CHENNAI INSTITUTE OF TECHNOLOGY

Sarathy Nagar, Kundrathur, Chennai-600069

An Autonomous Institute Approved by AICTE and Affiliated to Anna University, Chennai

DEPARTMENT OF BIOMEDICAL ENGINEERING

A Report on Core Course Project

AUTOMATED PARALYSIS PATIENT HEALTHCARE MONITORING SYSTEM USING IOMT THROUGH BLUETOOTH

By

BHARATH KRISHNAN S - 210421121009
GOKUL RAJ P - 210421121015
HEMANTH KUMAR R - 210421121017

Oct / Nov – 2023

CHENNAI INSTITUTE OF TECHNOLOGY CHENNAI-69

VISION OF THE INSTITUTE:

To be an eminent centre for Academia, Industry and Research by imparting knowledge, relevant practices and inculcating human values to address global challenges through novelty and sustainability.

MISSION OF THE INSTITUTE:

IM1.To creates next generation leaders by effective teaching learning methodologies and instill scientific spark in them to meet the global challenges.

IM2.To transform lives through deployment of emerging technology, novelty and sustainability.

IM3.To inculcate human values and ethical principles to cater the societal needs.

IM4.To contributes towards the research ecosystem by providing a suitable, effective platform for interaction between industry, academia and R & D establishments.

IM5.To nurture incubation centres enabling structured entrepreneurship and start-ups.

VISION OF THE DEPARTMENT:

To create a transformative knowledge experience through Research, Industrial technology based training, nurturing entrepreneur skill, inculcating human values and solving global healthcare challenge in a eco-friendly sustainable way

MISSION OF THE DEPARTMENT:

- **DM 1:** To provide high quality education by imparting strong foundation in fundamental biomedical engineering courses
- **DM 2:** To empower the students to cope the global challenges by industry connect , technology support and facilitating research
- **DM 3:**To promote entrepreneur, management creative skill and leadership quality for nation building
- **DM 4:** To transform the students by nurturing human values and Indian knowledge system
- **DM 5:** To implement professionalism in all activities in a eco-friendly sustainable way.

CHENNAI INSTITUTE OF TECHNOLOGY

An Autonomous Institute

CHENNAI-69

CERTIFICATE

This is to certify that the "**AUTOMATED PARALYSIS PATIENT HEALTHCARE MONITORING SYSTEM USING IOMT THROUGH BLUETOOTH**" Submitted by Bharath Krishnan S(210421121009),Gokul Raj P(210421121015), Hemanth Kumar R(210421121017) is a work done by them and submitted during **2023-2024** academic year, in partial fulfilment of the requirements for the award of the degree of **BACHELOR OF ENGINEERING** in **Biomedical Engineering**, at **Chennai Institute of Technology, Chennai.**

Core Course Project Coordinator **Internal Examiner**

Head of the Department **External Examiner**

ACKNOWLEDGEMENT

We express our gratitude to our Chairman **Shri.P.SRIRAM** and all trust members of Chennai institute of technology for providing the facility and opportunity to do this project as a part of our undergraduate course.

We are grateful to our Principal **Dr.A.RAMESH M.E**, **Ph.D.** for providing us the facility and encouragement during the course of our work.

We sincerely thank our Head of the Department, **DR.M.KAYALVIZHI,** Department of Biomedical Engineering for having provided us valuable guidance, resources and timely suggestions throughout our work.

We would like to extend our thanks to our **DR.N.ARCHANA**, Program Coordinator for her valuable suggestions throughout this project.

We wish to extend our sincere thanks to our Faculty Co-ordinator, **S.A.PRIYANKA,M.Tech.,** for her valuable suggestions and her kind cooperation for the successful completion of our project.

We wish to acknowledge the help received from the Lab Instructors of the Biomedical Engineering and others for providing valuable suggestions and for the successful completion of the project.

BHARATH KRISHNAN S (210421121009)
GOKUL RAJ P (210421121015)
HEMANTH KUMAR R (210421121017)

PREFACE

We are the student in the Department of Biomedical Engineering need to undertake a project to expand my knowledge. The main goal of my core project is to acquaint me with the practical application of the theoretical concepts I've learned during my course .It was a valuable opportunity to closely compare theoretical concepts with real-world applications. This report may depict deficiencies on my part but still it is an account of my effort. The results of my analysis are presented in the form of an industrial Project, and the report provides a detailed account of the sequence of these findings. This report is my Core Course Project, developed as part of my III year project. As an engineer, it is my responsibility to contribute to society by applying my knowledge to create innovative solutions that address their changes.

ABSTRACT

Paralysis of different muscles of the body can cause complications with other systems due to a lack of proper muscle function. The paralytic patients cannot be accompanied by others all the time and they are left alone. These people in most cases are not able to convey their needs as they are neither able to speak properly nor do they convey through sign language due to loss of motor control by their brain. They need the dependency of health staff for their daily needs. The monitoring system uses technology telecommunication and the evolution in telecommunication was applied in the project by using the wifi module ESP8266. At the same time, a few circuits and software are used to be a controller for all the main and sub equipment. The function of this sensor is that the patient just needs to move the body part to which the sensor is attached to convey a message. Besides this, the data will be displayed on an LED screen to show what the patient wants to convey. In the new proposed system, we intend to enhance the existing setup by integrating Bluetooth technology and audio communication. Building upon the telecommunication foundation, we will employ Bluetooth connectivity to establish a seamless link between the patient and caregivers. Instead of relying solely on text messages, this system will enable patients to communicate through audio, adding a more natural and expressive dimension to their interactions. Patients can now articulate their needs verbally, which will be transmitted via Bluetooth to a dedicated device monitored by caregivers.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

Introduction:

A paralysis patient monitoring system using ESP8266 and Arduino through Bluetooth represents a groundbreaking innovation in the field of healthcare technology. Paralysis, whether caused by spinal cord injuries, neurological disorders, or other medical conditions, presents significant challenges for both patients and healthcare providers. Effective monitoring and timely intervention are critical to ensure the well-being and safety of paralysis patients, and this system offers a comprehensive solution to address these concerns.

1. Background:

Paralysis is a condition that results in the loss of motor function in one or more parts of the body. Patients suffering from paralysis face various limitations in their daily lives, such as limited mobility, muscle weakness, and difficulties in communication. Monitoring their health status is crucial, as they are more vulnerable to various health issues, including pressure ulcers, respiratory problems, and infections. Traditional methods of monitoring paralysis patients involve periodic physical examinations, which are not only time-consuming but also do not provide continuous real-time data.

