Promoting Women's Safety: A GPS-Enabled Internet of Things Tracking System

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Abstract: The safety and well-being of women is a vital concern in today's society. This research proposes an innovative solution that merges Internet of Things (IoT) technology with GPS tracking to tackle this problem. The solution consists of a compact, easy-to-use IoT button with GPS, designed to enhance women's security in various circumstances. Small and portable, this GPS-enabled button can be discreetly carried. Once activated, it uses GPS to determine the user's location and syncs with a mobile app to deliver real-time location information and send instant alerts to chosen contacts or authorities. This technology based solution provides women with a proactive and responsive safety tool, improving their personal security. By incorporating cutting-edge technology, this solution ensures its reliability and effectiveness in addressing safety concerns, supporting the ongoing efforts to create safer spaces for women.

Keyword: Women's security, IoT technology, GPS monitoring, Location tracking system, Individual safety.

INTRODUCTION

The Internet of Things (IoT) is reshaping daily life with its advanced, smart features. Unlike conventional embedded systems, which are restricted to specific protocols or software within the chip, IoT devices are designed to make decisions based on the data they gather from their surroundings. Thanks to advancements in sensor technology, the widespread use of internet connected devices, and sophisticated data analysis techniques, IoT devices can independently respond to emergencies without needing human input. As a result, IoT devices are being utilized in various sectors, such as agriculture, healthcare, manufacturing, security, and communication, showcasing their extensive potential and impact. In today's digital age, technology plays a vital role in connecting individuals through the internet, which serves as a platform that links different components via a single device, creating a connection to a server.

Ensuring the safety of women has become a crucial issue globally. As more women work at all hours, the world is becoming increasingly unsafe for them. Despite advancements in technology aimed at enhancing safety, incidents such as kidnapping, harassment, and sexual assault remain prevalent. The rise in crimes against women in recent years underscores the need for more effective solutions. In situations where a woman lacks a mobile phone or device, reaching out to the authorities or her family can be challenging. The proposed solution aims to assist women by providing a way to track their exact location and notify authorities in such emergencies. In urgent situations, women can activate a button to send their location. The main objective of this research is to provide support to women in critical circumstances.

This study proposes a solution for difficult scenarios such as working irregular hours, traveling alone, and night shifts. The suggested system is similar to existing ones but adds extra features such as Short Messaging Service (SMS) and real-time support, including position tracking through Global Positioning System (GPS) and Global System for Mobile Communication (GSM). It provides a comprehensive range of voice and data transmission services, including tele-services, bearer services, and supplementary services. GSM is mainly used for voice communication and messaging, connecting two users by linking the mobile device to a nearby Base Station (BS). The Base Switching Center (BSC) facilitates communication between the calling user's BS and the recipient's nearby BS, establishing the connection in seconds.

GPS is a global navigation system that operates through a network of at least 24 satellites. It works continuously, 24 hours a day, seven days a week, in any weather conditions, and does not require subscription fees or setup costs. GPS collects satellite data in the form of a National Marine Electronics Association (NMEA) string, which provides details such as latitude, longitude, altitude, Coordinated Universal Time (UTC), and other important information.

The subsequent sections of this paper will review related literature in Section II, describe the proposed methodology in Section III, present the results along with location information in Section IV, and explore the contributions and future perspectives of the proposed work in Section V.

CHECK THE CITATIONS

Nandini Priyanka et al. created a child safety system designed to reduce safety risks for children. This system combined GSM and GPS modules for communication between the safety device and the parent's phone. Additionally, it included a Wi-Fi module for IoT capabilities, allowing data to be sent to the cloud and monitored via an Android app on the parent's phone. The app provided real-time location tracking of the device using location coordinates or SMS requests. Moreover, a panic alert system was integrated to automatically send SMS notifications and make phone calls during emergencies, ensuring that parents received immediate alerts and could respond quickly. The system also tracked plug and unplug events, sending notifications and updating the cloud whenever the device was disconnected from the child. The key innovation of this system was its automatic alert feature, which ensured rapid notifications to parents or caregivers in emergencies, thereby improving child safety.

