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Thalavapalayam, Karur - 639 113, TAMILNADU.

ADVANCED EMERGENCY RESPONSE SYSTEM FOR SENIOR CITIZENS

A MINOR PROJECT-IIIREPORT

Submitted by

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BACHELOR OF ENGINEERING

in

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

M.KUMARASAMY COLLEGE OF ENGINEERING

(Autonomous)

KARUR – 639 113

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M.KUMARASAMY COLLEGE OF ENGINEERING,KARUR

BONAFIDE CERTIFICATE

Certified that this **18ECP105L-Minor Project III**report **"ADVANCED EMERGENCY RESPONSE SYSTEM FOR SENIOR CITIZENS"** is the Bonafide work of "**PREETHI S (927622BEC155) , RAKCHANA R (927622BEC160) , SHIVANI B (927622BEC187) "**who carried out the project work under my supervision in the academic year (2024–2025)**ODD SEM**.

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This report has been submitted for the**18ECP105L – Minor Project III** final review held at M. Kumarasamy College of Engineering, Karur on _____.

PROJECT COORDINATOR

INSTITUTION VISION AND MISSION

Vision

To emerge as a leader among the top institutions in the field of technical education.

Mission

M1: Produce smart technocrats with empirical knowledge who can surmount the global challenges.

M2: Create a diverse, fully -engaged, learner -centric campus environment to provide quality education to the students.

M3: Maintain mutually beneficial partnerships with our alumni, industry and professional associations

DEPARTMENT VISION, MISSION, PEO, PO AND PSO

Vision

To empower the Electronics and Communication Engineering students with emerging technologies, professionalism, innovative research and social responsibility.

Mission

M1: Attain the academic excellence through innovative teaching learning process, research areas & laboratories and Consultancy projects.

M2: Inculcate the students in problem solving and lifelong learning ability.

M3: Provide entrepreneurial skills and leadership qualities.

M4: Render the technical knowledge and skills of faculty members.

Program Educational Objectives

PEO1: **Core Competence:** Graduates will have a successful career in academia or industry associated with Electronics and Communication Engineering

PEO2: **Professionalism:** Graduates will provide feasible solutions for the challenging problems through comprehensive research and innovation in the allied areas of Electronics and Communication Engineering.

PEO3: **Lifelong Learning:** Graduates will contribute to the social needs through lifelong learning, practicing professional ethics and leadership quality

Program Outcomes

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

PSO1: Applying knowledge in various areas, like Electronics, Communications, Signal processing, VLSI, Embedded systems etc., in the design and implementation of Engineering application.

PSO2: Able to solve complex problems in Electronics and Communication Engineering with analytical and managerial skills either independently or in team using latest hardware and software tools to fulfil the industrial expectations.

Abstract	**Matching with POs,PSOs**
IoT, ESP32 CAM, GSM Module, SMS Alerts, Telegram Bot	**PO1, PO2, PO3, PO4, PO5, PO6,PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2**

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Our sincere thanks to **Thiru.M.Kumarasamy, Founder** and **Dr.K.Ramakrishnan, Chairman** of **M.Kumarasamy College of Engineering** for providing extraordinary infrastructure, which helped us to complete this project in time.

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ABSTRACT

As the elderly population grows, the need for reliable and rapid emergency response systems becomes increasingly vital. Many senior citizens live independently or in situations where immediate assistance may not always be accessible, especially in critical moments of health emergencies or falls. This project, "Emergency Response System for Senior Citizens," addresses this need by providing a quick-response solution that enables seniors to summon help easily. The system is built around three main components: an emergency switch, an ESP32 CAM module, and a GSM module. In a potential emergency, the senior simply presses the emergency switch, triggering an immediate sequence of actions. First, the ESP32 CAM captures real-time video footage of the environment, providing valuable situational context, which is then instantly updated to a dedicated Telegram bot accessible by family members or caregivers. This live video enables loved ones or responders to assess the situation and determine if immediate intervention is required. Simultaneously, the GSM module sends an SMS alert to family members and nearby police stations, providing them with crucial notification of the senior's distress. This dual-alert mechanism ensures that help can be mobilized without delay. By combining video monitoring with instant messaging and SMS notifications, this system offers an effective, IoT-based safety net for seniors, allowing them to live more independently while knowing that help is just a button-press away

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LIST OF ABBREVIATIONS

ACRONYM		ABBREVIATION
GSM	-	Global System for Mobile communication
SMS	-	Short Message Service
PHD	-	Personal Health Device
AC	-	Alternative Current
GPS	-	Global Positioning System

