of blood transfusion and immunohematology headed by J.G. Jolly declared 1st October as the National Blood Donation Day.

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HEART ATTACK DETECTION & HEART RATE MONITORING SYSTEM USING IOT

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Abstract: Currently, Heart Disease is very common around the world. Various people have losed their life to cardiac arrest and lack of clinical consideration, so heart rate monitoring system make a fundamental part of keeping our heart wellbeing. Everyone from various ages have problem in pulse rate, the checking system must be sufficiently proficient to handle these conditions. In this paper, the heart rate and heart attack detection recognition system using IoT is being discussed. Mainly, the patient will convey equipment having sensors with Android application and the heartbeat sensor will check heart beat readings and transmit them over the web like mobile or other applications.

Keyword: Heart Disease, Internet of things(IOT) and Heartbeat Sensor

Introduction

Nowadays various individuals are losing their life because of heart attack. Heart failure can happen when the progression of blood to heart is blocked. Attributable tolate finding of the episode we are insufficient to spare the lives of numerous people. In this paper, we recommend aframework that will recognize heart failure by checking the pulse dependent on IOT (Internet of Things). For a healthy adult, common pulse is 60 to 100 bpm (beats per minute). Athlete's heart beatfor the most part run from 40 to 60 bpm relying on their wellness. In the event thatan individual's pulse is continually more than 100 pulsates every moment, at that point the individual is supposed to have higher pulse which is known as sinus tachycardia. It can lessen the productivity of heart by let-down the amount of blood through the body which brings chest agony and dizziness. With the headway in innovation it is easy to screen the patient'spulse even at home. IoT is skill of web based system component to assemble data from world universally to us.
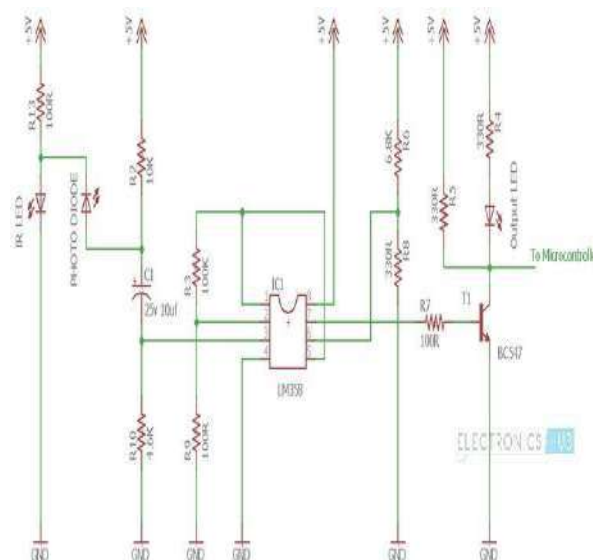
Motivation

Healthcare facilities are becomingadvanced to more readily serve the requirements of patients, specialists and staff member. To meet administrative objections forpatient's fulfilments operationalproductivity and clinical care,a cutting-edge emergency clinic must haveIoT advances all through the system so thatthe patient who serious in condition get proper treatment remotely in short time. To explore thefield of IoT and the usage of heart beat sensor in healthcare I am highly motivated towrite this paper.

Introduction of Heartbeat Sensor

Heartbeat device comes in numerous shapes and estimates and permits an instant approach to measurement the heartbeat. Heartbeat Sensors are square measure accessible in articulation Watches (Smart Watches), sensible Phones etc. The heartbeat is measured in beats per minute (bpm) that indicates the amount of times the heart is contracting or expanding in a minute.

Working of Heartbeat Sensor:

A basic Heartbeat Sensor comprises of a sensor and a control circuit. The sensor part of the Heartbeat Sensor comprises of an IR LED and a Photo Diode set in a clasp.

The Control Circuit comprises of an Op- Amp IC and scarcely any different partsthat help in associating the sign to a Microcontroller. The working of theHeartbeat Sensor can be seen better on the off chance that we investigate its circuit graph.

The above circuit shows the finger typeheartbeat sensor, which works by distinguishing the beats. Each heartbeat will modify the measure of blood in the finger and the light from the IR LED going through the finger and in this manner recognized by the Photo Diode will likewisefluctuate.