The emergence of the Internet of Things (IoT) and wearable health monitoring devices has paved the way for more efficient and effective healthcare solutions. In this context, the integration of Arduino and ESP8266 with Bluetooth technology offers an innovative approach to monitor and support paralysis patients. The system enables continuous, real-time data collection and transmission, allowing healthcare providers and caregivers to access vital health information instantaneously.

2. System Overview:

The paralysis patient monitoring system comprises an Arduino-based sensor array and an ESP8266 module equipped with Bluetooth capabilities. The Arduino unit is responsible for collecting various health parameters, including heart rate, body temperature, and motion data. These sensors are non-invasive and are either wearable or positioned in the patient's immediate environment. The ESP8266 module serves as a communication gateway, transmitting the collected data to a centralized monitoring station through a secure Bluetooth connection.

3. Benefits and Significance:

The implementation of this monitoring system offers several key advantages:

Real-Time Monitoring: The system provides continuous real-time monitoring of vital health parameters. This ensures that any abnormal readings or emergency situations are detected promptly, allowing for immediate interventions and potentially life-saving actions.

Remote Access: Caregivers and healthcare providers can remotely access the patient's data through a user-friendly interface. This feature allows for greater flexibility in caregiving, making it easier to provide round-the-clock support and reduces the need for frequent physical check-ups.

Improved Quality of Life: Continuous monitoring not only enhances the patient's safety but also contributes to an improved quality of life. Patients can experience increased independence and confidence, knowing that their health is constantly under surveillance.

Data Analysis and Trend Monitoring: The system records and stores historical data, allowing for trend analysis and long-term patient care planning. This information assists healthcare professionals in making informed decisions about the patient's treatment and care regimen.

Cost-Efficiency: By reducing the need for frequent hospital visits and manual monitoring, the system has the potential to reduce healthcare costs for both patients and healthcare providers.

Ethical and Privacy Considerations: The system is designed with a strong focus on data security and privacy. Patient data is encrypted and access-controlled to ensure the highest ethical and regulatory standards are met.

Customization and Scalability: The system is designed to be easily adaptable to various healthcare scenarios and can be customized to monitor additional health parameters or integrate with other assistive technologies.

4. Future Directions:

As technology continues to advance, there are numerous opportunities for further development and improvement of the paralysis patient monitoring system. These may include:

Integration with AI: Incorporating artificial intelligence for predictive analytics and early warning systems to anticipate health issues and improve patient outcomes.

Expanded Sensor Capabilities: Enhancing the sensor array to monitor additional health parameters such as blood pressure, oxygen saturation, and glucose levels.

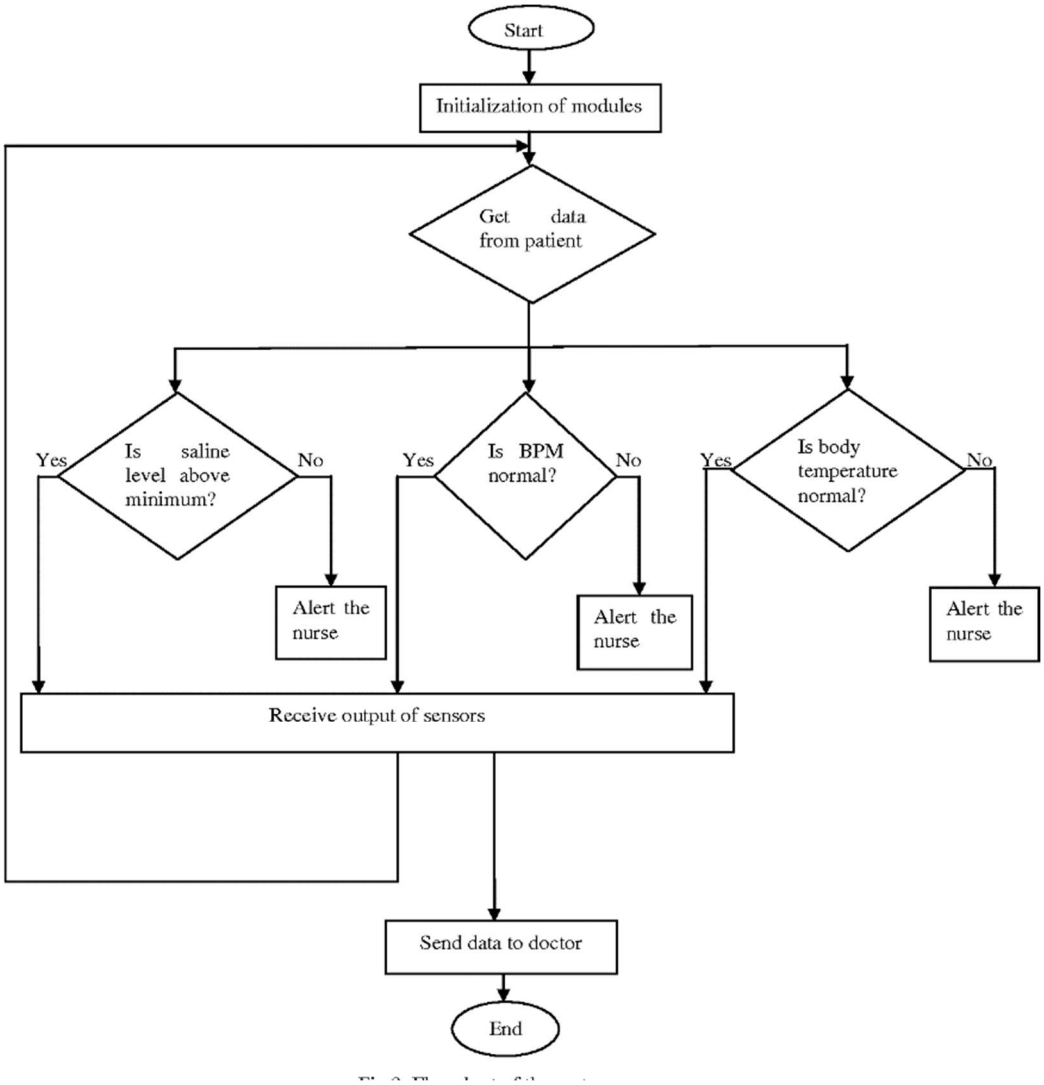
Interoperability: Ensuring compatibility with other healthcare systems, electronic health records, and wearable devices to create a comprehensive and interconnected healthcare ecosystem.