CHAPTER 1
INTRODUCTION

As the elderly population continues to grow globally, ensuring the safety and well-being of senior citizens has become a significant concern. Many elderly individuals live independently, which can sometimes leave them vulnerable, especially in situations where immediate assistance is crucial, such as during a fall or a sudden health emergency. In these critical moments, delayed help can result in serious consequences, making it essential to have a reliable, rapid-response system. The Emergency Response System for Senior Citizens is designed to address this pressing need by providing an easy-to-use, efficient solution for seniors to quickly summon help during emergencies. This IoT-based system is built around three key components: an emergency switch, an ESP32 CAM module, and a GSM module. When activated, the emergency switch triggers a sequence of actions to ensure immediate notification and assistance. Upon pressing the emergency switch, the ESP32 CAM module captures real-time video footage of the senior's environment, offering crucial situational context that can help family members, caregivers, or emergency responders assess the severity of the situation. The live video feed is instantly sent to a dedicated *Telegram bot*, allowing loved ones or healthcare providers to view the senior's condition from anywhere in the world. This feature helps determine whether immediate intervention is necessary. At the same time, the GSM module sends an SMS alert to predefined contacts, including family members and local emergency services, notifying them of the emergency. These alerts provide vital information, including the senior's location, ensuring that help can be dispatched quickly and efficiently. By combining real-time video monitoring with SMS notifications and instant messaging, the Emergency Response System for Senior Citizens offers a comprehensive, multi-layered safety solution that empowers seniors to live independently with the peace of mind that help is always just a button press away.

CHAPTER 2
OBJECTIVE

The **Emergency Response System for Senior Citizens** is designed to address the critical need for rapid and reliable assistance during emergencies, such as falls or health crises. As the elderly population increasingly opts for independent living, ensuring their safety and well-being becomes paramount. This IoT-based system integrates three core components: an **emergency switch**, an **ESP32 CAM module**, and a **GSM module**, offering a seamless and efficient solution for emergency situations.

When activated by pressing the emergency switch, the system initiates a dual-alert mechanism. The **ESP32 CAM module** captures real-time video footage of the senior's environment and streams it instantly to a dedicated Telegram bot, accessible by family members or caregivers. This live video feed provides valuable situational context, enabling quick assessment of the severity of the emergency. Simultaneously, the **GSM module** sends SMS alerts to predefined contacts, including family members and nearby emergency services, ensuring that notifications are received even in the absence of internet connectivity.

By combining real-time video monitoring with immediate messaging and SMS notifications, the system provides a robust and redundant safety net for senior citizens. This ensures that help can be mobilized without delay, offering peace of mind to both seniors and their caregivers. Designed for simplicity and reliability, the system empowers seniors to maintain their independence while guaranteeing that assistance is just a button-press away. This innovative solution demonstrates the potential of IoT technology in enhancing the safety and quality of life for elderly individuals.

CHAPTER 3
LITERATURE REVIEW

Haibin Zhang et al proposed "Connecting Intelligent Things in Smart Hospitals using NB-IoT" IEEE Internet of Things Journal - 2018

They have implemented use of Internet of Things (IoT), especially smart wearables, will play an important role in improving the quality of medical care, bringing convenience for patients and improving the management level of hospitals. However, due to the limitation of communication protocols, there exists non unified architecture that can connect all intelligent things in smart hospitals, which is made possible by the emergence of the Narrowband IoT (NB-IoT). In light of this, we propose an architecture to connect intelligent things in smart hospitals based on NB-IoT, and introduce edge computing to deal with the requirement of latency in medical process. As a case study, we develop an infusion monitoring system to monitor the real time drop rate and the volume of remaining drug during the intravenous infusion. Finally, we discuss the challenges and future directions for building a smart hospital by connecting intelligent things

Haoran Ren, et al proposed "A Novel Cardiac Auscultation Monitoring System Based on Wireless Sensing for Healthcare" IEEE of Translational Engineering in Health and Medicine – 2018

In this existing paper, a novel wireless sensing system to monitor and analyze cardiac condition is proposed, which sends the information to the caregiver as well as a medical practitioner with an application of the Internet of Things (IoT). An integrated system for heart sound acquisition, storage, asynchronous analysis has been developed, from scratch to information uploading through IoT and signal analysis. Cardiac auscultation sensing unit has been designed to monitor cardiovascular health of an individual. Bluetooth protocol is used to offer power efficiency and moderate data transmission rate. The Hilbert-Huang transform is

used to eliminate interference signals and to help to extract the heart sound signal features. Subsequence segmentation algorithm based on double-threshold has been developed to extract physiological parameters

