IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.67
Volume 5, Issue 3, March 2025

Women Safety Device with GPS and SMS Alert

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Abstract: *This abstract presents a conceptual design for a women's safety device that integrates GPS tracking and GSM-based SMS alert systems. The device, powered by an Arduino Uno microcontroller, utilizes a GPS module to monitor location and a GSM module to send SMS alerts to predefined contacts in case of emergencies. An LCD display provides real-time information, while a buzzer emits audible signals as needed. A 12V adapter ensures the device is adequately powered. The system is designed to enhance personal security by providing timely alerts and location data, thus offering a potential solution for enhancing safety in potentially dangerous situations*

Keywords: GSM-based SMS alert systems

I. INTRODUCTION

Women's safety has become a crucial concern in today's society, with rising incidents of harassment, abuse, and unforeseen dangers. Ensuring security and providing immediate assistance in emergency situations is a pressing need. Traditional safety measures such as pepper spray and self-defense techniques are useful, but they are not always effective in critical moments. Hence, technological advancements in embedded systems and communication networks offer a smart and reliable solution to enhance women's security. This project introduces a Women's Safety Device, an advanced, portable system designed to provide real-time location tracking and instant alerts in distress situations.

This device integrates multiple components to form a compact and effective safety system. The Arduino Uno serves as the central processing unit, efficiently handling data from various modules, including GPS (Global Positioning System) for accurate location tracking and GSM (Global System for Mobile Communications) for sending emergency SMS alerts. With a press of a button, the system instantly notifies predefined emergency contacts, sharing real-time location details to ensure prompt assistance. The incorporation of an LCD display provides live updates to the user, while a buzzer acts as an audible alarm to deter potential threats and alert nearby individuals.

One of the most significant features of this safety device is its ability to provide real-time tracking, making it easier for authorities, friends, or family members to locate the person in distress. The GPS module continuously updates the location, ensuring that the most accurate position is sent during emergencies. Additionally, the GSM module ensures communication even in areas with limited internet access, making it a reliable safety mechanism. The device is designed to be lightweight, portable, and easy to use, ensuring that women of all ages can carry it comfortably in their handbags or pockets.

Apart from emergency alert functions, the device can also be integrated with advanced technologies like IoT (Internet of Things) and cloud-based monitoring for extended safety features. By connecting the device to a mobile application or cloud server, real-time tracking and geofencing can be implemented, alerting contacts if the user enters an unsafe location. Artificial Intelligence (AI) and Machine Learning (ML) can further enhance the system by predicting potentially dangerous situations based on movement patterns and environmental conditions.

The power supply and efficiency of the device are crucial aspects, ensuring that it remains operational at all times. A rechargeable battery unit with a low-power consumption design is incorporated to enhance battery life. Additionally, the device's robustness and durability are considered, ensuring it withstands various environmental conditions. Future versions can include solar-powered charging, voice-activated alerts, and biometric authentication for added layers of security and ease of use.

In conclusion, this Women's Safety Device is an innovative, cost-effective, and highly practical solution aimed at addressing safety concerns. By leveraging GPS tracking, GSM-based alerts, real-time monitoring, and additional

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security features, the device empowers women to feel safe and connected, regardless of their location. With further advancements and integrations, this technology can significantly contribute to reducing crime rates and ensuring immediate response in distress situations. The project not only serves as a proactive measure but also as a crucial step toward enhancing women's empowerment and security in society.

II. METHODOLOGY

The development of this Women's Safety Device follows a structured approach integrating hardware and software components for optimal functionality. The system is centered around an Arduino Uno microcontroller, which processes inputs from the GPS module to track real-time location and the GSM module to send emergency SMS alerts. A panic button is incorporated, which, when pressed, triggers an instant message with the user's location to predefined contacts. An LCD display provides real-time status updates, while a buzzer acts as an audible alarm for immediate alerting. The device is powered by a 12V adapter or a rechargeable battery to ensure continuous operation. The software implementation involves programming the Arduino using C/C++ in the Arduino IDE, with embedded logic to detect emergencies, retrieve GPS coordinates, and send alerts via GSM. The system is designed to be compact, portable, and efficient, ensuring ease of use for women in distress situations. Further enhancements, such as IoT integration, geofencing, and cloud-based tracking, can be added to improve functionality and reliability.

