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WOMEN SHIELD: IoT ENABLED REAL TIME PROTECTION SYSTEM

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ABSTRACT

Safety and security are essential, and technological advancements have enabled proactive solutions for real-time protection. Modern systems use intelligent monitoring, rapid threat detection, and automated responses to enhance safety and reduce emergency response times. By integrating smart alert systems and communication channels, these innovations foster confidence, preparedness, and a safer environment. Wearable devices, AI-powered systems, and IoT integration have further improved personal security, enabling early detection of health issues or unsafe situations. Additionally, these technologies are helping create more inclusive safety solutions, benefiting the elderly and those in high-risk areas. Automation and machine learning allow systems to adapt to individual needs, providing personalized protection. These innovations make security more effective and equitable, ensuring accessibility for all. The future of safety and security will be predictive, offering proactive protection to safeguard individuals and communities. Our project, "Woman Shield" is designed to provide real-time protection by integrating advanced IoT technology. This smart system aims to enhance women's security by providing real time tracking, health monitoring, and quick emergency response, making it a vital tool for personal safety in public and private spaces.

1. INTRODUCTION

Women face increasing harassment and insecurity in various aspects of life, including workplaces, travel, and even their homes. It is essential to provide them with a safe environment and support during emergencies. Since women may not always be physically strong, they need immediate access to resources for help in critical situations like assault or robbery. Security systems and apps play a vital role in ensuring their safety by enabling quick alerts and emergency calls. Many existing security solutions are limited to specific devices and short-range communication like Bluetooth. To overcome these limitations, the proposed system integrates GPS and a long-range communication protocol, LoRaWAN. Unlike app-based tracking, which is device-dependent, this system uses the Ubidots platform, accessible from any internet-connected device. It offers a tracking range of 2–5 km with over 90%

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accuracy, enhancing security and accessibility. The aim of this proposed system is to design and develop a sustainable system and platform to monitor, track, and locate wallets when missing. It implements a GPS system for real-time tracking at a 2–5 km range and develops an Internet of Things (IoT) platform for data visualization, monitoring, and analysis using an Arduino Uno ESP8266 with LoRaWAN capability. India has upheld secularism and tradition for years, treating women with great respect. Ensuring women's safety should be a top priority, leading to various innovations such as security apps and wearable devices like wristbands. These advancements help women feel more secure in their daily lives. The IoT Women Safety System aims to provide security to all women, regardless of their background. Unlike traditional devices, this system does not require women to carry anything extra. It ensures immediate help during emergencies, allowing women to walk confidently and fearlessly. The Internet of Things (IoT) enables seamless communication between devices, gathering data from sensors and transferring it to servers for processing. The procedure is divided into three stages. In Stage 1, a fingerprint recognition system is implemented. The user's fingerprint is stored, and a name and ID are generated. During fingerprint verification, the system matches the scanned fingerprint with the stored one. If matched, the corresponding ID number is verified. In Stage 2, the system activates a high-voltage, low-current (HVLC) circuit. The HVLC circuit is connected to digital pin number 4 of the Arduino Nano. This pin is triggered after successful fingerprint recognition and activates the circuit for 15 seconds. Once the HVLC circuit is turned off, the pin is deactivated. When the HVLC circuit is active, a spark is generated, which can be used to defend against an attacker. The final stage involves sending a message with the user's location via the SIM808 module. Once the fingerprint is verified, the microcontroller transmits an AT command to the SIM808 module, which retrieves the user's location through GPS and sends it to a registered contact. This system provides a self-defense mechanism where the victim can protect herself using a high-voltage electric shock device while also sending emergency alerts to family and law enforcement. An advanced system can also be built that detects the location and health condition of a person, enabling timely action based on electronic gadgets like GPS, body temperature sensors, pulse rate sensors, motion sensors, and IoT technology. Multiple sensors can be used to precisely detect the real-time situation of a woman in critical, abusive situations. Typically, the heartbeat of a person under distress is elevated, which, along with motion sensors detecting abnormal movement, helps in decision-making. A smart band integrated with a smartphone offers a compact and cost-effective alternative to bulky security devices. It utilizes the phone's GPS and IoT connectivity, reducing power consumption while ensuring real-time tracking. With a long battery life, it provides continuous safety without inconvenience.