Malcolm Clarke et al proposed "Interoperable End-to-End Remote Patient Monitoring Platform based on IEEE 11073 PHD and ZigBee Health Care Profile" - IEEE Transactions on Biomedical Engineering – 2018

This existing paper described the implementation of an endto-end remote monitoring platform based on the IEEE 11073 standards for Personal Health Devices (PHD). It provides an overview of the concepts and approaches and describes how the standard has been optimized for small devices with limited resources of processor, memory and power and that use short range wireless technology. It explains aspects of IEEE 11073, including the Domain Information Model, state model and nomenclature, and how these support its plug-and-play architecture.

The review of literature for child safety and location tracking devices are discussed below.

MAGESH KUMAR.S et al "IPROB – EMERGENCY APPLICATION FOR WOMEN", Department of Computer science Sree Krishna College of Engineering Unai village Vellore (TN) India, ISSN 2250-3153 International Journal of Scientific and Research Publications, online at the link www.ijsrp.org , Volume 4, Issue 3, March 2014

They have developed an emergency response situation recognizing app called as IPROB to provide women safety even in the situation like terrorist attacks or natural disaster, by just shaking the mobile above the predefined threshold value automatically activate the system. It starts capturing the surrounding voice to test and confirm the unsafe IPROB situation where it raised the notification and user

fail to respond in predefine time then the message alert sends to the register contacts. If the mobile profile at the receiver is in silent mode then convert it into the General profile to give the voice notification as "YOUR CHILD IS IN TROUBLE PLZ HELP...PLZ HELP …" continuously like a ring tone, until they stop it. If a register contact confirms a PROB then appropriate emergency services like ambulance, fire brigade are alerted. If a register contact responds with an audible notification, then it automatically connects and enables the speakerphone at the victim side. An integrated tri-axial accelerometer used to evaluate the unique movements that a phone experiences as threshold.

Vaijayanti Pawar et al, "SCIWARS Android Application for Women Safety", Department of Computer Engineering, Late G.N.S.COE Nasik India, ISSN: 2248-9622 International Journal of Engineering Research and Applications pp.823- 826, March 2014.

They have developed a SCIWARS app (Spy Camera Identification and Women Attack Rescue System) which consist of two modules. A first module act as an intelligent alerts system which detects the infrared rays coming from every Night-vision hidden cameras placed in changing roomshotels room etc and also informed the user about unsafe place through message. Now it's the user responsibility whether to register a complaint or not by forwarding the notification with the location to legal authorities such as Police. The second module will get activated by pressing any key continuously which will provide the help to the victim from physic attack in unsafe situation. It sends the emergency message containing location to register contacts. It also records the voice and captures the images of the surrounding for 45 seconds. This information also stored in secret location of mobile for future evidences. This app also able to converts the receiver mobile profile from silent to general mode, and also supports the auto-call receiving system at victim side.

CHAPTER 4

EXISTING SYSTEM

The existing system is designed to enhance women's safety, particularly in potentially dangerous situations like walking alone at night. It relies on a **manual emergency button** that must be pressed by the user to trigger the system. Once activated, the **microcontroller** initiates a series of actions, including tracking the victim's real-time location via a **GPS module** and sending **SMS alerts** through a **GSM module** to predefined contacts, such as family members and local police stations. This setup ensures the victim's position can be traced even if she is moving, providing a basic safety mechanism in emergencies.

However, the system has significant limitations. It depends entirely on the victim's ability to press the emergency button, making it ineffective in scenarios where she is incapacitated, such as being attacked and rendered unconscious. The system's reliance on **SMS alerts** using GSM technology also poses challenges in areas with poor network connectivity, potentially delaying or failing emergency notifications. Additionally, the system lacks the ability to capture visual or audio evidence, which is crucial for assessing the situation and aiding in legal investigations. Lastly, the system may struggle to efficiently track a victim's changing position, especially if she is on the move, which can hinder the swift response needed in critical situations. These limitations highlight the need for more advanced, automated safety solutions to address diverse emergency scenarios effectively.