Vijayalakshmi et al.addressed the pressing issue of women's safety by creating an advanced system.
The proposed model integrated second-generation GPS and GSM mobile communication technologies. GSM was primarily used for voice calls and messaging, connecting via nearby base stations and the Base Switching Center (BSC) to ensure quick connectivity, with an emphasis on prioritizing emergency communications. The system offered advantages such as worldwide wireless connectivity, improved frequency efficiency, and the ability for multiple users to access the network at the same time. To improve women's safety, the system featured GPS for accurate location tracking, street image-based location identification, and sensor-based methods. Moreover, Wi-Fi, often integrated with modules like ESP8266, ensured stable internet connectivity and seamless data transmission to the cloud. The paper's innovation lay in its comprehensive approach to addressing women's safety concerns by combining various technologies into a robust and effective solution.

Ebenezer, V et al. addressed women's safety by developing a comprehensive system that incorporated pulse, temperature, and vibration sensors, alongside an ESP32 cam and GPS modules. The system provided temperature readings in both Fahrenheit and Celsius and tracked pulse rates, while using the BLYNK app to update user data, such as pulse and temperature, whenever the app was opened. Google Maps was used to monitor the user's real-time location. Vibration sensors detected unusual movements, triggering alerts to selected contacts through the BLYNK app for immediate incident monitoring. Known for its compact, easy-to-use, and costeffective design, the system functioned automatically during emergencies, eliminating the need for manual activation, which set it apart from existing solutions. The paper showcased an innovative method to enhance women's safety by combining various sensors with live data updates and notifications, greatly improving user security.

The literature highlights several obstacles, including the potential for safety gloves and wristbands to wear out over time, which can impact their durability. It is crucial to ensure these devices are tough enough to withstand various environmental factors. User comfort is also a major concern; bulky or uncomfortable devices, especially for children, may not be worn regularly. Additionally, compatibility issues may arise if devices do not easily integrate with existing child safety systems or lack uniform communication protocols. To address these issues, the focus is on enhancing both durability and comfort through advanced materials and ergonomic designs. There is also an emphasis on ensuring smoother integration with current safety systems and promoting standardized communication protocols for better compatibility. This holistic approach is novel in considering both technical and usercentered factors, aiming to eliminate barriers to the broader adoption of safety devices.

PROPOSED SYSTEM

The proposed system is a wearable women's safety device designed to provide realtime emergency alerts and location tracking using advanced STEM components. It integrates an ESP32 microcontroller, GPS module, and a panic button, allowing the wearer to trigger an alert with a simple press. Upon activation, the device captures the user's location and transmits it to a cloud-based monitoring system, which can be accessed by predefined emergency contacts. The cloud system is developed with HTML, CSS, JavaScript, and PHP, offering a user-friendly interface for real-time tracking. Additionally, the system features low power consumption, ensuring long battery life for continuous use. By combining IoT and cloud integration, the device ensures fast and reliable responses in critical situations. The system aims to bridge the gap between wearable technology and personal safety with a focus on real-time responsiveness and ease of use. It also provides a scalable solution for expanding safety features, such as adding biometric or environmental sensors.
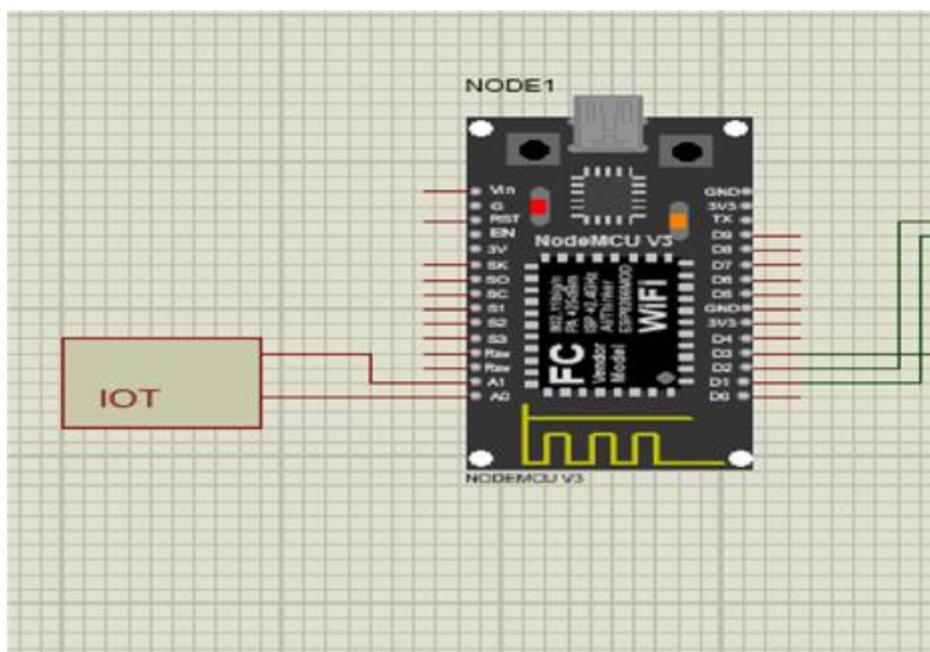
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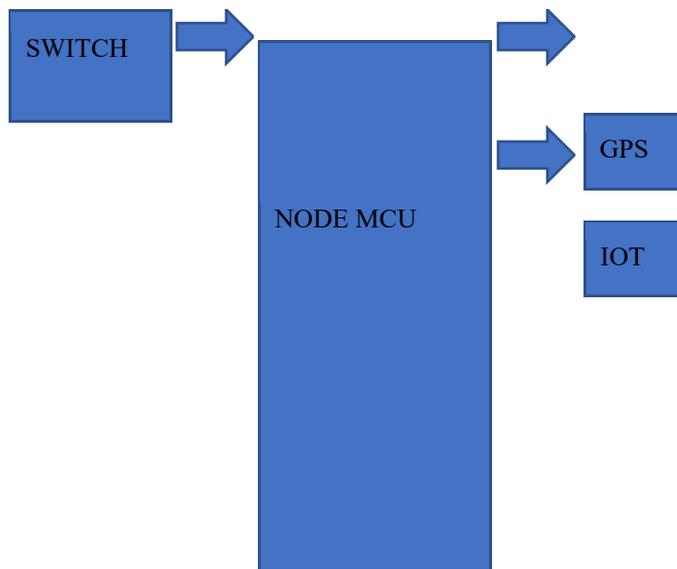
SOFTWARE REQUIREMENT:

