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Guardian Gadget: A Smart Electronic Safety Device for Women

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Abstract - Women's safety is a critical global concern, necessitating technological solutions for rapid and reliable emergency assistance. This paper presents a compact, efficient safety device that integrates GPS tracking and GSM communication to enhance personal security. The device provides real-time location updates to predefined contacts, ensuring timely help in distress situations. Utilizing the SIM800L GPS GSM module, the system offers seamless communication and accurate tracking. Designed for ease of use and portability, this device aims to offer a proactive, low-cost, and practical safety tool, with the potential to significantly improve women's security by enabling immediate response mechanisms.

***Key Words*:** Women's safety, GPS tracking, GSM communication, Emergency assistance, Real-time location tracking.

1.INTRODUCTION The increasing incidence of harassment, assault, and emergencies has heightened the need for reliable, portable, and easy-to-use safety devices. Traditional safety measures often rely on manual input, which may be impractical in high-risk situations. This paper introduces a women's safety device that uses GPS and GSM technologies to provide quick response and enhanced security. The device sends real-time location updates to predefined emergency contacts, enabling immediate action from friends, family, or law enforcement. Its independence from mobile applications offers a more reliable solution in critical moments. The device aims to address the limitations of existing solutions by providing a standalone system that does not rely on smartphone applications or internet connectivity. This ensures functionality even in situations where a smartphone is inaccessible or unusable. The system is designed to be easily concealable and usable in distress situations, overcoming limitations of devices that require significant user interaction.

2. LITERATURE REVIEW

A literature survey was conducted to analyze existing solutions and identify gaps in women's safety devices. The survey revealed that many current solutions rely on smartphone applications, which may not be feasible in all situations due to factors such as battery drain, lack of internet access, or the inability to access the phone during an emergency. There is a need for a standalone device that offers quick and reliable emergency assistance without dependence on internet connectivity or manual input. This project aims to address these gaps by developing a compact, cost-effective, and user-friendly safety device that provides a dedicated and reliable means of summoning help. The survey also considered wearable safety devices, but found issues with user compliance and the potential for the device to be removed by an assailant. The proposed device seeks to overcome these limitations by being designed for secure and discreet carry.

The key components used in the proposed device include:

- Arduino UNO
- NEO 6M GPS Module
- SIM800L GSM Module
- Panic Button
- Buzzer
- Battery Management System
- Boost Converter

Fig 1- Components

3. Proposed Methodology:

The proposed device integrates GSM, GPS, and a simple activation mechanism to provide an independent emergency response system. The device, activated by a single press of an emergency button, sends an SOS message with the user's location to predefined contacts. Real-time GPS tracking continuously updates the user's location, while GSM technology ensures functionality in areas with weak or no internet access. The device also places an emergency call to predefined contacts, ensuring the alert is noticed immediately. A boost converter ensures stable power supply to the GSM module. The system is designed to be cost-effective, power-efficient, and easy to carry, making it a practical and accessible safety tool. The use of a dedicated panic button minimizes the risk of accidental deactivation, and the combination of SMS and voice calls ensures that the emergency alert is received even if one communication channel is temporarily unavailable. The system's low power consumption is a key design consideration, maximizing battery life and ensuring the device is operational for extended periods.

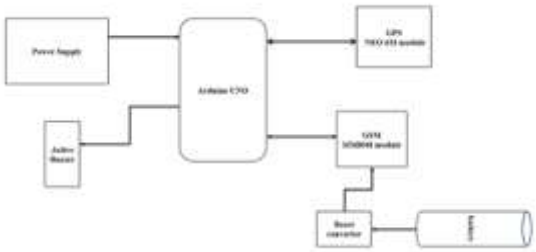

Fig 2- Block Diagram

4. HARDWARE AND SOFTWARE IMPLEMENTATION

The system utilizes the SIM800L GPS GSM module for communication and accurate tracking. The hardware components include:

- Arduino UNO: Processes sensor data and controls communication.
- NEO 6M GPS Module: Provides accurate location information.
- SIM800L GSM Module: Enables SMS and voice call functionality.
- Panic Button: Activates the emergency protocol.
- Buzzer: Provides an audible alert.
- Battery Management System: Ensures efficient power management.
- Boost Converter: Provides stable voltage to the GSM module.

