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HUMAN SAFETY DEVICE TO MONITOR KIDS AND SICK ELDERLY

M. Pravalika, [2] S. Swathi, [3] Thamanna
[1] Department of Electrical Engineering, Stanley College of Engineering and Technology for Women, Hyderabad, [2] Department of Electrical Engineering, Stanley College of Engineering and Technology for Women, Hyderabad, [3] Department of Electrical Engineering, Stanley College of Engineering and Technology for Women, Hyderabad.

Abstract : The objective of this project is to design and develop a Human Safety Device for monitoring vulnerable individuals such as children, the elderly, and patients with medical conditions. The device offers a compact, reliable, and cost-effective solution for real-time detection, monitoring, and emergency response. Built around the ESP32-S2 Mini controller, it integrates a MEMS sensor for fall detection, a temperature sensor for health monitoring, and GSM and GPS modules for communication and location tracking. The system works in both manual and automatic modes. In emergencies, users can press a dedicated button to send an SOS message with their location to pre-stored contacts, while automatic alerts are generated if sudden falls, abnormal movements, or unsafe temperature levels are detected. The GSM module enables SMS notifications even in areas without internet, ensuring the device remains effective in remote and outdoor environments, thereby enhancing safety and timely response.

IndexTerms - Human Safety Monitoring, ESP32 Microcontroller, Fall Detection, GPS Tracking, GSM Communication, Emergency Alert System.

I.INTRODUCTION

In today's world, safeguarding children and elderly individuals has become a pressing priority. Young children, driven by curiosity and energy, often wander into unsafe situations without adequate supervision. Meanwhile, older adults—particularly those with medical conditions—are more prone to accidents such as slips, fainting spells, or sudden health emergencies [1]. Without immediate help, these incidents can quickly escalate into life-threatening situations.

For many households, constant monitoring is challenging due to busy schedules. Traditional approaches rely heavily on human oversight, which is not always dependable. However, with progress in embedded systems, wireless communication, and sensor technology, it is now possible to build intelligent solutions that provide continuous monitoring and rapid emergency response [2].

The proposed design introduces a smart safety monitoring device capable of identifying unusual conditions like falls or abnormal temperature changes. Sensors gather live data, which is processed by a microcontroller. If an emergency is detected, the system automatically sends an alert message along with location information to caregivers. This enables swift intervention and minimizes the chances of severe outcomes [3].

II.LITERATURE SURVEY

Numerous studies have explored the development of safety monitoring technologies. Many IoT-based solutions employ wearable devices fitted with sensors to track the health status and physical activity of older adults [4]. These devices transmit live information to cloud platforms, enabling continuous analysis and supervision.

Some researchers have concentrated on enhancing the precision of fall detection by applying machine learning techniques [5]. By examining sensor data patterns, these systems can distinguish genuine falls from normal movements, thereby minimizing false alerts. Other investigations have integrated GPS and GSM modules to enable location tracking and emergency communication [6].

Wireless sensor networks are also widely adopted in healthcare monitoring, as they support uninterrupted data gathering and transmission [7]. However, such systems often rely on stable internet access, which may not be available everywhere. Furthermore, many current solutions are costly and technically complicated, limiting their accessibility for everyday users. Some devices are designed to monitor only one parameter, which reduces their dependability and overall usefulness [8]. Consequently, there is a strong demand for a straightforward, affordable, and unified system capable of tracking multiple parameters while delivering rapid emergency notifications [9].