The yield of the photograph diode is given to the non – upsetting contribution of the first operation – amp through a capacitor, which alter the DC Components of the sign. The first operation – amp as a non – reversing enhancer with an intensification factor of 1001.

The yield of the first operation – the amp is given as one of the contributions to the second operation – amp, which goes about as a comparator. The yield of the second operation – amp triggers a transistor, from which, the sign is given to a Microcontroller like Arduino.

The Op-amp utilized in this circuit is LM358. It has two operations – amps on a similar chip. Additionally, the transistor utilized is a BC547. A LED, which is associated with the transistor, will squint when the beat is identified.

Heartbeat sensor through IoT

The pulses are detected by heartbeat sensor and afterward read it as information signals. The read information is handled by the microcontroller and transmitted it to the WiFi module for transferring to the web server stage for additional examination and perception. The information is prepared and put away progressively with the date and time stamp when the information was captured.

The framework comprises of info, yield, and preparing units. The information units are the client fingertips catching unit; heartbeat sensor unit, the force flexibly unit and the UI unit. The yield units are the LCD and the WiFi Module unit. The microcontroller act as the preparing unit, likewise alludes to as checking and control the unit. The framework has the ATmega32p microcontroller and modified utilizing the installed C programming language in the system. The sensor and different gadgets are changed and controlled by using implanted C codes. The heartbeat sensor is main part for detecting the heartbeat. The detected information from the sensor is given to the simple to computerized converter (ADC) for change to advanced sign. The changed over computerized signal is b e i n g then transmitted to the microcontroller.

The microcontroller follows up on the sign dependent on the guidelines . The prepared information are transmitted to the LCD screen for client data. Moreover, the information is sent continuously to the WiFi module and transmitted to the web server for additional investigation and perception. The broke down and envisioned information are refreshed simultaneously progressively to mirror the status of the human heartbeat rate.

Conclusion

Nowadays we have facing danger of respiratory failures very much. This framework which assists with identifying the pulse of individual utilizing heartbeat detecting regardless of whether an individual is at home. This framework moreover will helps for the emergency clinic observing framework system, all patients checked by a single individual in the server room. This framework which serves to measure internal heat level, heartbeat, beats of an individual. we will make this framework for creatures likewise with the goal that we can spare them. If this innovation will grow then we can recognize heart blockage through this innovation by our venture.

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India's Electric Mobility Transformation – Progress, Opportunities and Challenges

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ABSTRACT – Mobility being the central nervous system of a developing country like India needs to be seamless, sustainable and efficient to ensure stronger economy and prosperous society. While the electrification revolution is sweeping across the global mobility landscape, India stands at a very strategic position to lead this sector. India support the global EV30 at 2030 campaign, which targets to have at least 30% new vehicle sales be electric by 2030. Global technology trends and India's rapidly growing economy have led to focus on electrification of transportation as the primary technology pathway to achieve this transformation. This connexion presents India with a powerful but fragile opportunity to emerge as a global leader in new mobility solutions and battery manufacturing, positioning India for durable economic growth and global competitiveness. But to do so India needs to address certain challenges such as domestic manufacturing of batteries, technological advancements of batteries, building a robust charging infrastructure in the country etc. This paper aims to bring forward the current status of India in terms of vehicle electrification, describes the policies undertaken by the Government of India in attaining its goal, the challenges which India needs to overcome and possible solutions for all the challenges, enabling India achieve its target of a well-functioned, efficient and sustainable e-mobility solutions.

INTRODUCTION

Mobility is an important economic driver as moving people and goods implies well-functioning and prosperous society. Increasing the efficiency and quality of a country's mobility system helps support a stronger economy and a higher standard of living for its citizens. Ensuring a sustainable and effective mobility of people and goods is one of the main challenges facing humanity in today's urbanized world. The mobility networks constitute essentially the central nervous system of our cities, influencing practically all aspects of the human condition; from the models of establishment to the economic activity, passing on the social relations, the security and the public health. The omnipresence of air transport is approaching the world, and bold initiatives like the hyperloop are at the point of being launched, to also reduce travel times for terrestrial mobility.