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CHAPTER 5

PROBLEM STATEMENT

1. **Dependence on the Emergency Button:**
    - The system's reliance on the emergency button is its primary limitation. If the victim is unable to press the button (due to unconsciousness or being attacked), the system is rendered ineffective. This means that the system is not foolproof and may fail in critical moments.
2. **Limited in Poor Signal Areas:**
    - The use of GSM technology for sending SMS alerts requires network connectivity. In areas with poor signal or no network coverage, the system's ability to notify emergency contacts or law enforcement can be severely hindered. This can delay the response time, which is crucial in emergencies.
3. **Lack of Visual Evidence**:
    - Another significant disadvantage is the lack of video capture or any form of visual evidence. In many cases, law enforcement may need video footage for investigations and legal proceedings. Without visual evidence, the system cannot provide a clear understanding of the nature of the emergency, making it harder to take appropriate actions.
4. **Challenges in Tracing Moving Victims:**
    - While the system can trace the victim's position using the GPS module, it struggles to efficiently track moving victims, especially if they are walking fast, in a vehicle, or in a location where the GPS signal may be weak. This could slow down the emergency response time, preventing help from reaching the victim quickly enough.

CHAPTER 6

PROPOSED SYSTEMS

The Emergency Response System for Senior Citizens is designed to provide a quick, reliable, and easy-to-use solution for elderly individuals, particularly those living independently, to summon help during emergencies. The system consists of three main components: an emergency switch, an ESP32 CAM module, and a GSM module. When the emergency switch is activated, it triggers the ESP32 CAM module to capture real-time video footage of the senior's environment. This live video is immediately sent to a dedicated Telegram bot, which allows family members, caregivers, or emergency responders to assess the situation remotely and determine the appropriate course of action. In parallel, the GSM module sends an SMS alert to predefined contacts, such as family members and local emergency services, providing essential information such as the senior's location and a brief description of the emergency. The dual alert system, combining both video monitoring and SMS notifications, ensures that help can be mobilized without delay. By leveraging Internet of Things (IoT) technology, the system enhances the safety and independence of seniors, giving them peace of mind that help is just a button press away. The simplicity and reliability of the system make it an effective safety net, allowing seniors to live more independently while ensuring that family members and caregivers are always informed and able to respond promptly in times of need.

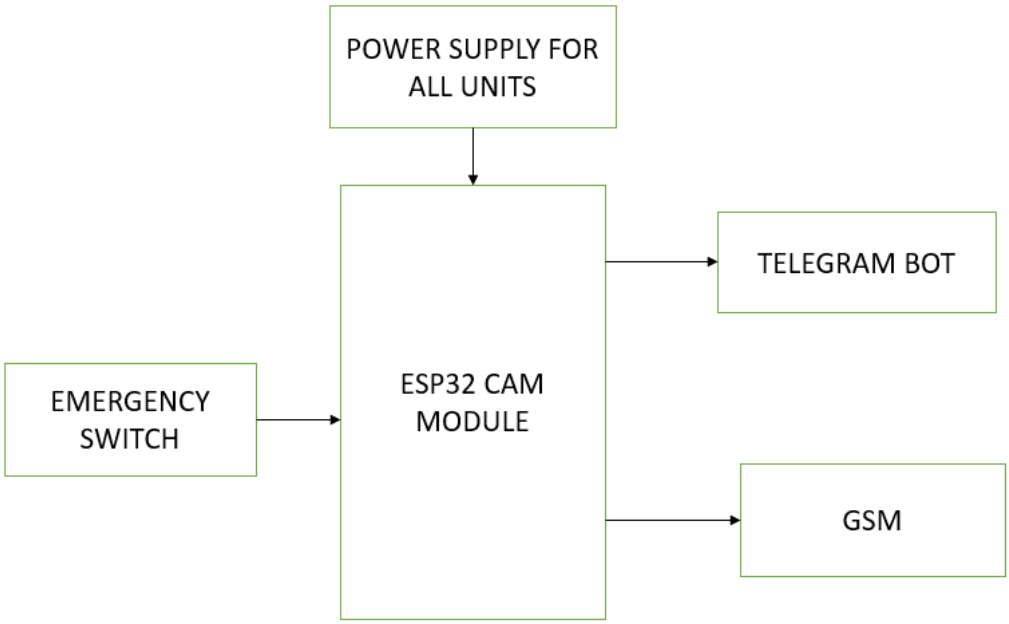
CHAPTER 7
METHODOLOGY

The proposed IoT-enabled hydroponic farming system utilizes a structured approach to revolutionize crop cultivation by eliminating the need for soil. The system incorporates essential components such as an ESP8266 microcontroller for IoT integration, a DHT sensor for temperature and humidity monitoring, a moisture sensor for water level detection, a 12V induction bulb for artificial lighting, and a water pump for irrigation. These components are integrated into a hydroponic setup comprising a water reservoir, nutrient delivery system, and optimized plant containers. The microcontroller processes sensor data and activates components like the water pump and lighting system based on real-time conditions, ensuring efficient monitoring and automation of plant growth. The Blynk app provides remote control and real-time data visualization for seamless system management.