III.PROPOSED SYSTEM

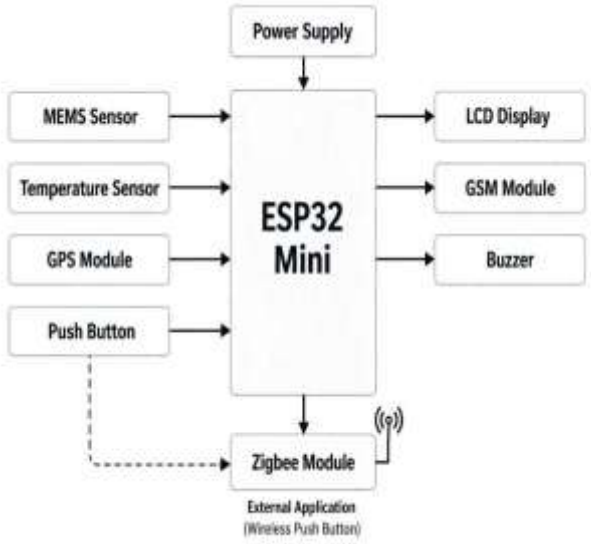
The proposed solution is intended to deliver a comprehensive safety mechanism by combining sensing, data processing, and communication features. It continuously observes the user and identifies unusual conditions in real time.

A motion sensor (MEMS) is employed to capture sudden movements, changes in orientation, and falls. This component is crucial for detecting accidents, particularly among elderly individuals. A temperature sensor monitors body heat and highlights abnormal variations that may signal potential health concerns.

At the core of the system is the ESP32 microcontroller, which serves as the main processing unit. It gathers input from all sensors, analyzes the data, and determines whether the situation is normal or critical, based on preset threshold values.

In case of an emergency, the GSM module transmits an alert message to designated contacts. The GPS module supplements this by providing live location details, enabling caregivers to reach the user quickly. A manual push button is also included, allowing the user to send an alert directly when needed, thereby enhancing reliability and ease of use [10].

IV.HARDWARE DESCRIPTION



Block Diagram of the System

The hardware arrangement is made up of several interconnected components that work together to provide efficient monitoring and communication.

The ESP32 microcontroller functions as the main control unit, processing sensor inputs and managing the overall operation of the system. It is commonly used in embedded applications because of its speed and reliability.

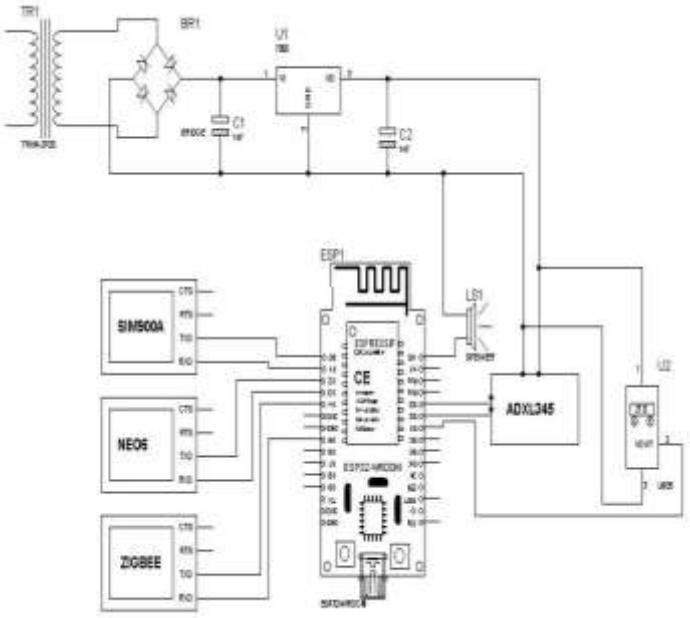
A MEMS sensor is utilized to capture motion and orientation changes. By detecting sudden shifts in acceleration and position, it helps in recognizing falls.

The LM35 temperature sensor measures body heat and produces an analog signal that reflects temperature levels. This signal is then converted into digital form by the microcontroller.

The GSM module is responsible for transmitting emergency notifications through cellular networks with the help of a SIM card.

The GPS module provides accurate location details by receiving signals from satellites, making it possible to track the user's position. For user interaction, an LCD display shows system status, while a buzzer generates audible alerts during emergencies.

Finally, a push button is included to allow manual activation of the alert system, giving the user direct control in urgent situations [11].