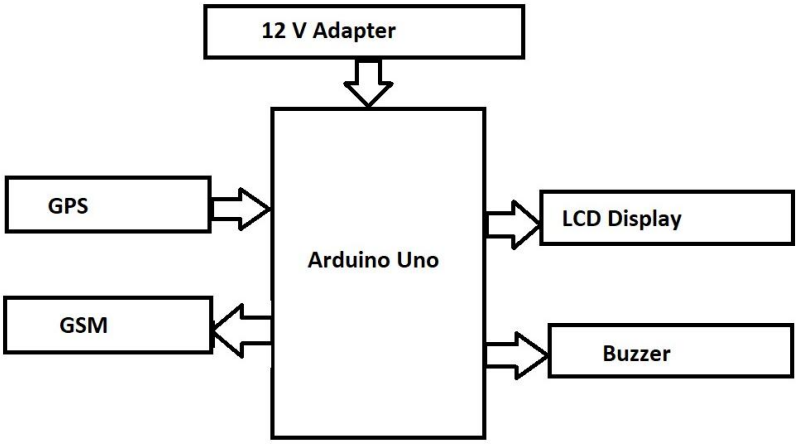

Fig1: Block Diagram

III. HARDWARE AND SOFTWARE REQUIREMENTS

1. Hardware Components

The **Women's Safety Device** is designed using essential hardware components that ensure reliable tracking, communication, and alert mechanisms. The key hardware components include:

- **Arduino Uno** – The microcontroller unit that processes data from all sensors and modules.
- **GPS Module (Neo-6M or similar)** – Provides real-time location tracking by obtaining latitude and longitude coordinates.
- **GSM Module (SIM800L or SIM900A)** – Sends SMS alerts with location details to predefined emergency contacts.
- **Panic Button** – A push button that, when pressed, triggers the emergency alert mechanism.
- **LCD Display (16x2)** – Displays system status, alerts, and location information to the user.
- **Buzzer** – Provides an audible alarm to alert nearby individuals in case of emergency.
- **12V Power Adapter / Rechargeable Battery** – Ensures continuous operation of the device, even during power outages.
- **Connecting Wires and PCB Board** – Facilitates connections between various modules and ensures a stable electrical circuit.

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2. Software Requirements

The software development for the Women's Safety Device involves coding, data processing, and communication functionalities. The major software requirements include:

- **Arduino IDE** – Used for writing, compiling, and uploading code to the Arduino Uno microcontroller.
- **Embedded C/C++ Programming** – The programming language used to control hardware components and implement the logic for tracking and alerts.
- **AT Commands for GSM Module** – Used to send SMS alerts and establish communication between the GSM module and Arduino.
- **Google Maps API (Optional)** – Can be integrated for real-time location tracking via a mobile or web application.
- **IoT Platform (Optional)** – For cloud-based monitoring and remote access through an app or web interface.

By integrating both hardware and software components, the system ensures real-time tracking, instant alerts, and ease of use, making it a practical and reliable solution for women's safety. Future enhancements may include AI-based threat detection, voice-activated emergency alerts, and wearable form factors for improved usability.