2. LITERATURE SURVEY

In countries like India, women are progressing positively. However, women and girl children in many countries still feel unsafe and frustrated due to the lack of security and safety measures [1]. Every minute, somewhere in the world, women are harassed or even lose their lives. In such situations, women feel helpless and find it difficult to seek protection or call for help from family members or nearby individuals. Ensuring women's safety is crucial. Security systems can help alleviate such worries and offer support during critical situations. The proposed system comprises GSM, GPS, and Google Maps to send the victim's current location to trusted contacts. It uses satellite detection for location tracking and real-time updates [2].

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In today's world, women's security is a critical issue. Every individual is responsible for making women feel safe, whether they are outside or at home [3]. We must ensure to help women overcome safety concerns. This security system uses technologies like GSM and GPS, combined with specialized software, to track women in dangerous situations. When a victim is in danger, pressing a designated button triggers the system to track the victim and alert her trusted contacts through messages. Google Maps is used to pinpoint the exact location of the victim's vehicle. Many employers now ensure the safety of women employees working late at night by implementing such security systems and apps. Most systems rely on the combination of GSM and GPS for vehicle tracking [4].

It is estimated that by 2050, the world population will reach around nine billion, up from the current seven billion. Around 53% of women experience security issues throughout their lives [5].
A.Z.M. Tahmidul et al. [5] proposed an application-based wearable device. The primary function of this device is to send SMS alerts along with the victim's current location to the nearest police station and family members. The application interface also points out safe locations for escaping criminal attacks. However, the device is not user-friendly for rural women, many of whom are not familiar with mobile applications or may not own smartphones. Additionally, the form factor of the device is too large to be carried easily.
To address rape prevention, another study [6] proposed a smart mobile application named "BONITAA," which features SMS alerts, location tracking, health support, medical support, counseling, and self-defense tips for rape victims. They integrated the Bangla language to make the application user-friendly for rural women. Nevertheless, women unfamiliar with mobile applications may not fully benefit from these facilities.
In [7], the authors proposed a wearable device for women's safety to prevent sexual assault. The method included a mobile application, and the device was designed using GSM, GPS, Wi-Fi, and a microcontroller. It can make calls and send locations to pre-recorded numbers or the nearest police stations. However, the device requires a constant internet connection, making it costly and not accessible to every woman in society. Furthermore, the application interface is not flexible for all end-users.
In [8], another women's safety device was proposed, capable of sending SMS alerts and location information to pre-saved phone numbers. To prevent sexual assaults, the device was integrated with three push-buttons, GSM, GPS, RFID, a vibrator, a buzzer, and a display. However, the prototype was too large to carry, and operating three switches during a panic situation could be difficult.
U. Rai et al. [9] developed a safety device using Raspberry Pi with a GPS module and a push button. Pressing the button sends the longitude and latitude coordinates via GPS. They also developed an application to locate the victim. Although the prototype is simple, it is large in size, and Raspberry Pi requires a constant internet connection.
N. R. Sogi et al. [10] proposed a Raspberry Pi-based IoT device called "SMARISA" (Smart Ring for Women's Safety). The device sends the victim's location and includes a camera module that captures incidents and uploads images to a local server while triggering a buzzer. They also developed a mobile application to communicate with the victim's trusted contacts. However, this device lacks a GSM module and is expensive. Moreover, Raspberry Pi is power-hungry.

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Various sensors like pulse rate, motion, and temperature sensors have been integrated into different devices [13], [14], [18]. However, these devices may produce false readings due to sensor interference, leading to false activations. Additionally, the form factors of these devices are too large for practical use.

Another device [11] was developed to help victims of harassment, sending SMS alerts and locations to family members. However, sensor-based devices may not always be reliable because of false triggering.

T. Sen et al. [12] developed a women's safety device with Raspberry Pi, which included a camera module and nerve simulator. It sends the victim's location via GPS and GSM and offers an Android application and local server for enhanced security. However, the device is bulky and impractical to carry.

V. Sharma et al. [15] developed a smart shoe for women's safety using Raspberry Pi and Arduino Uno. However, shoe-based video capturing is inefficient, and using Arduino instead of Raspberry Pi limits the system's capabilities. Moreover, a shock generation of 400KV could be lethal within minutes.

Another work [16] proposed a device supporting women in danger, capable of sending SMS alerts and location details to relatives. However, the device's AAA batteries and large LCD screen make it bulky.