The system undergoes testing, calibration, and optimization to ensure accurate sensor readings and responsive automation features. Users receive notifications and alerts via the IoT platform, enabling proactive management of environmental conditions. By maintaining optimal temperature, humidity, hydration, and light exposure, the system ensures ideal conditions for crop growth. This user-friendly and resource-efficient hydroponic farming system addresses traditional agriculture challenges, offering a sustainable and scalable solution for urban farming and boosting productivity in limited spaces.

CHAPTER 8

BLOCK DAIGRAM



CHAPTER 9

WORKING

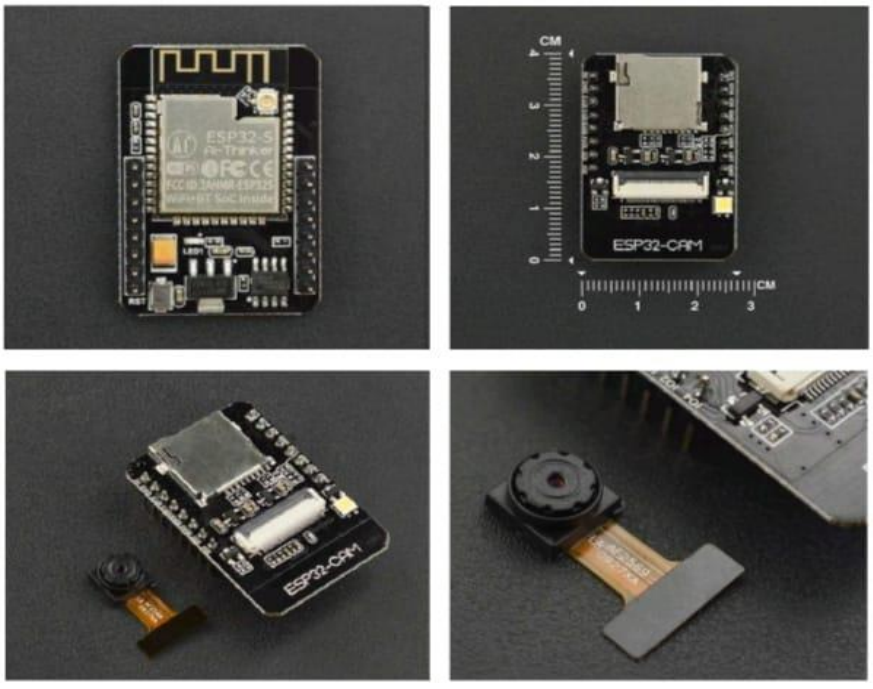
The Emergency Response System for Senior Citizens operates through an integrated system of hardware and software designed to provide swift assistance during emergencies. The process begins when a senior citizen presses the emergency button, which triggers the system's response. Once activated, the ESP32 CAM module captures real-time video of the surrounding environment, which is then streamed directly to a dedicated Telegram bot. This allows family members or caregivers to monitor the situation remotely and make an informed decision on whether immediate intervention is required. The video feed provides valuable situational awareness, helping loved ones assess the severity of the emergency.

Simultaneously, the GSM module sends an SMS alert to predefined contacts, including family members and local emergency services. The SMS contains crucial information, such as the senior's location and a brief description of the emergency, enabling responders to act quickly. Both the video streaming and SMS alerts work in parallel, ensuring that the senior's emergency is communicated without delay. The system is powered by a microcontroller, which coordinates the actions of all components, ensuring seamless operation. The entire setup is designed to be reliable and automatic, providing a comprehensive, IoT-based solution to ensure senior citizens' safety in emergency situations. This system offers peace of mind by enabling rapid and efficient communication between seniors and their caregivers or emergency responders.