Circuit Diagram of the Human Safety Device

V.WORKING OF THE SYSTEM

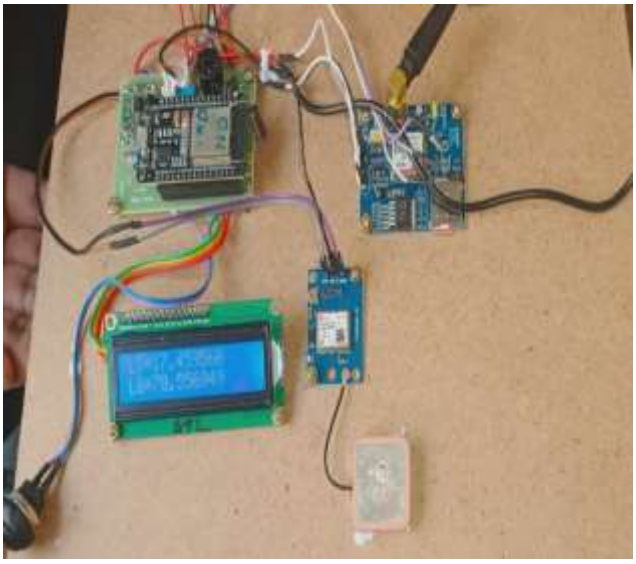
The system functions in a continuous monitoring mode. Once the device is powered on, all components are initialized and the sensors begin gathering data related to movement and body temperature.

The microcontroller receives this input and processes it in real time. It compares the sensor readings against preset threshold values to identify irregular conditions. For instance, a sudden spike in acceleration may suggest a fall, while a rise in temperature could point to a possible health concern.

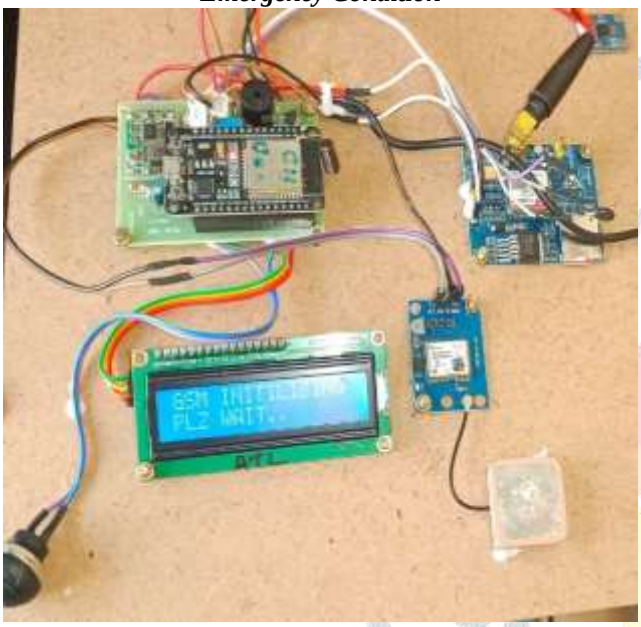
When an abnormal situation is detected, the alert mechanism is triggered. The buzzer is activated to notify people nearby, while the GSM module sends an emergency message to selected contacts. The GPS unit adds location information to the alert, helping caregivers reach the user quickly. Even after the alert is sent, the system continues monitoring, ensuring uninterrupted safety [12].