User Experience: Ongoing user feedback and usability testing to enhance the system's interface and ensure it remains user-friendly and accessible for patients and caregivers.

5. Conclusion:

The paralysis patient monitoring system using ESP8266 and Arduino through Bluetooth represents a transformative leap forward in the healthcare industry. By enabling real-time, continuous health monitoring and remote access to patient data, it not only enhances patient safety but also improves their quality of life. This system has the potential to revolutionize the way we care for paralysis patients, offering a scalable, cost-effective, and ethically sound solution that can be tailored to meet the unique needs of each patient. As technology continues to evolve, the possibilities for further enhancements and integrations are vast, promising a brighter future for those living with paralysis.

6.Comprehensive Analysis:



CHAPTER 2

PROBLEM STATEMENT

- Paralysis of different muscles of the body can cause complications with other systems due to a lack of proper muscle function.
- The paralytic patients cannot be accompanied by others all the time and they are left alone .
- These people in most cases are not able to convey their needs as they are neither able to speak properly nor do they convey through sign language due to loss in motor control by their brain.
- They need the dependency of health Staff for their daily needs.

REQUIREMENTS OF PARALYSIS PATIENT:

Medical Care and Rehabilitation: Paralyzed patients often require ongoing medical care, physical therapy, and rehabilitation to manage their condition and improve their quality of life. They may want access to the best possible healthcare and therapies to help them regain some level of independence.

Mobility: Many paralyzed individuals have a strong desire to regain some degree of mobility or independence. They may want assistive devices like wheelchairs, braces, or exoskeletons that can help them move around and perform daily activities more easily.

Pain Management: Paralyzed patients may experience chronic pain, muscle spasms, and other physical discomforts as a result of their condition. Pain management and relief are essential for their comfort and well-being.

CHAPTER 3

PROBLEM OBJECTIVES

- Design a system that can continuously monitor and prevent pressure sores in paralysis patients by alerting caregivers when repositioning is required.
- Develop a medication management system that helps paralysis patients adhere to their prescribed medication schedules, ensuring they receive the right medications at the right times.
- Create an accessible environmental control system that allows paralysis patients to independently control their surroundings, such as lights, appliances, and temperature, using assistive technology.
- Develop a system that enhances the safety of paralysis patients in wheelchairs by providing obstacle detection, navigation assistance, and real-time feedback on terrain conditions.
- Create a communication system that enables non-verbal paralysis patients to communicate with caregivers and loved ones effectively, using technology like eye-tracking or brain-computer interfaces.
- Patient Safety: Ensure the safety of paralysis patients by monitoring their vital signs, movements, and other health parameters in real-time to prevent accidents and complications.
- Early Detection of Health Issues: Detect any health issues or complications promptly, such as pressure ulcers, infections, or respiratory problems, to initiate timely medical intervention.
- Enhanced Quality of Life: Improve the quality of life for paralysis patients by allowing them to communicate, control their environment, and maintain a level of independence.
- Remote Monitoring: Enable healthcare providers and caregivers to remotely monitor the patient's condition, reducing the need for frequent in-person visits and hospitalizations.
- Data Collection and Analysis: Gather and analyze data on the patient's vital signs, movements, and activity levels over time to track their progress, identify trends, and make informed healthcare decisions.

CHAPTER – 4

LITERATURE REVIEW

1.Title: Paralysed Patient Healthcare Monitoring Device

Authors: Anagha, Jhanavi M., Khushi M.S., Nithin Kumar S.

Providing thorough and ongoing monitoring, treatment, and support for those who are affected by or mobility limitations is the goal of a paralysis healthcare monitoring system. Injuries to the nervous system, such as spinal cord injuries or neurological conditions like stroke, frequently result in paralysis, which is the loss of muscular function in a portion of your body .

Through our initiative, we created a productive system for meeting the basic requirements of patients who are paralyzed, such as providing them with access to food and drink as well as help with bathroom needs. The use of continuous observation of patients, which considerably lessened the workload on nursing personnel and carers, made this accomplishment feasible. Real-time patient monitoring is the primary component of our project's functionality. Our technology guarantees that patients receive prompt help without the need for a nurse to be monitoring signs displayed by the patients. This encourages patient autonomy while simultaneously allocating healthcare resources as efficiently as possible.

2.Title: Automated Paralysis Patient Monitoring System

Authors: Kaythry Pandurangan, R.Vinu

Paralytic people in most cases are not able to convey their needs as they are neither able to speak properly nor do they convey through sign language due to loss in motor control by their brain. In such a situation, our proposed system helps the disabled person in displaying a message over the LCD by simple motion of their hand. The proposed system works by reading the various tilt directions of the hand. The transmitter is attached to a glove which is worn by patient. User just needs to tilt the device in different directions to convey different messages.

IoT enabled Paralysis patient healthcare helps to know the health status and needs of the patients by being at a remote place. This system model plays a vital role by being an assistive aid for people who are affected by paralysis. The IoT cloud stores the messages gives an overview of the health status of the patient over a period of time.

Further development can be made by using additionally gyro sensor and flex sensors which brings in more applications to be included to our proposed system. Gyro sensor can be used for the purpose of

measuring the rotational movement of the hand and flex sensor can be used to detect the motion made by individual fingers. GSM module can be used additionally for the purpose of sending the messages conveyed by the paralyzed patients by sending a SMS to the registered person.

3.Title**:** Automated Paralysis Patient Health Care System

Authors: Vidya Sarode,K.R Alex Rappai, Victor Thomas3, Akash Dubey, Shashank Shukla

The noble aim behind this project is to design a health care system which will be helpful for paralyzed and mute people . A Dumb individual all through the world uses gesture based communication for the correspondence. The progression in implanted framework can give a space to plan and build up an interpreter framework to change over the communication via gestures into discourse. As sign language primarily used by deaf but also used by people who can hear having problem in speaking so the approach used in this analysis is vision based. The glove uses are fitted with flex sensor in three dimensions to collect the data from every position of figure and hand motion to differentiate and distinguish each and every word from a particular sign. Heart attack is the major reason for death among both genders men and women. However, its occurrence cannot be always predictable.