M. R. Ruman et al. [17] also developed a safety device capable of sending the victim's location for early rescue. However, with the integration of shock generators and other features, the prototype becomes too large to carry.

3. PROPOSED SYSTEM

The proposed system is an advanced IoT-based health monitoring and emergency alert system utilizing the ESP32 microcontroller to integrate multiple sensors and communication modules. It continuously tracks vital parameters such as SPO2 levels, body temperature, and fall detection using respective sensors. A panic switch is included to allow manual emergency alerts. The GPS module provides real-time location tracking, which is crucial for emergency response, while GSM and IoT modules enable remote monitoring and instant alerts to caregivers or medical professionals. The system incorporates an LCD for displaying health parameters, a buzzer for immediate alerts, and an efficient regulated power supply (RPS) to ensure stable operation. By automating health monitoring and integrating real-time data transmission, this system enhances patient safety, facilitates timely intervention, and ensures continuous health tracking, making it an effective solution for elderly individuals and those with critical health conditions.

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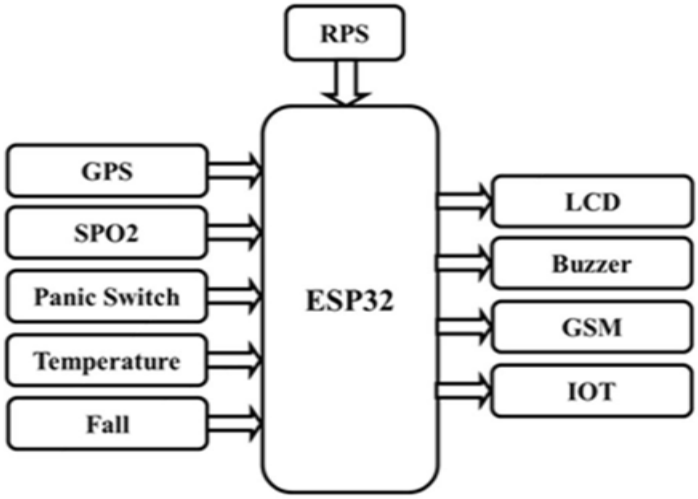


Fig-3.1: Block Diagram

The block diagram represents a health monitoring and emergency alert system centered around the ESP32 microcontroller. It integrates various input sensors, including GPS for location tracking, SPO2 for oxygen level monitoring, a panic switch for emergency alerts, a temperature sensor for body temperature measurement, and a fall detection sensor for identifying sudden falls. The system is powered by a regulated power supply (RPS) to ensure stable operation. The ESP32 processes the collected data and sends alerts through output modules such as an LCD for real-time display, a buzzer for immediate notifications, a GSM module for message-based alerts, and an IoT module for remote monitoring and cloud integration. This setup enhances real-time health tracking and emergency response, making it an efficient solution for patient care and safety.

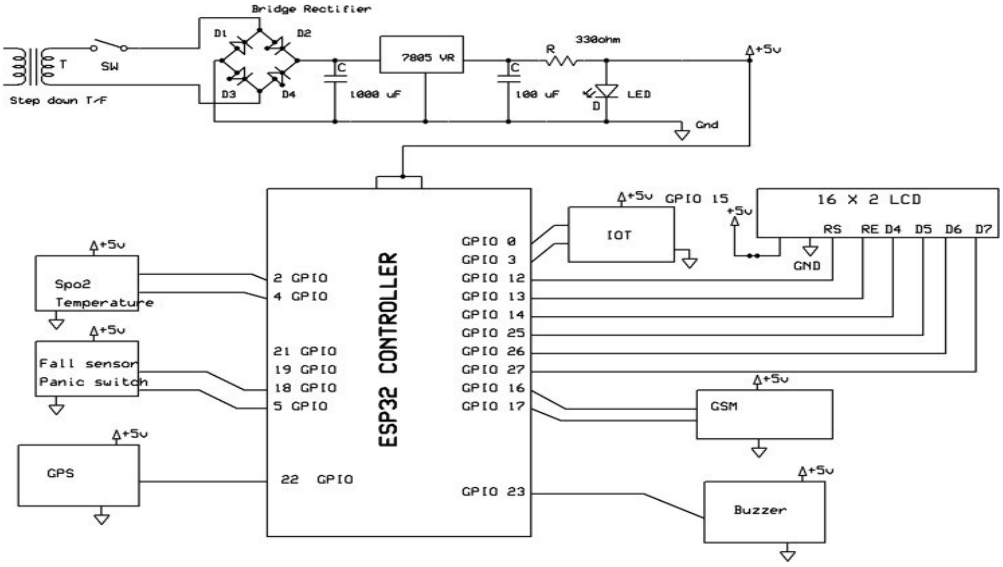


Fig-3.2. Circuit Diagram Explanation with Pin Description

The given circuit diagram represents a health monitoring and emergency alert system using the ESP32 microcontroller. The system is designed to monitor vital health parameters and send alerts in case of emergencies. Below is the explanation of the different components and their pin connections.