The growth of vehicles in India was rapid, the number of owners per 1,000 inhabitants passed from 53 in 2001 to 167 in 2015. India uses a large variety of motorized means of transport on its routes and its automobile segments are very different from those of most other countries in the world. On the basis of sales data of the last six years, it is estimated that the vehicles circulating on the Indian routes are the following:

1. Two-wheelers: 79% of the total number of vehicles.
2. Three-wheelers (passenger and goods), including tempos: 4% of the total number of vehicles.
3. Buses and large goods vehicles like trucks: 3% of the total number of vehicles.
4. Economy four-wheelers (cars costing less than ₹1 million): 12% of the total number of vehicles.
5. Premium four-wheelers (cars costing higher than ₹1 million): 2% of the total number of vehicles.
The prevalence of small vehicles like two-wheelers, three-wheelers, economy four-wheelers and small cargo vehicles in India is unique among larger countries. These small vehicles require unique technical and industrial capabilities. Here, India has the opportunity to lead the way in electrification of small vehicles. India's potential volumes for these vehicles lay the foundation for a transformative manufacturing and industrial policy as the nation grows. Meanwhile, the electrification revolution is sweeping across the global mobility landscape. Over the last decade, a collection of circumstances have conspired to create an opening for electric mobility to enter the mass market. Those forces include:

1. Climatic change: The prospect of rapid global temperature increase has created the need for a reduction in the use of fossil fuels and the associated emissions. India has committed to cutting its GHG emissions intensity by 33% to 35% percent.

2. Advances in renewable energy: Over the last decade, advances in wind and solar electricity generation technologies have drastically reduced their cost and introduced the possibility of clean, low-carbon and inexpensive grids. India proposes to add 175 GW of renewable energy capacity by 2020 and to achieve 40 percent of its electricity generation from non-fossil sources by the same year.

3. Rapid urbanization: Economic development, especially in emerging economies, is creating a wave of urbanization as rural populations move to cities in search of employment. It represents an important stage in the process of economic development, notably due to the lack of energy and transport, which leads to intense traffic and pollution. According to a recent study by the OMS, India figures in the 14th rank among the most polluted countries in the world. Electric vehicles (VE) can in some cases improve the situation by reducing local pollution and reducing emissions.

4. Data capture and analysis: With the advent of smartphones capable of GPS and the universe associated with mobility applications, mobility has experienced a digital revolution. That digital revolution has created possibility of a greater utilization of existing transportation assets and infrastructure. For EVs, which rely on lower variable costs to

offset relatively high fixed costs, this enhanced utilization is a critical element of achieving total costs of ownership compared to internal combustion vehicles.

5. Battery chemistry: Advances in battery technology have led to higher energy densities, faster charging and reduced battery degradation from charging. Combined with the development of motors with higher rating and reliability, these improvements in battery chemistry have reduced costs and improved the performance and efficiency of electric vehicles.

6. Energy security: The essential requirements are the Diesel and the GNC, which are required for the propulsion of a mobility system based on an internal combustion engine (ICE), an exhaustible and costly supply chain, which can avoid disruptions due to meteorological conditions, geopolitical events, etc. India must import oil to cover more than 80 percent of its transportation materials. This relationship is said to increasingly mean, to measure, that a population that rapidly urbanizes requires greater inner-urban and peri-urban mobility.

While some countries have created a roadmap for a complete transition to electric vehicles, the political decision makers in India are convinced of the need for a transition to electro mobility, and the political contours of this transition are just being finalized. The transition to electro mobility is a much-contested global strategy for the decarbonisation of transport sectors. India is one of the few countries to support the global campaign EV30@30, which aims to make at least 30% of new vehicle sales electric by 2030. The Indian government has marked the beginning of a new era of mobility for India. Global technological trends and the rapid growth of the Indian economy have led to a focus on electrification of transport as the key technological avenue to achieve this transformation. This approach offers an extremely effective but limited opportunity for new global leaders to develop innovative battery solutions that will place India at the vanguard of sustainable economic growth and global competitiveness. India is in a unique position, introducing electric vehicles (VE) on a large scale and thus surpassing traditional mobility models, while maintaining the economy, air pollution and dependence on oil imports, and at the same time reducing battery costs thanks to scale effects faster than predicted in current forecasts.