CHAPTER 10
COMPONENTS

1.ESP32 CAM MODULE:

A variety of Internet of Things applications are made possible by the ESP32-CAM module, a small and adaptable development board that combines an OV2640 camera with the ESP32 microcontroller. It has 520KB of SRAM, a dual-core 32-bit CPU with a clock speed of up to 240 MHz, and Bluetooth 4.2 and Wi-Fi (IEEE 802.11 b/g/n) compatibility. The module has several GPIO pins for connecting to sensors and other devices, runs on low power with deep sleep modes using as little as 6mA, and has a TF card slot for storing data. The ESP32-CAM is perfect for applications like wireless video surveillance, smart home appliances, intelligent agriculture, QR code identification, and facial recognition systems since it can capture JPEG photos and transmit video.



10.1 : ESP32 CAM MODULE

2.GSM MODULE :

Electronic devices may send and receive data, voice conversations, and SMS messages thanks to specialized hardware called a GSM (Global System for Mobile Communications) module, which facilitates communication across cellular networks. Like mobile phones, these modules usually have a SIM card slot for network authentication and connect to GSM networks using a variety of protocols. In order to enable wireless communication, the GSM module connects to the closest base station, which is a component of a network that is separated into cells. Its internal components include an integrated circuit for radio signal processing, flash memory for firmware storage, and frequently a real-time clock and analog-to-digital converter. Popular modules such as the SIM900 and SIM800 are compatible with dual-band or quad-band frequencies.

10.2 : GSM MODULE

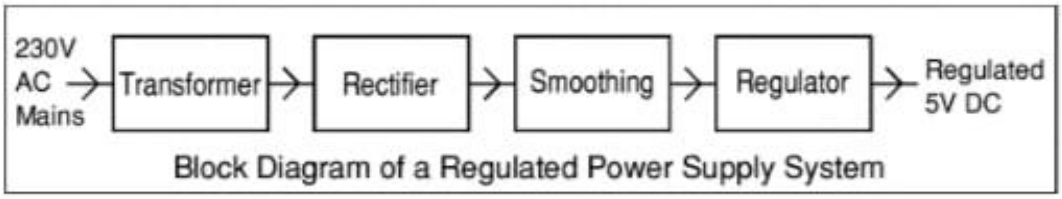
3.TRANSFORMER:

An electrical component called a step-down transformer is necessary for many applications in both home and commercial settings because it lowers high voltage levels. This transformer's main job is to change high voltage, low current alternating current (AC) into low voltage, high current AC, which is safer and better suited for powering equipment and appliances around the house

10.3 : TRANSFORMER

4.POWER SUPPLY:

Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others.



10.4 : POWER SUPPLY

CHAPTER 11
RESULT AND DISCUSSION

The Emergency Response System for Senior Citizens has proven effective in reducing emergency response times and enhancing the overall safety of seniors. By combining video surveillance and real-time alerts, the system allows family members, caregivers, and emergency responders immediate access to vital information, facilitating quicker decision-making during emergencies. Early testing has demonstrated the system's reliability in real-world situations, with the video feed providing responders with valuable situational context to make informed choices. Additionally, the dual-alert mechanism ensures that help can be mobilized swiftly, minimizing the risks associated with delayed intervention.

The system also received positive feedback from both seniors and caregivers. Seniors found the emergency switch intuitive and easy to use, ensuring that activating the system in an emergency is simple. Caregivers appreciated the remote monitoring capabilities provided by the Telegram bot, which allowed them to assess the situation from a distance. The inclusion of SMS alerts added another layer of reliability, ensuring the system remains functional even in areas with weak internet connectivity. Overall, the system has demonstrated high usability and effectiveness, showing strong potential in improving emergency response times and enhancing the safety and independence of senior citizens.

CHAPTER 12
CONCLUSION AND FUTURE WORK

The Emergency Response System for Senior Citizens provides a practical and effective solution for improving the safety and independence of elderly individuals, particularly those living alone. By combining real-time video surveillance, instant messaging, and SMS alerts, the system ensures that emergency responders and family members can be immediately notified and assess the situation from a distance. This dual-alert mechanism greatly enhances response times and increases the likelihood of timely intervention, which is crucial in emergency situations. The system allows seniors to live independently with confidence, knowing that help is just a button press away.

As the aging population grows, the importance of such IoT-based solutions will continue to increase. The integration of technology into senior care is becoming an essential part of ensuring their safety and well-being. The system's ability to provide instant communication and location tracking will play a critical role in reducing emergency response times and providing peace of mind to both seniors and their families. Moreover, its ease of use and reliability are key factors that contribute to its overall effectiveness in real-world scenarios.