Processing speeds of computers have increased dramatically, with computers being advanced to the levels where they can assist humans in complex tasks. It is justified that sign language decoding using these modern techniques helps in achieving more efficiency in the field of gesture recognition thus making it easy to understand for everyone. To continue this moment, it is clear that further research in the areas of future extraction, classification methods, and gesture representation are required to realize the ultimate goal of humans interfacing with machines on their own natural terms. This project is useful for deaf and dump people those cannot communicate with normal person. It is also useful for speech impaired and paralysed patient means those do not speak properly.

4.Title: Paralyzed Patient Monitoring Equipment -IoT

Authors: Avinash Wilson J, Viancy V

A survey of the Global Burden of Diseases (GBD) estimated that, approximately 5.8 million people lose their lives due to stroke. Stroke is the major cause of paralysis, which affects almost 33.7% of the population with paralysis. But there is no optimal tracking system to monitor the patient's health and daily needs. In this high speed world it is not possible to constantly take care of their near ones who need their help. To overcome such difficulties paralyzed patient monitoring equipment is introduced, which checks the patient's heart rate using SEN-11574 and captures the hand gestures using MPU-6050.

According to the sensor values, a patient's need is notified to the Care-Taker via mobile application using Internet of Things.

This IoT based paralyzed patient monitoring equipment is a wearable device and serves as an efficient system for the paralyzed patients. The system is inexpensive and helps the patients notify their Care-Taker in case of any needs through their hand gestures. Also, the equipment monitors the vital framework of the patient such as heart rate and if the parameter goes from normal range to an unsafe range, the patient's relative/caretaker is immediately notified so that critical care can be given to the patient before he/she reaches a dangerous state.

5. According to a survey, nearly 1 in every 5000 people are paralyzed. Fully paralyzed patients require 24 hour support. But in this days, it is not possible to constant monitor patient. So they need a person which take care's movement disabled or paralyzed patient. And appliances cannot be handled by them. So they need constant help and they cannot work independently there are various applications which can be drive from eye blink detection and these are not limited. An efficient, real time blink detection can be used for almost any purpose. It can be used for on/off appliances such as lighting devices, fan, television or a microwave oven. Electrooculographic direction of a wheelchair utilizing eye development A convenient remote eye development controlled Human Computer Interface (HCI) for debilitated individual Eye controlled turning on and off the electronic gadgets Launching the rocket utilizing look in war field A few inquires about have been done as of late to develop Human Computer Interface

6. In another research Abhinandan Das et.al proposed ISLR system is considered as a pattern recognition technique that has two important modules: feature extraction and classification. The joint use of Discrete Wavelet Transform (DWT) based feature extraction and nearest neighbour classifier is used to recognize the sign language. The experimental results show that the proposed hand gesture recognition system achieves maximum 99.23% classification accuracy while using cosine distance classifier .

7. Authors Anetha K et.al presented various method of hand gesture and sign language recognition proposed in the past by various researchers. For deaf and dumb people, Sign language is the only way of communication. With the help of sign language, these physical impaired people express their emotions and thoughts to other person . Priyanka R Potdar et.al. Proposed a system to aid communication of deaf and dumb people communication using Indian sign language (ISL) with normal people where hand gestures will be converted into appropriate text message

8. The researcher Sachin Bhatt et.al. Presented the recent research and development of sign language based on manual communication and body language. Sign language recognition system typically elaborate three steps preprocessing, feature extraction and classification . Classification methods used for recognition are Neural Network (NN), Support Vector Machine(SVM), Hidden Markov Models

(HMM) . Mukul Singh Kushwah et.al. Presented application that helps the deaf and dumb person to communicate with the rest of the world using sign language. The key feature in this system is the real time gesture to text conversion

9.Title: An IoT based SMART patient health monitoring system

Authors: C R Srinivasan, Guru Charan, P Chenchu Sai Babu

Smart and connected health care is of specific significance in the spectrum of applications enabled the Internet of Things (IoT). Networked sensors, either embedded inside our living system or worn on the body, enable to gather rich information regarding our physical and mental health. In specific, the accessibility of information at previously unimagined scales and spatial longitudes combined with the new generation of smart processing algorithms can expedite an advancement in the medical field, from the current post-facto diagnosis and treatment of reactive framework, to an early-stage proactive paradigm for disease prognosis combined with prevention and cure as well as overall administration of well-being rather than ailment.

This paper offers a comprehensive survey of recent research trends along with all the smart healthcare opportunities and challenges. There has always been a great demand for needless and costeffective healthcare solutions. With huge funding and increased focus on the smart healthcare arena, users have access to numerous products, services and applications. Since smart healthcare has multifaceted applications it provides researchers a wide range of opportunities to actively innovate innovative products and enhance current architectures.

CHAPTER 5

METHODOLOGY

EXISTING SYSTEM

The project used the technology in telecommunication, where the evolution in telecommunication was applied in this project by using GSM module SIM900A.At the same time, a few circuit and software are used to be a controller for all the main and sub equipment.A few components like microcontroller and GSM module are used.

The function of this sensor is that the patient just needs to move the body part to which the sensor is attached to convey a message. Besides this, the data will be displayed at the LED screen to know what the patient want to convey. On the other hand, the buzzer will sound when there is any emergency case and the SMS alert will be sent to the care taker of the patient. The main aim of this project is to help paralyzed patient to convey their message or need.

PROPOSED SYSTEM

In the new proposed system, we intend to enhance the existing setup by integrating Bluetooth technology and audio communication. Building upon the telecommunication foundation, we will employ Bluetooth connectivity to establish a seamless link between the patient and caregivers. Instead of relying solely on text messages, this system will enable patients to communicate through audio, adding a more natural and expressive dimension to their interactions. Patients can now articulate their needs verbally, which will be transmitted via Bluetooth to a dedicated device monitored by caregivers .

METHODOLOGIES

Data Acquisition and Sensors:

This component includes various sensors and devices for collecting data from the patient. These may include vital signs monitors, motion sensors, environmental sensors, and other wearable or non-wearable sensors.

- Heart Rate Monitor: Measures the patient's heart rate and rhythm, typically using electrocardiography (ECG) sensors or photoplethysmography (PPG) sensors.
- Blood Pressure Monitor: Measures the patient's blood pressure, which can include both systolic and diastolic readings.

- Pulse Oximeter: Measures the oxygen saturation (SpO2) and pulse rate of the patient's blood.