TYPES OF ELECTRIC VEHICLES

In general, five different types of EVs, according to their engines technology are sorted:

I. BATTERY ELECTRIC VEHICLES (BEVS):

This vehicle BEV is also called all-electric vehicle (AEV). The AEV equipped with BEV technology operates entirely like a battery-powered electric vehicle. To drive the vehicles, it requires a large battery, which can be charged by connecting to the network. This battery is charged via a transmission line equipped with one or more electric motors to drive the vehicle. These BEVs do not have a combustion engine and do not use liquid fuel. BEVs generally use large batteries to provide the vehicle with an acceptable autonomy. A typical BEV can travel between 160 and 250 km, although some of them can travel up to 500 km with a single load. An example of this vehicle type is the Nissan Leaf, which is 100% electric and is currently equipped with a 62 kWh-battery, giving it an autonomy of 360 km.
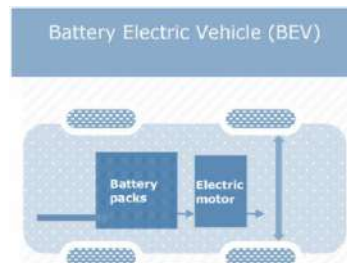

FIG 1. BATTERY ELECTRIC VEHICLE

II. PLUG-IN HYBRID ELECTRIC VEHICLES (PHEVS):

These PHEVs are also called series hybrids. One can choose between the fuels, the conventional fuel (for example the petrol/diesel) or the alternative fuel (for example the biodiesel). It can also operate with a rechargeable battery.

These hybrid vehicles are powered by a conventional combustion engine and an electric motor, which is charged via an external plug-in power source. PHEVs can store enough electricity from the network to significantly reduce their fuel consumption under normal driving conditions.

PHEVs can run in at least 2 modes:
- All-electric Mode, in which the motor and battery provide all the car's energy
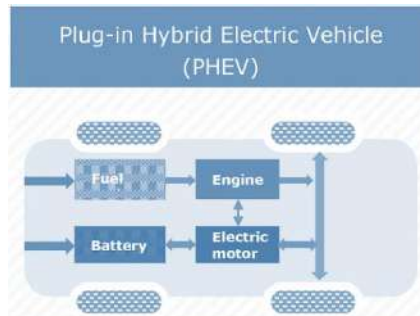- Hybrid Mode, in which both electricity and petrol/diesel are employed

FIG 2. PLUG-IN HYBRID ELECTRIC VEHICLE

III. HYBRID ELECTRIC VEHICLES (HEVS):

The HEVs are also called series hybrids or parallel hybrids. The HEVs are equipped with both a motor and an electric motor. The motor obtains energy from the fuel and the electric motor obtains electricity from the battery. The transmission is driven simultaneously by a motor and an electric motor. This was then trained by the governor. The hybrid vehicles are propelled by a combination of a conventional combustion engine and an electric motor.

The difference to PHEVs is that HEVs cannot be branched into the network. In fact, the battery, which supplies the electric motor with energy, is charged thanks to the energy generated by the thermal motor of the vehicle. In modern models, the batteries can also be charged by the energy generated during braking and thus the movement energy can be converted into electrical energy.
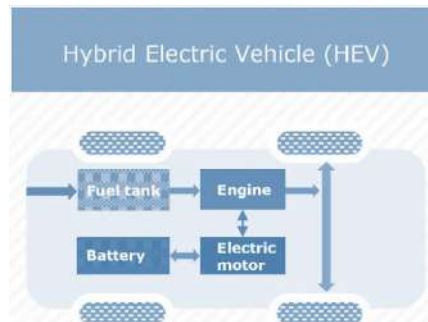