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4. RESULTS

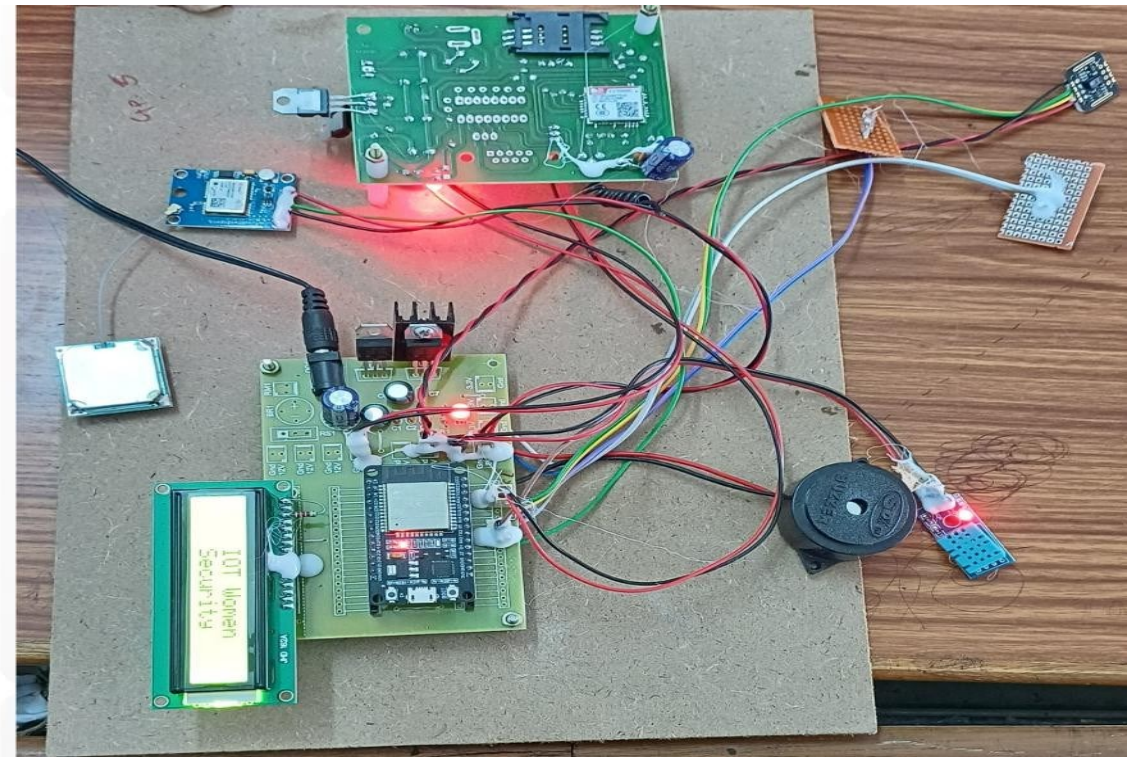


Fig-4.1: Hardware Setup of the Project



Fig-4.2:Title of Project in LCD Display

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Fig-4.3: Parameters on LCD Display