Data Processing and Analytics:

Data from the sensors are processed and analysed in this block. It may involve data preprocessing, feature extraction, machine learning algorithms for trend analysis, and anomaly detection. Data processing and analytics in a paralysis patient monitoring system are crucial components that handle the collected data, extract valuable insights, and provide actionable information to improve patient care

User Interface

The user interface is the means through which patients, caregivers, and healthcare professionals interact with the system. It provides real-time feedback, alerts for critical events (e.g., fall detection, abnormal vital signs), and data visualization.

Medication Reminders:Implement medication management features, including medication schedules, dosage reminders, and prescription details.

Emergency Assistance:Include a one-touch emergency button or call feature for patients to seek help in critical situations.

Alert System:

Critical Event Alerts:

Automatically detect and send alerts for critical events, such as falls, irregular heart rate, low oxygen saturation, or sudden changes in vital signs.

Customizable Alerts: Allow users to configure alert settings, including the type of alerts, notification methods (e.g., SMS, email, in-app notifications), and the severity of alerts.

Ensure that alert data is transmitted and stored securely to protect patient privacy and comply with relevant data security regulations.

Communication and Connectivity:

This component ensures that the system can communicate with remote servers, other healthcare systems, and mobile apps. It includes connectivity options like Wi-Fi, cellular, and Bluetooth for data transmission.

Paralysis Patient Monitoring System:

This central block represents the core of the monitoring system, where data flows in and out, and where decisions are made based on the processed data. It manages the integration of data from various sensors, executes analytics algorithms, and generates alerts or notifications.

Bluetooth Technology:

By combining Bluetooth technology with a user-friendly interface and a robust alert system, paralysis patient monitoring systems can provide patients and their caregivers with the information and support needed to ensure patient safety and well-being.

CHAPTER 6

RESULTS

The aim of this project is to constantly measure, display and monitor the patient's vitals by using a set of sensors which has been successfully implemented. We have also incorporated a mode where a trigger alert is sent to the doctor and the patient's family whenever the vitals reach or cross a particular limit. Our main goal is to design a wearable Smart Device that constantly monitors the vitals. We have successfully implemented that using IoT technology.

The readings were recorded in the output of Arduino IDE compiler and the photo snaps were taken.

Thus the paralysis patient's Heart rate , Pulse rate .Temperature was continuously monitored by the sensors and when there is sudden change in these parameter such as heart beat(When it is below or above 60-100 beats per minute) then there will be an indication of high or low according to the condition in the output.

As the caretaker cannot take care of the eldery patient(may be he might be cooking in kitchen or watering plant) so during this time him/her is provided with a Bluetooth device through which this emergency output reaches. Even when the Care taker is hearing music with the Bluetooth device , an sudden audio interruption is sent with emergency messages during emergency situations.

So this becomes very advantageous for the caretaker and thus the emergency situations are being easily handled due to the early detection of abnormalities.

CHAPTER 7

ANALYSIS OF PROJECT

Improved Patient Safety:

- Early Detection of Falls: The system can detect falls and promptly alert caregivers or medical professionals, reducing the risk of injury.
- Alerts for Critical Health Events: The system can provide alerts for abnormal vital signs, ensuring swift medical intervention when needed.

Enhanced Quality of Life:

- Independence and Mobility: Patients can control their environment, including lights, appliances, and communication devices, even if they have limited physical mobility.
- Medication Management: The system can help patients adhere to medication schedules, promoting better health management.

Prevention of Complications:

- Pressure Sore Prevention: Continuous monitoring can help prevent pressure sores by providing timely reminders for repositioning.
- Respiratory Health: Monitoring respiratory rate and oxygen levels can prevent respiratory complications in patients.

Remote Monitoring and Telehealth:

- Healthcare providers can remotely monitor patients' health and make informed decisions without requiring in-person visits.
- Telehealth consultations and remote support can improve access to healthcare services, especially for patients with limited mobility.

Data-Driven Insights:

- Long-Term Trend Analysis: Patient data is continuously collected and analyzed, providing insights into health trends and allowing for early intervention.
- Personalized Care: Healthcare providers can tailor care plans based on individual patient data and needs.

Timely Emergency Response:

- Rapid Response to Emergencies: In case of critical health events, the system can facilitate immediate communication with emergency services.
- Location Tracking: Some systems may include GPS or location tracking to pinpoint the patient's location during emergencies.

The specific outcomes of a paralysis patient monitoring system can vary depending on the system's features, the patient's condition, and the quality of care it enables. Nevertheless, the overarching goal is to enhance patient safety, improve quality of life, and provide better support and care for individuals living with paralysis.

CHAPTER 8

TECHNOLOGIES USED

A paralysis patient monitoring system relies on various technologies to collect, process, and communicate patient data. These technologies play a crucial role in ensuring the system's effectiveness and the well-being of patients. Here are some of the key technologies used in such a monitoring system.

SOFTWARE USED:

1. Wireless Communication:

   Bluetooth: Connect sensors and wearables to a central monitoring unit or a user interface device.

2. Arduino IDE :

   A compiler used for compiling and running code in the Arduino. In our project we use Arduino NANO.