FIG 3. HYBRID ELECTRIC VEHICLE

IV. FUEL CELL ELECTRIC VEHICLES (FCEVS):

The FCEV is also known as a car without exhaust. They use «poly-element technology» to produce the electrical energy necessary for the operation of the car. The chemical energy of fuel is converted directly into electricity. These means of transport are ensured by an electric motor, which uses a mixture of compressed water and oxygen obtained from the air, with water of the same quality resulting from this process. The Hyundai Nexo FCEV is an example of this type of vehicles, being able to travel 650 km without refueling.
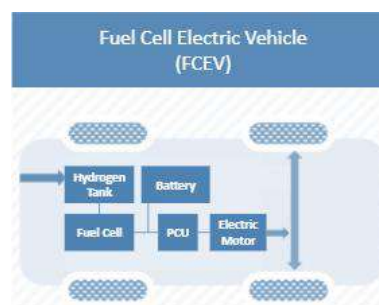

FIG 4. FUEL CELL ELECTRIC VEHICLE

V. EXTENDED-RANGE EVS (ER-EVS):

These are very similar to the BEV category. However, the ER-EV provides a motor backup battery to recharge the vehicle's batteries in case of need. The motor is heavy, as in the PHEV and HEV-1 motors, and is used only for charging, which allows it to be connected to a car on the fly. The BMW i3, for example, has a battery capacity of 42.2 kW/g, which offers autonomy of 260 km in electric mode, and users can benefit from 130 km of additional autonomy in electric mode.

CURRENT STATUS- THE GLOBAL EV MARKET AND INDIA

In 2016, the market for electric vehicles exceeded the volume of two million electric cars in circulation worldwide, with 750,000 units sold in a single year, an increase in inventories of 60% compared to 2016. In 2016, China sold more electric vehicles than the rest of the world two years earlier, with this number increasing between 2015 and 2020. The experts of the sector estimate that by 2030, 7% of the global automobile park will be composed of electric

vehicles, against 0.2% currently. While India's ambitions in the field of electric vehicles, notably two-row electric, four-row and electric buses, become more and more known, other countries are encouraged to follow the example of India.

According to an analysis of data from the International Energy Agency, 10% of personal vehicles sold in the world in 2022 were entirely electric. The 5 countries where the share of sales of electric vehicles is the highest are Norway (100% electric vehicles will represent 80% of all electric vehicles in 2022), Iceland (41%), Sweden (32%), the Netherlands (24%) and the China (22%). The two other largest automobile markets show a decline in sales of electric vehicles, but faster growth: the European Union (12%) and the United States (6%).

Electric vehicles around the world must increase by 75 to 95% by 2030, in order to reach international climate objectives, to limit climate warming to 1.5 degrees C (2.7 degrees F) and to prevent a number of harmful effects of climate change. This objective is written in the context of the recent exponential growth of sales of electric vehicles in the gray zone. The average annual growth rate over the last five years was 65%; over the course of the next few years, the world will need an average annual growth rate of only 31%.
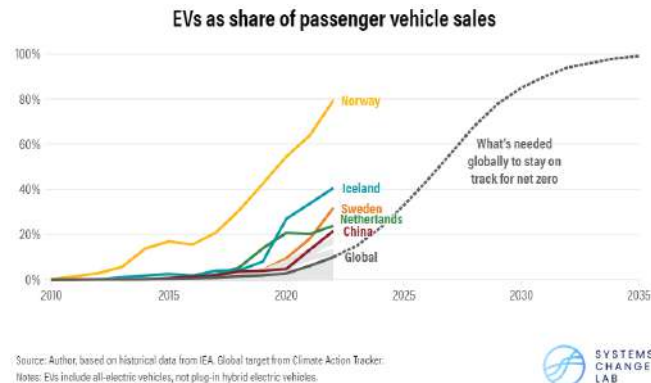

FIG 5. EVs as share of passenger vehicle sales

The sales of electric vehicles in India will increase in just one year, from 2021 to 2022, by 0.4% to 1.5%. That's about three times faster than the average worldwide average, which took three more years. 0.4% of sales of electric vehicles in year 2015 on 1.6% in year 2018.

Although the purchase price of electric vehicles is very high, the sales volume of electric vehicles has increased significantly especially in the last years, when one considers the versions with combustion engines of the same vehicle models. Furthermore, many countries are preparing for the transition to mobility, in which they encourage the use of cars with fossil fuels and promote electro mobility.