VI.RESULTS

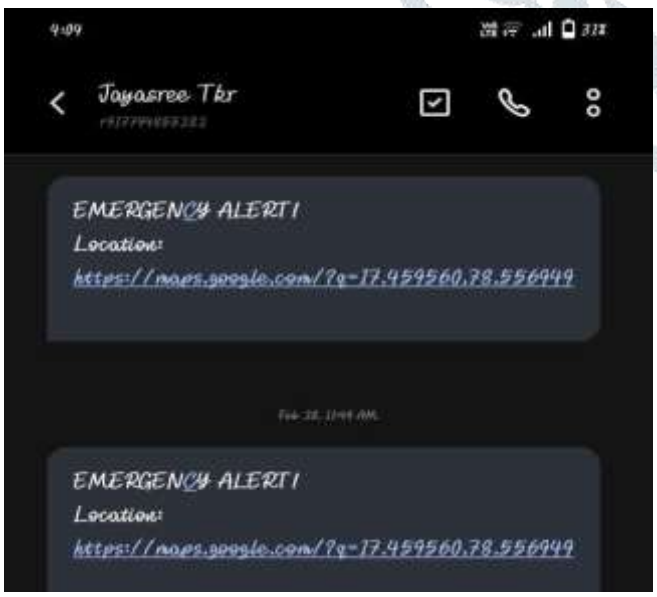
Normal Condition



Emergency Condition



Initializing message



Message Received

The system was evaluated under different scenarios to assess its effectiveness. Under normal circumstances, it monitored the user continuously without any disruption. When a fall was simulated, the MEMS sensor accurately detected the sudden movement, and the system promptly generated an alert.

In the same way, when temperature readings went beyond the acceptable range, the system issued a warning and transmitted an alert message. The GSM module successfully delivered notifications to the registered contacts without delay, while the GPS unit provided precise location details that helped in identifying the user's position.

The outcomes demonstrate that the system operates efficiently in real-time situations. In comparison with existing solutions, the proposed design offers stronger feature integration and improved dependability [13].

VII.CONCLUSION

The developed human safety monitoring system offers a practical solution for protecting both children and elderly individuals. By integrating sensors, communication modules, and a microcontroller, it ensures continuous observation and delivers rapid responses during emergency situations.

The design is straightforward, affordable, and user-friendly, making it suitable for everyday applications. It helps minimize the risk of accidents by issuing timely alerts and sharing location details. The combination of multiple functions within a single device enhances both reliability and efficiency.

This system has significant potential in modern healthcare and personal safety contexts, particularly in scenarios where immediate assistance is essential [14].

VIII.FUTURE SCOPE

The system can be enhanced further by incorporating advanced capabilities. Linking it with IoT platforms would allow remote supervision and storage of data on cloud servers. Dedicated mobile applications could also be developed to deliver real-time updates directly to caregivers. Additional health sensors—such as those for heart rate, blood pressure, and oxygen saturation—may be integrated to broaden the scope of monitoring. The use of machine learning techniques could refine fall detection, improve accuracy, and minimize false alerts.

Future progress in smart healthcare technologies is expected to make such devices more compact, efficient, and widely applicable in everyday life. [15].

IX.REFERENCES

[1] X. Wang et al., "Elderly Fall Detection Systems: A Survey," *Frontiers in Robotics and AI*, 2020.

[2] M. E. Karar et al., "IoT-Based Fall Detection Survey," *Applied Sciences*, 2022.

[3] A. Pathak et al., "IoT-Based Fall Detection and GPS Tracking System," *IJARIIT*, 2024.

[4] S. Madhavan et al., "IoT-Based Patient Fall Detection System," *JoMEA*, 2024.

[5] A. Chandak et al., "Machine Learning Based Fall Detection," *Computational Intelligence*, 2022.

[6] M. Arun et al., "IoT-Based Health Monitoring System," *IJRASET*, 2025.

[7] W. Saadeh et al., "Wearable Fall Detection System," *IEEE Transactions*, 2019.

[8] H. Alemdar et al., "Wireless Sensor Networks for Healthcare," *Computer Networks*, 2010.

[9] A. Al-Kababji et al., "IoT-Based Fall Monitoring Framework," 2021.
[10] R. Kamal, *Embedded Systems Design*, Tata McGraw-Hill, 2013.
[11] K. Alharbi et al., "IoT-Based Fall Detection Communication," *Scientific Reports*, 2024.
[12] L. Wang et al., "Real-Time Fall Detection System," 2024.
[13] J. Gubbi et al., "Internet of Things: Vision and Applications," 2013.
[14] A. Lakhdari et al., "IoT Fall Detection with AI," 2025.
[15] M. Guizani et al., "IoT Technologies Survey," IEEE, 2015.