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Empowering Women Safety With Smart IoT Technology

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A B S T R A C T :

In the current digital era, concerns regarding the safety and autonomy of women persist, particularly in rural and isolated areas where instances of assault continue to rise. Although surveillance systems like CCTV provide some deterrence, they are often ineffective in identifying perpetrators during the act. This paper proposes a portable, cost-efficient, and rapid-response safety device, developed using Internet of Things (IoT) technology, aimed at enhancing women's security. The device integrates GPS and GSM modules with an ESP8266 microcontroller, enabling real-time location tracking and communication. The system is designed to empower women with immediate assistance and situational awareness, thereby promoting a sense of independence and protection.

Keywords—Women Safety, IoT, ESP8266, GPS, GSM, Emergency Alert, Real-time Tracking

1. Introduction

The project titled "IoT-Based Women's Safety Device" focuses on the development of a compact and user-friendly wearable solution intended to safeguard women in potentially dangerous situations. The system comprises an ESP32 camera module, ESP8266 microcontroller, and GPS functionality. When the integrated button is activated, the camera captures an image, and a message containing the user's real-time location is dispatched via Telegram to predefined emergency contacts. This device is engineered to be discreet, lightweight, and easily operable, particularly during distress. The central objective of this research is to provide an affordable and reliable security solution that can operate effectively in emergency scenarios, particularly where the user perceives imminent threat.

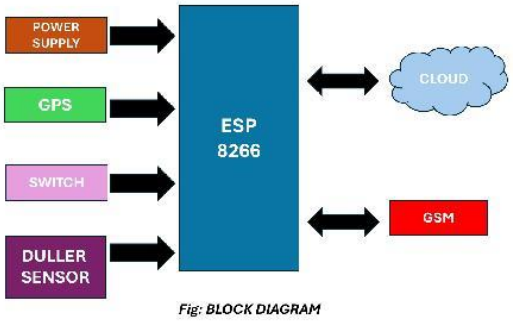

Fig: BLOCK DIAGRAM

2. Review of Literature

Numerous studies have explored the integration of IoT technologies in personal safety systems, with a specific emphasis on enhancing women's security. An IoT-based emergency system using virtual instrumentation has been proposed, where sensors provide real-time environmental data visualized through a centralized interface. GPS and GSM-based emergency alert devices have been designed to transmit the victim's location to guardians or nearby authorities upon activation.

Research involving Raspberry Pi-enabled systems has demonstrated effective threat detection using motion sensors and geolocation data. Wearable devices have also been enhanced with vital sign monitors and accelerometers, allowing them to identify distress scenarios.

Android applications further extend the capabilities by incorporating real-time GPS tracking and remote communication. Studies confirm the efficiency of such devices in emergency responsiveness, but emphasize the need for further innovation in range, reliability, and user adaptability.

3. Framework and Methodology

A. System Components

- GPS Module (NEO-6M V2): Captures the user's location.
- GSM Module (SIM900A): Sends SMS alerts with location data.
- ESP8266/Arduino Uno: Manages operations and communication.
- Panic Button: Triggers emergency response.
- Buzzer: Emits sound for local alerting.

B. Workflow

1. Activation: Panic button pressed.
2. Data Acquisition: GPS acquires location.
3. Alert Transmission: GSM sends SMS to registered contacts.
4. Local Alert: Buzzer sounds for nearby help.

C. Limitations and Justification

Bluetooth, while available, is limited by short-range capabilities and is unsuitable in cases like abduction. Thus, GPS and GSM offer more effective coverage and functionality in critical situations.

D. Power Efficiency

The design emphasizes low power consumption, enabling integration into wearable formats such as wristbands, keychains, or pendants.

4.Result and Discussion

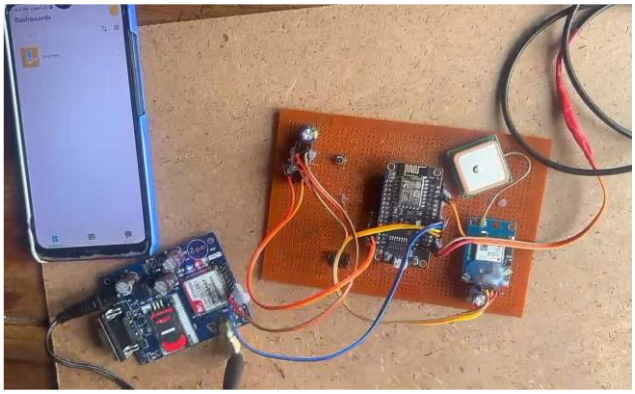

Fig : OUTPUT

The system was prototyped using Arduino Uno, SIM900A, and NEO-6MV2. Testing confirmed the following outcomes:

- Accurate GPS Tracking: Live coordinates were transmitted successfully to emergency contacts.
- Reliable Communication: GSM module ensured message delivery under standard network conditions.
- User-Friendly Interface: Panic button was intuitive and responsive.

The system’s performance was stable, with minimal latency in triggering alerts. The buzzer ensured that nearby individuals were notified, enhancing situational response time. Scalability tests and real-time threat detection will be part of future enhancements.

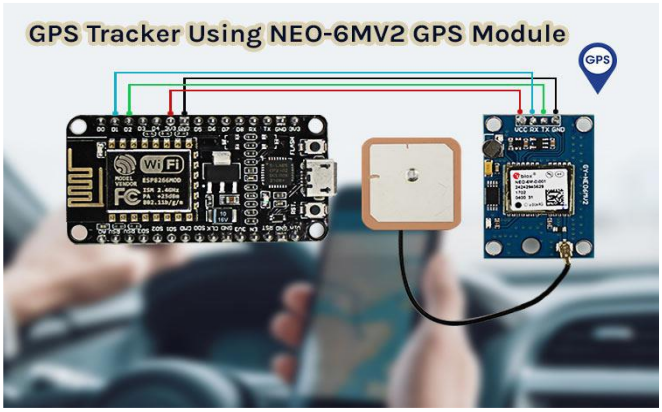

Fig : GPS Tracker Using NEO-6MV2

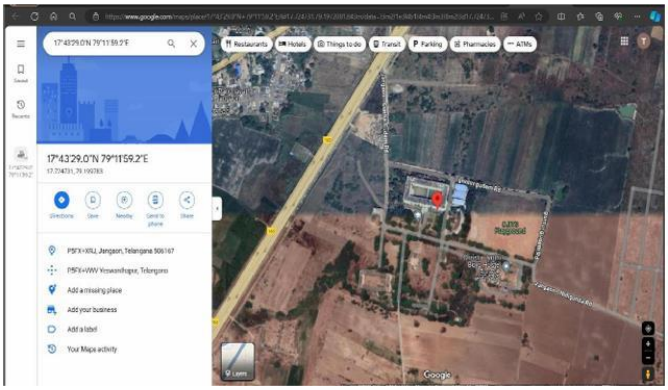

Fig : Location Tracking

Conclusion

The proposed device offers an innovative and practical approach to enhance women's safety using IoT technology. With its ability to send location-based alerts in real-time, coupled with user-friendly operation, the system demonstrates high potential for real-world implementation.

Future development will focus on adding voice alerts, automatic motion-based triggers, and a mobile app interface. Integration with law enforcement systems and AI-based threat pattern detection will also be explored to further increase utility and effectiveness.

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