CHALLENGES TO OVERCOME

To become a world leader in terms of electric vehicles and in order to provide a sustainable e-mobility solution to its people, India needs to overcome certain challenges which include:

- Building a Robust and Competitive Battery Manufacturing Supply Chain
- Building a Robust Battery Charging Infrastructure
- Government Policies and Regulations promoting electric vehicles.

EV BATTERIES

The batteries today represent approximately one third of the total purchase price of electric vehicles, and the price of these batteries has fallen by more than 70% over the last six years. The innovations continuing in the technology of batteries and a larger scale of production are leading to a strong sustainable decline in prices. Experts estimate that prices could fall to approximately US\$109 per kWh by 2025 and to US\$73 per kWh by 2030. If we look at the latest ambitions of countries such as France, the United Kingdom (which envisages a transition to all petrol and diesel vehicles by 2040), Norway (which has twelve plants by 2025) and China (which envisages 7 million sales), considering electric vehicles up to 2025) and India, where the goal of transition to an all-electric system is further increased, the prices could fall even faster than the current forecasts.5 Based on global forecasts of VE (under consideration of India's ambitions to reach 100%) of VE- Sales by 2030), the world economy will need approximately 30 Giga-watts of batteries for electric vehicles by 2030, which is equivalent to an investment of 125 Billion Dollar (8 Lakh Crore INR) for the manufacturing of batteries alone.

The worldwide capacity for manufacturing batteries continues to increase rapidly, and many companies and countries announce their intention to build more plants in the Gigafactory-scale. Industry experts expect the global battery production capacity to more than double between 2017 and 2021 and rise from 119 GWh/year to 273 GWh/year in this period.

BATTERY MANUFACTURING SUPPLY CHAIN IN INDIA

India would need at least 20 battery production plants, which would produce a total of around 800 GWh of batteries by 2030, in order to support 100% electric sales in all vehicles The Indian demand by 2030 could exceed 38% of the global capacity. The manufacturing of batteries and components for electric vehicles could help Indian equipment manufacturers and technological enterprises to benefit from the country's exciting objectives in electrification of vehicles and thus strengthen the competitiveness of India on the world stage.

India's goal of 100% electric vehicles requires the creation of a supply chain to manufacture robust and competitive batteries. To achieve this, India must overcome four challenges.

A. Low mineral reserves

India has no reserve of some of the most important Li-Ion components, including lithium, cobalt, nickel, and no reserve of copper, which is used in wires, cables and electrical lines. Therefore, the reliable supply not only of raw materials, but also of functionally transformed materials used in the anode and the cathode constitutes a challenge.

To achieve a national planned large-scale production of batteries for electric vehicles, India should probably intensify partnerships and international agreements to guarantee access to important minerals, according to the roadmap in material technology and the chemistry of batteries. The options for the development of the supply chain should be considered on the basis of evaluations of the chemistry of batteries and the possible increase of production.

B. Early-stage battery manufacturing industry

In India, there are currently no major manufacturers of batteries for electric vehicles and there are no point systems that provide adequate capacity at any time. The assembly of block batteries with cells imported from India can reduce the costs and internalize a greater part of the battery's value as well as enhance the autonomy, allowing the national demand to be responded to by custom-made accelerator cells.

C. Lack of coordination among stakeholders

This lack of coordination between the most important groups of interest constitutes a major obstacle to the rationalization of the efforts of different branches and organizations all in strengthening the supply chain for the fabrication of batteries in India.

D. High perceived risk

The investment risks in this sector are judged high. Due to the absence of clear production directives in the long term and the uncertainty regarding the future technology of batteries, manufacturers of batteries and vehicles are constrained from making significant investments.

EV CHARGING INFRASTRUCTURE

In India, we expect that the electrification of transport during the next decade will be carried by light electric vehicles (LEV). Road vehicles and light utility vehicles (LUV) are the other segments of vehicles important to electrify.

The requirements for the recharging of electric vehicles depend on the specifications of the batteries of the electric vehicles, since the power supply of the batteries must be with voltages and currents that are suitable for recharging.