Looking ahead, the system can be further developed to include additional features, such as integration with wearable devices for continuous health monitoring, automatic fall detection, and advanced analytics to predict potential emergencies. Future work could also focus on expanding the system’s accessibility, integrating it with other smart home technologies, and enhancing its ability to function in low-connectivity areas. Continuous improvements and adaptations will ensure the system remains a valuable tool in enhancing the quality of life and safety of elderly individuals, especially as technology continues to advance.

CHAPTER 13
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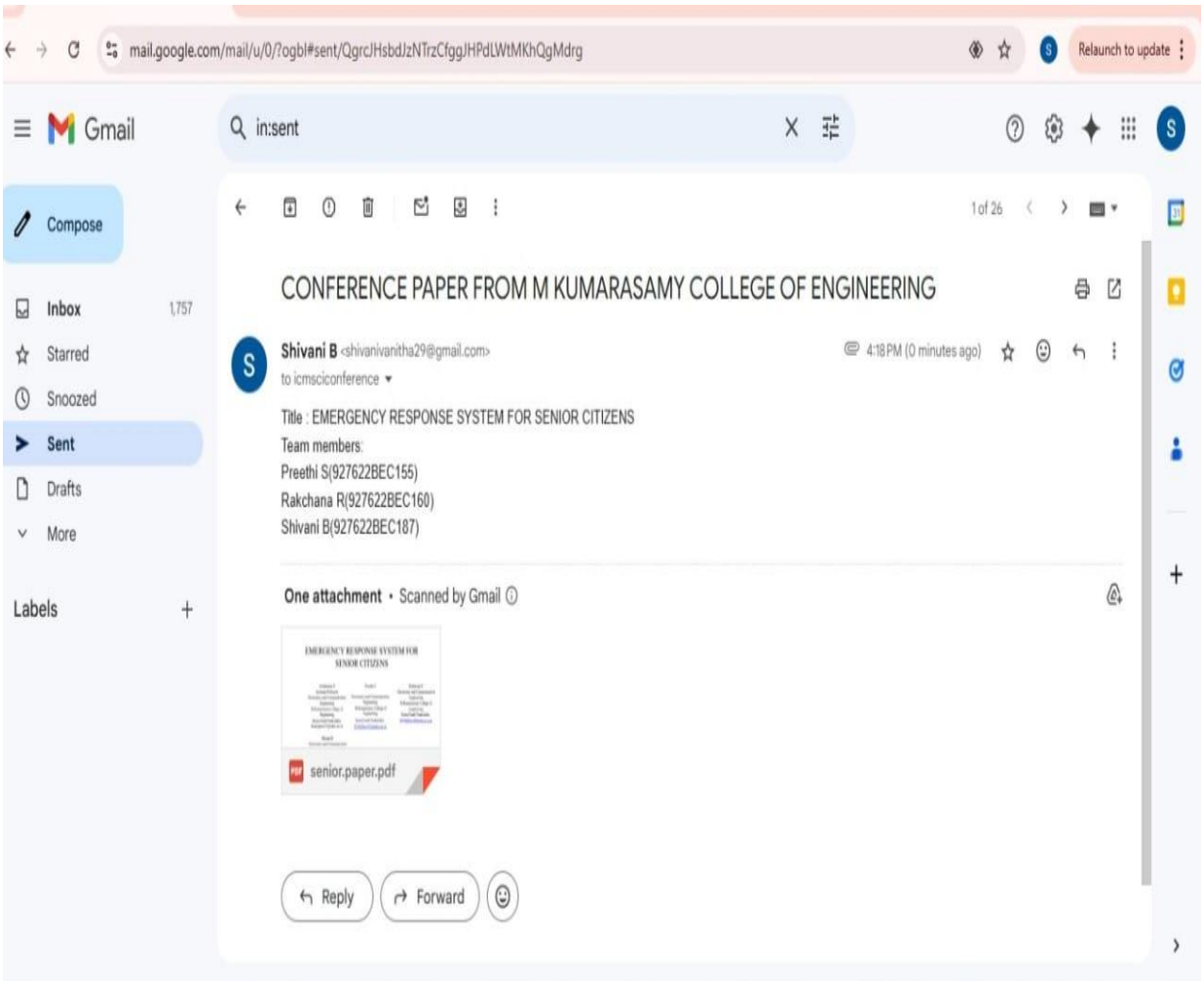
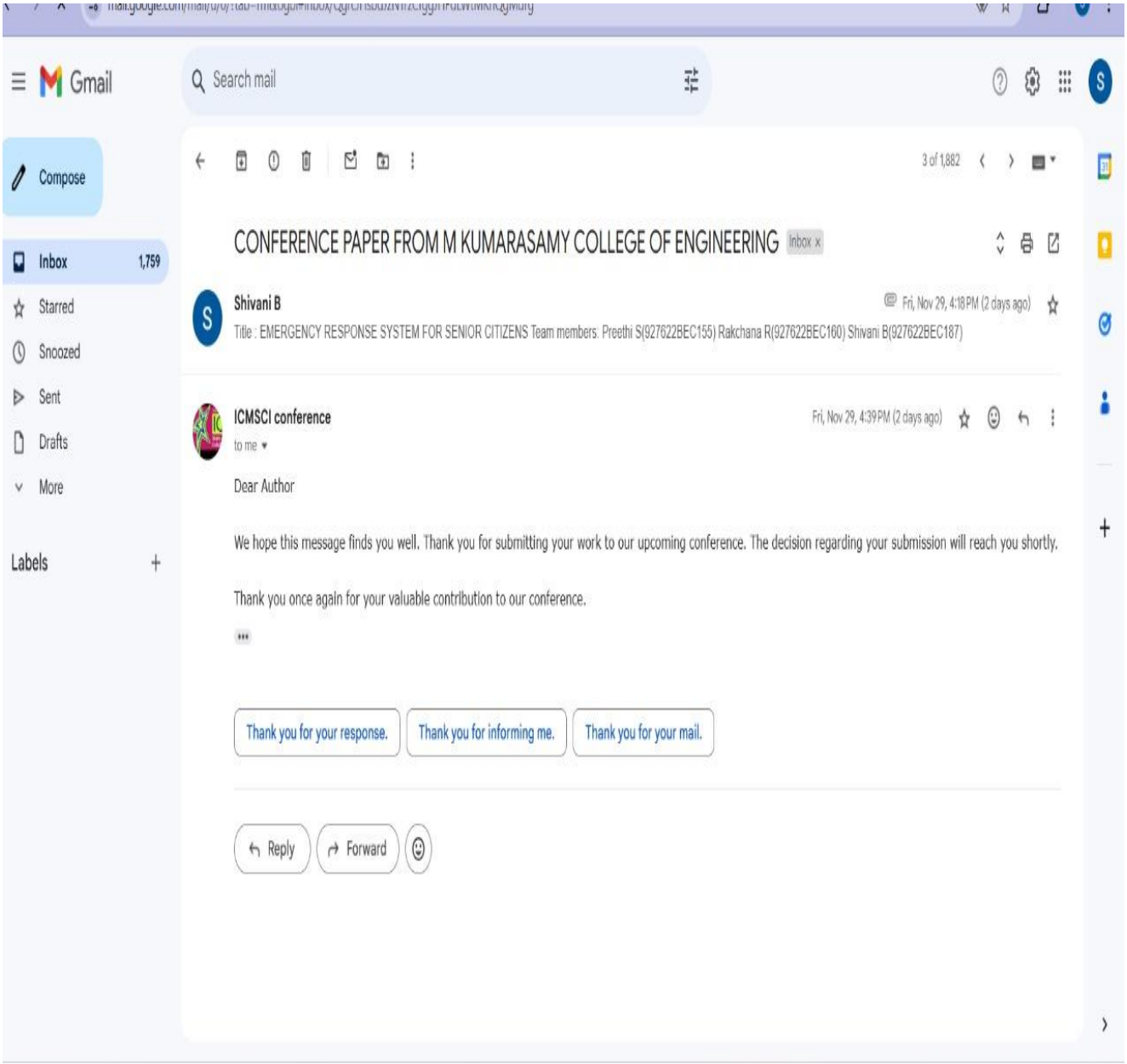
CHAPTER 14

PROJECT OUTCOME

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Shivani B
Fri, Nov 29, 4:18 PM (2 days ago)
Title : EMERGENCY RESPONSE SYSTEM FOR SENIOR CITIZENS Team members: Preethi S(927622BEC155) Rakchana R(927622BEC160) Shivani B(927622BEC187)
ICMSCI conference
Fri, Nov 29, 4:39 PM (2 days ago)
to me
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