3. IoT (Internet of Things)

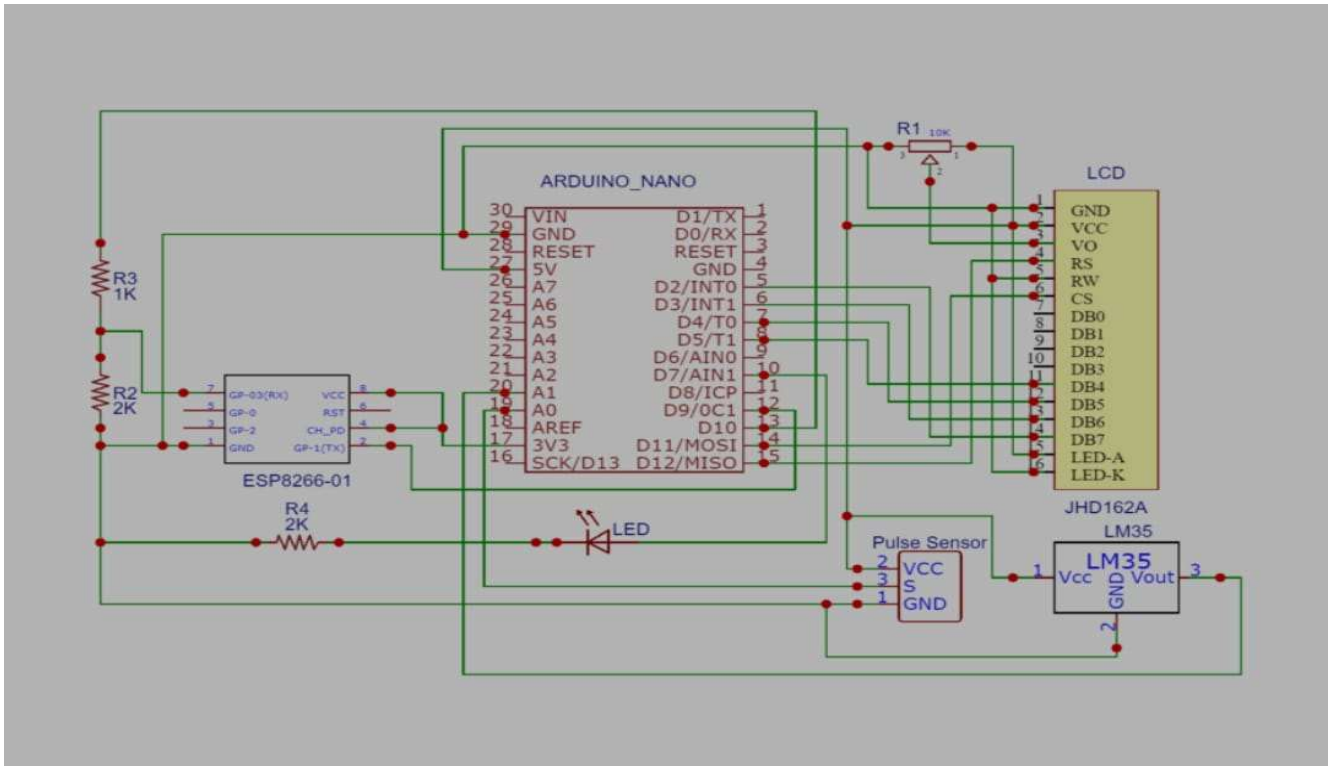
   IoT Devices: Enable seamless connectivity and communication between devices, sensors, and the central monitoring system.

   -IoT Protocols: Ensure efficient and secure data transfer in an IoT ecosystem.

HARDWARE COMPONENTS USED:

1. Arduino Nano Board
2. ESP8266-01 WiFi Module
3. 16x2 LCD Display
4. Potentiometer 10K
5. Pulse Sensor
6. LM35 Temperature Sensor
7. 2K Resistor
8. 1K Resistor
9. LED 5mm Any Color
10. Connecting Wires
11. Breadboard
12. Paralysis Socket

CIRCUIT DIAGRAM:



ARDUINO NANO:

The Arduino Nano is a compact and popular microcontroller board based on the ATmega328P or ATmega168 microcontroller. It is a member of the Arduino family of boards, and it is designed for projects where space is limited, and you need a small and lightweight microcontroller.

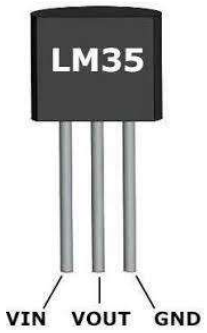
PULSE SENSOR:

A pulse sensor is a type of sensor used to detect and measure a person's heart rate or pulse rate. It's a valuable tool for monitoring an individual's physiological health and can be integrated into various

applications, including fitness trackers, medical devices, and wearable technology. Here's some information about pulse sensors

LM35 TEMPERATURE SENSOR:

The LM35 is a precision temperature sensor integrated circuit that is commonly used in electronics and microcontroller projects to measure temperature. It provides an analog voltage output that is directly proportional to the temperature in degrees Celsius. The LM35 is straightforward to use and is popular for applications requiring temperature sensing and control.



JUMPER WIRES:

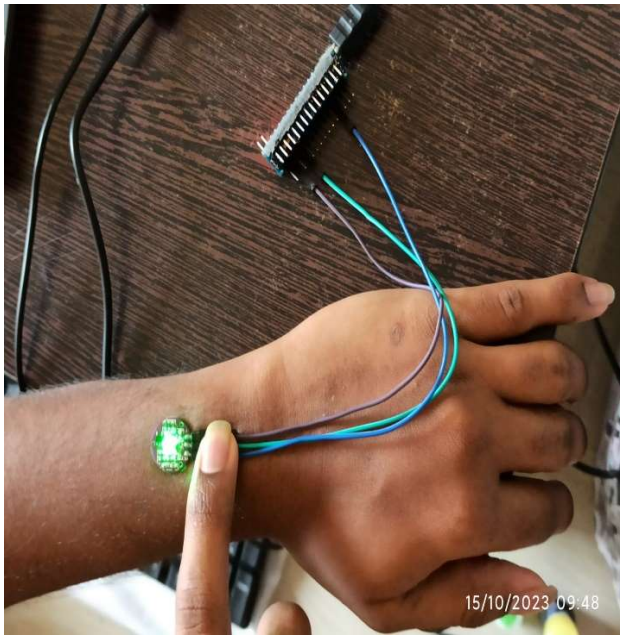
Jumper wires are essential components in electronics and electrical projects. They are simple wires with connectors at both ends, typically used to establish electrical connections between various components on a breadboard, a circuit board, or between different modules and sensors