The models e-2W and e-3W are powered by low voltage batteries. Also the first generation of electric cars operated with low voltage batteries. However, these may be phased out in the future, even if they continue to exist in certain application cases such as taxis. The second generation of electric cars is, as the latest electric car models show, powered by high-tension batteries. These electric utility vehicles are divided according to loading capacity into low-tension and high-tension vehicles.


FIG 7. Battery Capacity and Voltage

CHARGING METHODS AND POWER RATINGS

The power supply system for electric vehicles (EVSE) is the basic unit of the charging infrastructure for electric vehicles. The EVSE draws on the local power supply and uses a control system and a cable connection, so that the electric vehicle can be charged completely safely. The load leader or refill is the most commonly used loading technology. The requirements of the EVSE and the loading guide depend on factors such as the vehicle type, the battery capacity, the loading method and the rated performance.

PLUG-IN CHARGING

The charging of electric vehicles requires the supply of the battery with constant current (CC). Since the power distribution system provides alternating current (CA), a converter is required to supply the battery with CC. The load conductor can be alternating current or direct current. In an EVSE AC the alternating current supply is carried out via the integrated charger of the electric vehicles, which converts it into direct current. An EVSE CC converts the external energy and supplies a Power-CC directly to the battery, which the integrated charger converts.

FIG 8 EVSE POWER RATINGS
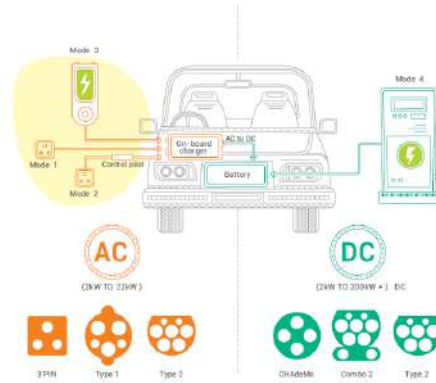
	Power level	Current type	Compatible EV segments
Normal power charging	P ≤ 7kW	AC & DC	E-2Ws, e-3Ws, e-cars, other LCVs (up to 1 ton)
	7kW < P ≤ 22kW	AC & DC	
High power charging	22kW < P ≤ 50kW	DC	E-cars, LCVs and MCVs (1-6 tons)
	50kW < P < 200kW	DC	

BATTERY SWAPPING

An alternative method of recharging batteries, widely used throughout the world, is battery replacement, in which an empty battery of electric vehicles is removed from the vehicle and replaced by a fully charged battery. This technology is tested for various segments of electric vehicles, including E-2W, E-3W, E-Autos and even E-Bus.

TYPES OF BATTERY SWAPPING

Manual:
A battery exchange station is an autonomous device in which the batteries are manually inserted into the individual sockets and removed, usually at the main. The manual replacement stations are of modular construction and do not occupy much space. These are used for applications with batteries 2 W and 3 W; because the batteries are small and their weight can be transported by one or two people.

Autonomous:
In the applications 4-W and E-Bus, robotic replacement is used, because the batteries are larger and heavier and require a mechanical support. These exchange stations are also larger and require a more significant surface.

The exchange of batteries is currently considered a practical solution for commercial fleets of electric vehicles, especially in the segments e-2W and e-3W. The Ministry for Road Transport and Highways (MoRTH) has banned the sale and approval of electric vehicles without batteries, thereby causing a huge surge in the market for battery replacement solutions. In addition, industry actors are investing massively in the development of battery exchange-ecosystems. This is due to the fact that in the coming years, the exchange of batteries will become an independent component of the network for charging electric vehicles in India.

GOVERNMENT OF INDIA TARGETS FOR EV CHARGING INFRASTRUCTURE

MOP TARGETS FOR PUBLIC CHARGING

The Energy Ministry (MoP) sets out in its Guidelines and Standards for Loading Infrastructure which defines the following minimum requirements for the placement of public loading sources:
• At least one charging station should be available in a grid of 3km x 3km.
• One charging station to be set up every 25km on both sides of highways/roads.

According to the MoP guidelines, public loading terminals may contain one or more types of terminals or all combinations thereof. These chargers for e-2W and e-3W can be installed on every charger, provided they meet the technical and safety standards set by the Central Electricity Board (CEA).