The software implementation involves programming the Arduino UNO to manage sensor data, control the GPS and GSM modules, and trigger alerts. The system flowchart outlines the operational process, from initialization to continuous monitoring and emergency

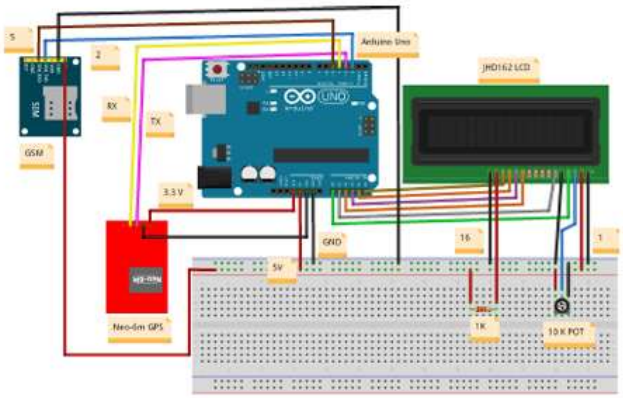

Fig 3- Hardware connection

response. The Arduino UNO was selected for its ease of programming and wide availability, while the SIM800L module was chosen for its compact size, low power consumption, and reliable performance. The software is designed to prioritize rapid response and minimize latency in sending out emergency alerts. The software also includes error handling routines to ensure reliable operation under a variety of conditions.

5. RESULTS

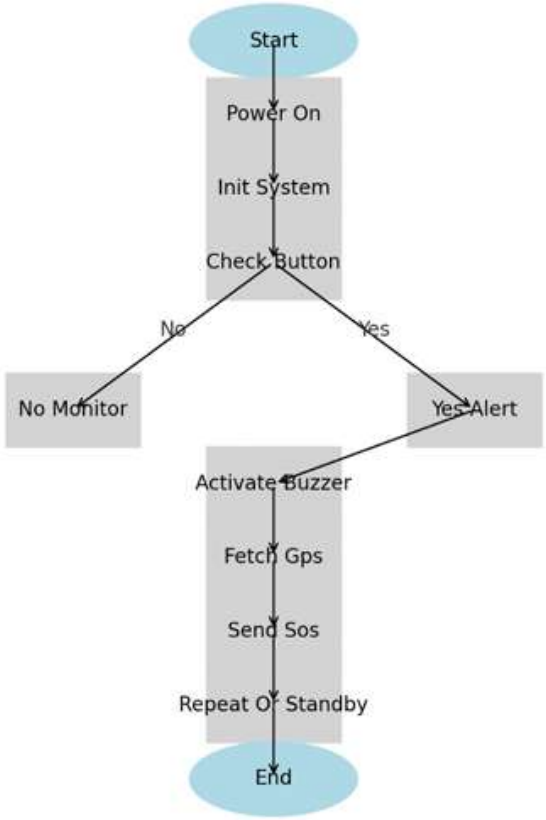

Fig 3- Working Flowchart

The device is currently under simulation and testing to evaluate its efficiency in real-time scenarios. Preliminary results indicate that the system effectively transmits location data and alerts during simulated emergency situations. The device's compact size and ease of use make it a practical safety tool for women of all age groups. Testing is being conducted in various environments to assess the device's performance under different signal conditions and potential obstructions. The results of these tests will be used to further optimize the system's performance and reliability. The testing protocol includes evaluating the accuracy of the GPS positioning, the reliability of the GSM communication, and the battery life of the device.

6. Conclusion

This project presents a compact and efficient women's safety device that integrates GPS tracking and GSM communication to provide quick and reliable emergency assistance. The device offers a proactive solution to safety concerns, with the potential to significantly improve women's security by enabling immediate response mechanisms. By providing a reliable and accessible means of summoning help, this device can empower women and provide them with a greater sense of security. The device's low cost and ease of use make it a viable alternative to more expensive and complex solutions.

7. Future Scope

Future enhancements include integrating audio-visual recording, cloud storage, motion detection, and voice-activated triggers. The device could also be adapted for elderly care, children's safety, and mental health monitoring. Partnerships with law enforcement and NGOs could further amplify its reach and effectiveness. Additional sensors, such as accelerometers and gyroscopes, could be incorporated to detect falls or sudden impacts, automatically triggering an alert even if the user is unable to press the panic button. Cloud storage of data could provide a valuable record of events for investigative purposes.

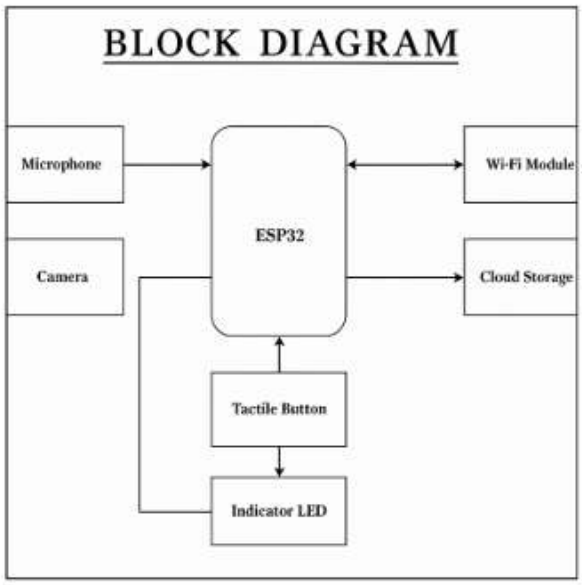

Fig 4 – Feature scope

Future versions could also incorporate more advanced encryption techniques to enhance the security and privacy of the user's data.

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