CHAPTER 9

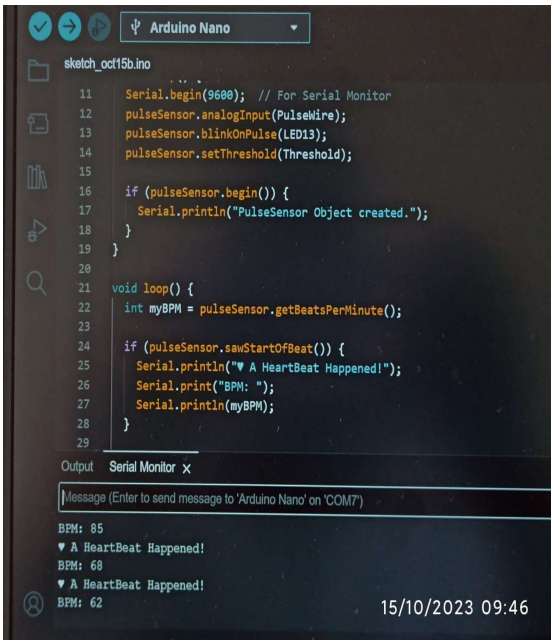
PROJECT PHOTOS

WORKING SNAPS OF PROJECT

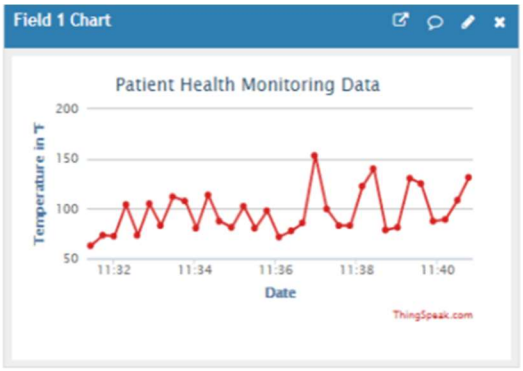
SIGNAL AQUISTION

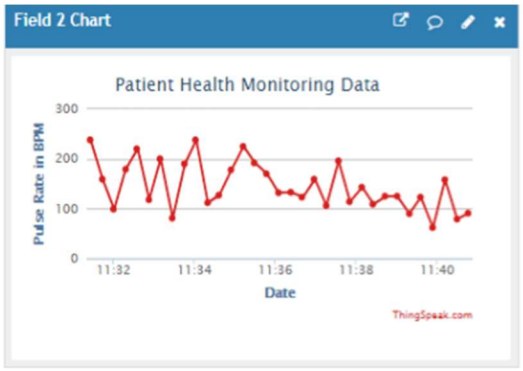


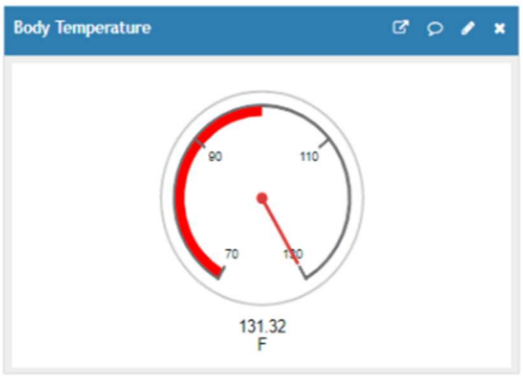
OUTPUT

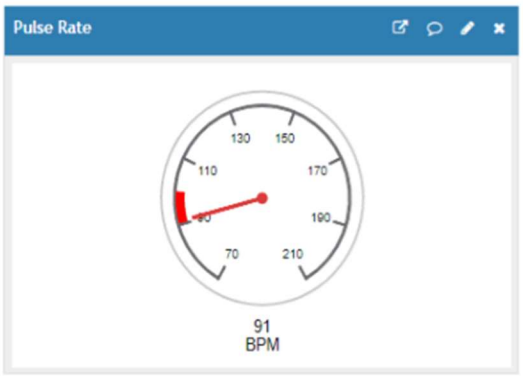


GRAPH OBTAINED









CHAPTER 10

CONCLUSION

IoT enabled Paralysis patient healthcare helps to know the health status and needs of the patients by being at a remote place. This system model plays a vital role by being an assistive aid for people who are affected by paralysis. The IoT cloud stores the messages gives an overview of the health status of the patient over a period of time.

This report offers a comprehensive survey of recent research trends along with all the smart healthcare opportunities and challenges. There has always been a great demand for needless and costeffective healthcare solutions. With huge funding and increased focus on the smart healthcare arena, users have access to numerous products, services and applications. Since smart healthcare has multifaceted applications it provides researchers a wide range of opportunities to actively innovate innovative products and enhance current architectures.

This is primarily due to the need to continually educate and convince healthcare experts to adjust to the digital age. Although IoT-backed smart healthcare technologies can enhance income and enhance quality of lives, if security and safety is compromised the advantages can readily be overlooked. Additional measures should be taken to deal with threats and to secure potential information at the ends of both the customer and the developer. Thus, this dynamically increasing industry's vision and long-term achievement lies in the synergy between scientists, healthcare practitioners, and the people.

CHAPTER 11

REFERENCES

1. Population Reference Bureau, “2014 World Population Data Sheet”. [Online]. Available: http://www.prb.org/Publications/Datasheets/2014/2014-worldpopulation- data-sheet.aspx OECD/European Commission “Sweden-A good life in old age? Monitoring and improving quality in long-term care”, June 2013. OECD. [Online]. Available: http://www.oecd.org/els/healthsystems/ Sweden-OECD-EC-GoodTime-in-Old-Age.pdf
2. F. Yuan Jie, Y. Yue Hong, X. Li Da, Z. Yan, and W. Fan, "IoT-Based Smart Rehabilitation System," Industrial Informatics, IEEE Transactions on, vol. 10, pp. 1568-1577, 2014.
3. X. Boyi, X. Li Da, C. Hongming, X. Cheng, H. Jingyuan, and B. Fenglin, "Ubiquitous Data Accessing Method in IoT-Based Information System for Emergency Medical Services," Industrial Informatics, IEEE Transactions on, vol. 10, pp. 1578-1586, 2014.
4. J. Jin, J. Gubbi, S. Marusic, and M. Palaniswami, "An information framework for creating a smart city through Internet of Things," IEEE Internet of Things Journal, vol. 1, pp. 112-121, 2014. Jawbone Inc., “Jawbone fitness trackers,” accessed April 2015. [Online]. Available: https://jawbone.com/up/trackers
5. FitBit Inc., “flex: Wireless activity + sleep wristband,” accessed April 2015. [Online]. Available: https://www.fitbit.com/flex Apple Inc., “Apple watch,” accessed April 2015. [Online]. Available: https://www.apple.com/watch/
6. Pantelopoulos and N. Bourbakis, “A survey on wearable sensor-basedsystems for health monitoring and prognosis,” IEEE Trans. Sys., Man, and Cybernetics, Part C: Applic. and Reviews, vol. 40, no. 1, pp. 1-12, Jan 2010.
7. D. Son, J. Lee, S. Qiao, R. Ghaffari, J. Kim, J. E. Lee, C. Song, S. J. Kim, D. J. Lee, S. W. Jun, S. Yang, M. Park, J. Shin, K. Do, M. Lee, K. Kang, C. S. Hwang, N. Lu, T. Hyeon, and D.-H. Kim, “Multifunctional wearable devices for diagnosis and therapy of movement disorders,” Nature Nanotechnology, pp. 1-8, 2014.
8. N. Birbaumer , A. Kübler, N. Ghanayim, T. Hinterberger, J. Perelmouter, J. Kaiser, I. Iversen, B. Kotchoubey, N Neumann, H. Flor, ”The Thought Translation Device (TTD) for Completely Paralyzed Patients”, IEEE Transactions on Rehabilitation Engineering, vol. 8, No. 2, pp. 190-193, June 2000.
9. Syed Faiz Ahmed, Syed Muhammad Baber Ali, and Sh. Saqib Munawwar Qureshi, “Electronic Speaking Glove for Speechless Patients, A Tongue to a Dumb”, Proceedings of 2010 IEEE Conference on Sustainable Utilization and Development in Engineering and Technology, pp.56-60, 20 &21 November 2010.