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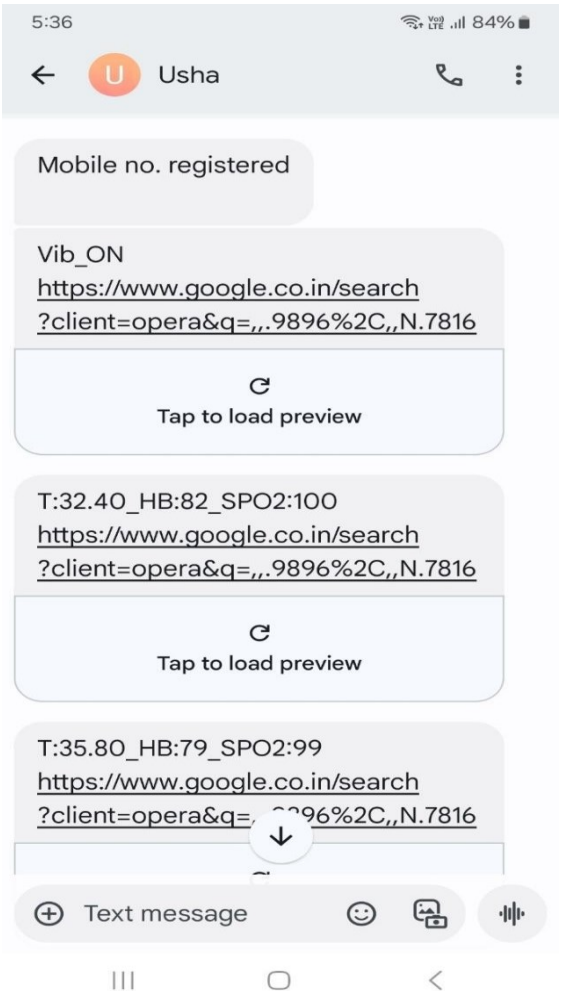
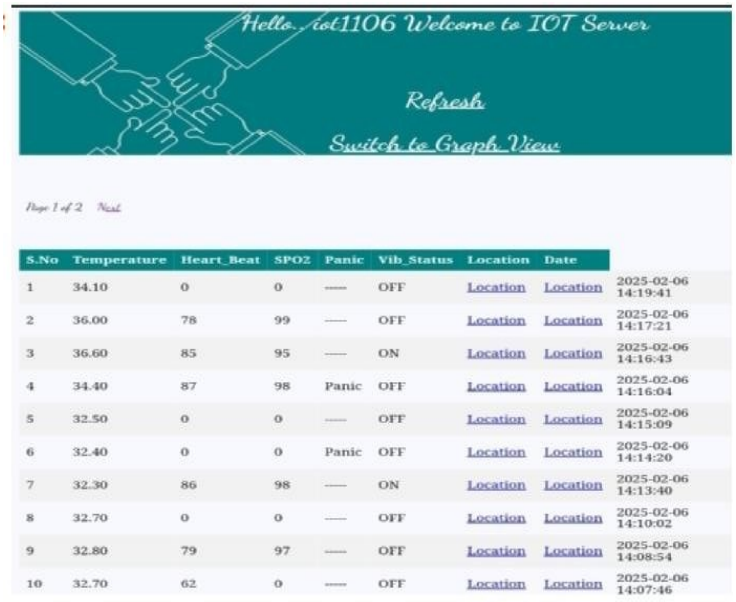


Fig-4.4: Message Results



S.No	Temperature	Heart_Beat	SPO2	Panic	Vib_Status	Location	Date	
1	34.10	0	0	----	OFF	Location	Location	2025-02-06 14:19:41
2	36.00	78	99	----	OFF	Location	Location	2025-02-06 14:17:21
3	36.60	85	95	----	ON	Location	Location	2025-02-06 14:16:43
4	34.40	87	98	Panic	OFF	Location	Location	2025-02-06 14:16:04
5	32.50	0	0	----	OFF	Location	Location	2025-02-06 14:15:09
6	32.40	0	0	Panic	OFF	Location	Location	2025-02-06 14:14:20
7	32.30	86	98	----	ON	Location	Location	2025-02-06 14:13:40
8	32.70	0	0	----	OFF	Location	Location	2025-02-06 14:10:02
9	32.80	79	97	----	OFF	Location	Location	2025-02-06 14:08:54
10	32.70	62	0	----	OFF	Location	Location	2025-02-06 14:07:46

Fig-4.5: Web page recording the Data

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5. CONCLUSION

The system successfully integrates multiple health monitoring sensors with the ESP32 microcontroller to provide real-time tracking and emergency alerts. The system efficiently collects data from GPS, SPO2, temperature, panic switch, and fall sensors, processes it through the ESP32, and displays the information on an LCD screen. Additionally, emergency alerts are transmitted via GSM and IoT, ensuring prompt communication in critical situations. The inclusion of a buzzer enhances safety by providing immediate audible alerts. This project demonstrates a reliable and efficient solution for real-time health monitoring and emergency response, making it highly beneficial for elderly individuals and patients requiring continuous supervision.

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