MOHUA TARGETS FOR SEMI-PUBLIC CHARGING

The Ministry for Housing and Urban Affairs (MoHUA) has amended its Model for Regulation of Building Materials (MBBL) 2016, to include the provision of charging points for electric vehicles in buildings.
• Charging infrastructure shall be provided for EVs at 20% of all 'vehicle holding capacity'/'parking capacity' at the premises.
• The building premises will have to have an additional power load, equivalent to the power required for all charging points to be operated simultaneously, with a safety factor of 1.25.

The amendments are applicable to all buildings except independent residences. Further provision norms for slow chargers (SC) are provided based on the number of EVs to be serviced, by segment. Norms for fast chargers (FCs) are not compulsory.

GOVERNMENT STAKEHOLDERS OF EV CHARGING INFRASTRUCTURE

Numerous administrative bodies at central, state and local levels are responsible for managing electric vehicle charging. The roles played by these organisms can be divided into the functions of political and governmental work and into the functions of executive power or work in the factory.

POLICY-MAKING AND REGULATORY AUTHORITIES

These government bodies are responsible for formulating policies, making regulations, and establishing standards and specifications for EV charging infrastructure.

The supply of electricity is a key requirement for implementation of charging infrastructure. Electricity being a subject on the Concurrent List of the Constitution, both central and state-level bodies are involved in regulating electricity supply for EV charging.

The **Ministry of Power (MoP)** issued the Charging Infrastructure Guidelines and Standards for public charging infrastructure, which laid out an enabling framework for implementation. MoP clarified that the operation of EV charging services did not require licensing under the Electricity Act 2003.

The **Central Electricity Authority (CEA)** is responsible for defining technical standards and regulations for EV charging.

The **State Electrical Regulatory Commissions (SERCs)** set the EV tariff and other regulations concerning electricity supply for EV charging.

The Ministry of Housing and Urban Affairs (MoHUA) amended the Model Building Byelaws 2016 and the Urban and Regional Development Plans Formulation and Implementation Guidelines 2014 (URDPFI) to include provisions for EV charging.

EV charging standards are defined by the **Bureau of Indian Standards (BIS)**, the standards-making body of the country.

EXECUTIVE OR IMPLEMENTING AUTHORITIES

The MoP was designed by the Bureau of Energy Efficiency (BEE) together with the Central Nodal Agency (CNA) for use as part of the infrastructure for recharging public electric vehicles in transit across the country. The DHI is a central agency responsible for public relations. It is responsible for managing the FAME II program, which includes subsidies for public infrastructure for charging electric vehicles. Under the direction of MoP, the states were designated under the name SNA to take over the work in the public recharge plant. According to the state, the public electricity distribution companies (DISCOM) are represented by SNA.

DISCOMs are responsible for providing electricity connections for EV charging, implementing the EV tariff established by SERCs, ensuring that EV charging infrastructure is connected and operating properly, preventing improper use of EV connections, managing the distribution network, and undertaking grid upgrades based on growth in load including from EV charging.

CHARGE POINT OPERATORS

Charge point operators set up, manage, and operate a network of EV charging points for semi-public or public use and they can also own the EV chargers. CPOs caters to different arrangements and can simultaneously manage a mix of client-owned and self-owned charge point networks.

CONCLUSION

With the support of government and industry, India can realize a shared, electric and connected mobility system and this transformation will potentially benefit the country by improving air quality, reducing oil imports, and creating jobs among other benefits. In order to capture the potential opportunity in 2030, batteries must remain a key focal point today. Batteries will continue to be the key cost driver of EVs. This highlights the critical importance of India's commitment to transformative mobility solutions and the market opportunity associated with domestic battery manufacturing. Growing India's battery manufacturing ecosystem will create huge competitive advantages in mobility, consumer electronics, and support a stable and resilient electricity grid that can absorb increasing shares of renewable energy. In this way, batteries have leverage over several of the most dynamic and growing sectors of India's economy. Such a transformation will do more than enable the clean movement of people and goods. It will create benefits that will reach to almost every corner of India's economy and geography.

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