10. M. Wald," Captioning for Deaf and Hard of Hearing People by Editing Automatic Speech Recognition in Real Time", 10th International Conference on Computers Helping People with Special Needs ICCHP 2006, LNCS 4061, pp. 683-690, 2006.

11. N. P. Bhatti, A. Baqai, B. S. Chowdhry, and M. A. Unar , "Electronic Hand Glove for Speech Impaired and Paralyzed Patients", EIR Magazine, pp. 59-63, May 2009.

12. M. Chan, D. Esteve, C. Escriba, and E. Campo, "A review of smart homes - Present state and future challenges", Computer methods and programs in biomedicine, Elsevier, vol.91, No.1, pp. 55-81, 2008.

13. Jingdong Zhao, Li Jiang, Shicai Shi, Hegao Cai, Hong Liu, G.Hirzinger, "A Five-fingered Underactuated Prosthetic Hand System", International Conference on Mechatronics and Automation, pp. 1453-1458, June 2006.

14. Priti D. Nandnikar and Manoj S. Nagmode, "Sensorized Glove for Rehabilitation Purpose", International Journal of Engineering Research and General Science, vol.3, Issue.3, pp.189-194, MayJune 2015 .

15. Rolga Roy, S. Archa, Josny Jose, and Rinku Varghese, "A survey on different methodologies to Assist paralyzed patients", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, vol.5, Issue.3, pp.1281-1285, March 2016.

16. Shifali Gupta, ": Android Based Mobile Drive System", International Journal of Advances in Electronics and Computer Science, vol.5, Issue.6, pp. 24-27, June 2018.

17. P. Aparna, P. Mohana Priya, T. Usha Rani, B. Jeba Jaculin, and B. Pradeep Raja, "Development of an Assistive Aid for Speech Impaired", International Journal of Scientific and Research Publications, vol. 2, Issue. 3, pp.1-4, March 2012.

18. J. Davis, "Improving Upper-Extremity function in adult Hemiplegia", OT Practice, vol. 6, Issue. 22, pp. 8-13, 2001. T. Deepasri, M. GokulPriya, G. Arunkumar, P. Mohanraj, and M.

19. Shenbagapriya, "Automated Paralysis Patient Health Care Monitoring System", South Asian Journal of Engineering and Technology vol. 3, No. 2, pp. 85–92, 2017.

20. M. Mohana, S. Priyadharshini, N. Sowmiya, and G. Pavithra Devi," An IoT based automated communication system for paralyzed patients using simple hand gestures", European Journal of Molecular & Clinical Medicine, Vol. 7, Issue. 4, 2020, pp. 2681-2686.

21. Komal V. Sindagi, Ragini B. Patil, Rukkayya L. Mujawar, and M. B. Mulik," GSM based Paralysis Patient Monitoring System", International Research Journal of Engineering and Technology, Vol. 07 Issue. 06, June 2020, pp. 265-267.

22. V. Viancy, J. Avinash Wilson, and P. Anusha, "Paralyzed Patient Monitoring Equipment – IoT", International Journal of Advanced Research in Basic Engineering Sciences and Technology, Vol.6, Issue.10, October 2020, pp.25- 28.

23. Srinivasan L., et.al., "IoT-Based Solution for Paraplegic Sufferer to Send Signals to Physician via Internet", arXiv preprint arXiv:2304.10840, Research Article, 2023.

24. Varghese, Ninet D. Hepsiba, and L.D. Vijay Anand, "Health Monitoring and Observatory System for Paralysed Patients using Blynk Application", 2022 6th International Conference on Devices, Circuits and Systems (ICDCS), IEEE, 2022.

25. Renee N., et.al., "IOT Based Paralysis Patient Health Care Monitoring System", Journal of University of Shanghai for Science and Technology, vol. 23, no. 6, 2021.

26. Sarode, Vidya, et.al., "Automated Paralysis Patient Health Care System", International Research Journal of Engineering and Technology (IRJET), vol. 8, issue 5, 2021.

27. Deepasri T., et.al., "Automated paralysis patient health care monitoring system", South Asian Journal of Engineering and Technology, vol. 3, no. 2, pp. 85-92, 2017.

28. Sindagi, Komal V., et.al., "GSM based Paralysis Patient Monitoring System", International Research. Journal of Engineering and Technology, vol. 7, issue 6, pp. 265-267, 2020.

29. Shanmugaraj G., et.al., "Enhancing Paralysis Patient Care through an IoT-Enabled Healthcare Ecosystem", Journal of Population Therapeutics and Clinical Pharmacology, vol. 30, no. 11, pp. 271-280, 2023.

PO AND PSO ATTAINMENT

PO.No	Graduate Attribute	Attained	Justification
PO 1	**Engineering knowledge**	Yes / No	
PO 2	**Problem analysis**	Yes / No	
PO 3	**Design/Development of solutions**	Yes / No	
PO 4	**Conduct investigations of complex problems**	Yes / No	
PO 5	**Modern Tool usage**	Yes / No	
PO 6	**The Engineer and society**	Yes / No	
PO 7	**Environment and Sustainability**	Yes / No	
PO 8	**Ethics**	Yes / No	
PO 9	**Individual and team work**	Yes / No	
PO 10	**Communication**	Yes / No	
PO 11	**Project management and finance**	Yes / No	
PO 12	**Life-long learning**	Yes / No	

PSO.No	Graduate Attribute	Attained	Justification
PSO 1	To analyze, design and develop solutions by applying the concepts of Robotics for societal and industrial needs.	**Yes/No**	
PSO 2	To create innovative ideas and solutions for real time problems in Manufacturing sector by adapting the automation tools and technologies.	**Yes/No**	