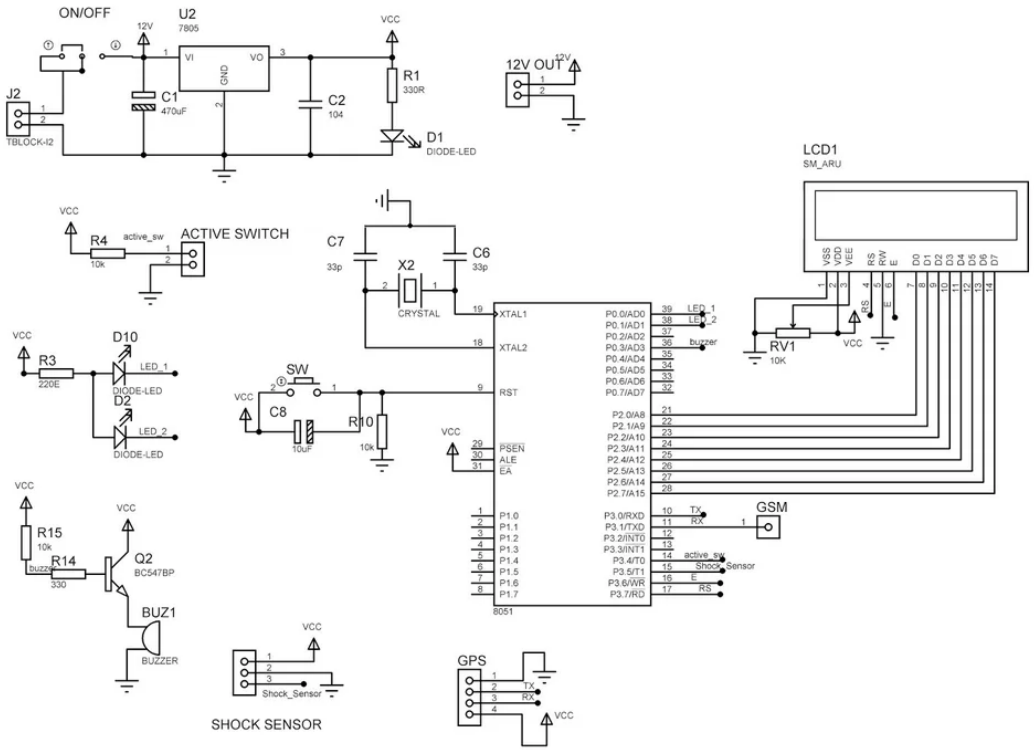

Fig2:Circuit Diagram

IV. RESULT

The implementation of the Women's Safety Device has demonstrated effective real-time tracking and instant alert functionalities, ensuring a reliable safety mechanism. During testing, the GPS module successfully retrieved accurate location coordinates, which were promptly transmitted via GSM SMS alerts to predefined emergency contacts. The panic button functioned efficiently, triggering the alert system within seconds. The LCD display provided clear status updates, and the buzzer emitted a loud sound, effectively drawing attention in emergency situations. The system was found to be user-friendly, portable, and responsive, making it a practical solution for enhancing women's security.

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Furthermore, the device maintained stable operation under various environmental conditions, and the power supply unit, including a rechargeable battery, ensured continuous functionality. The integration of Google Maps API (optional) allowed for precise location tracking when tested with a mobile interface. Future improvements, such as IoT-based remote monitoring and AI-driven threat detection, could further enhance the effectiveness of the device. Overall, the results indicate that this affordable and efficient solution can significantly improve personal safety and emergency response times, making it a valuable tool for women's security.

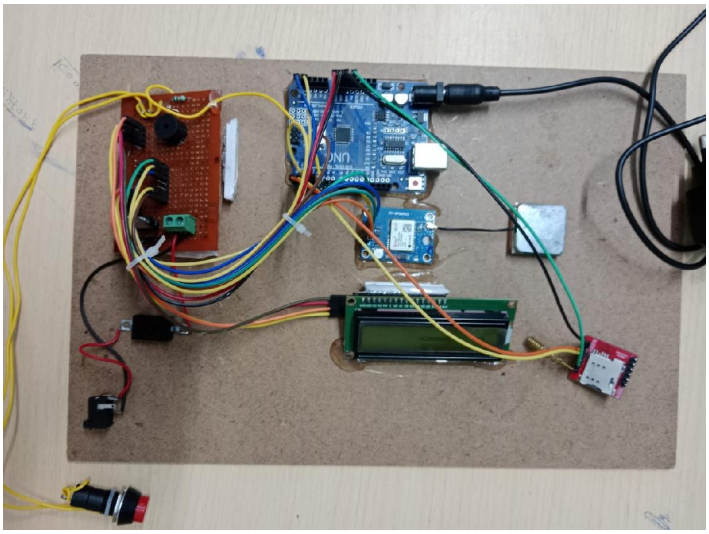

Fig 3: Project Output

V. CONCLUSION

The Women's Safety Device is an innovative and practical solution designed to enhance personal security by integrating GPS tracking, GSM-based emergency alerts, and an audible alarm system. The device ensures that in distress situations, women can instantly notify their emergency contacts with real-time location details, allowing for swift assistance. The Arduino Uno microcontroller efficiently processes inputs from the GPS and GSM modules, while the panic button serves as a quick-response mechanism. The addition of an LCD display for status updates and a buzzer for immediate alerting further improves the effectiveness of the system. With its compact, portable, and user-friendly design, this device provides a cost-effective yet powerful safety solution that can be used by women in various environments, including workplaces, educational institutions, and while traveling alone.

This project could include IoT integration for cloud-based tracking, AI-driven threat detection, geofencing technology, and biometric authentication for added security. By leveraging these advanced technologies, the device can become a fully automated and intelligent safety system that not only alerts emergency contacts but also provides real-time updates to law enforcement agencies. The implementation of this device on a large scale can significantly contribute to reducing crime rates and ensuring women's empowerment by providing them with a sense of security and confidence in their daily lives.

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