1. Windows
2. Arudino ide
3. Blynk

HARDWARE REQUIREMENT:

1. NODE MCU
2. GPS MODULE
3. SWITCH
4. IOT

CIRCUIT DIAGRAM

DEVELOPMENT PLATFORMS:

Numerous development platforms and tools are available to simplify IoT development:

- **Arduino:** Arduino is a popular open-source electronics platform that offers a range of microcontroller boards and software tools for creating IoT prototypes and projects.
- **Raspberry Pi:** Raspberry Pi is a versatile, affordable single-board computer that can be used in a wide range of IoT applications. It's known for its flexibility and ease of use.
- **Development Kits:** Many manufacturers provide IoT development kits with hardware and software components specifically tailored for building IoT solutions. These kits often include sensors, microcontrollers, and development environments to speed up the development process.

These tools and platforms make it easier for developers and businesses to create and deploy IoT applications.

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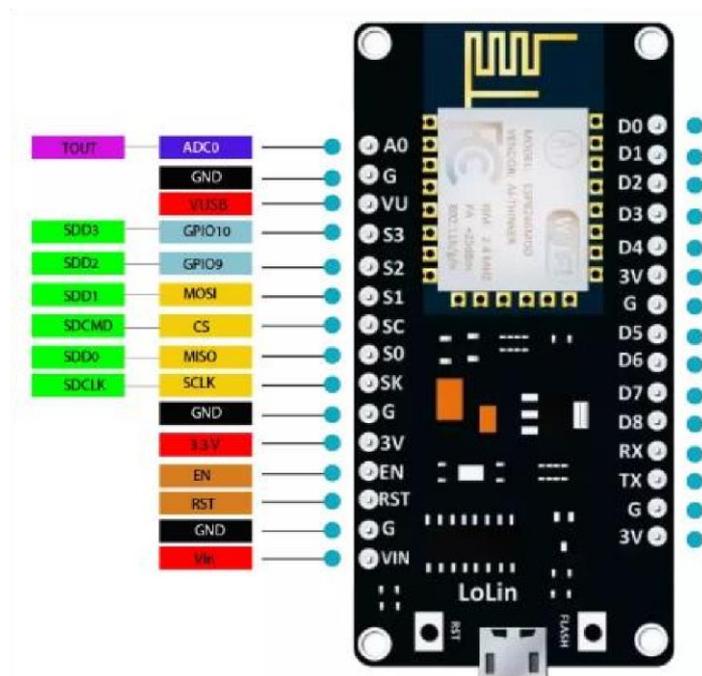
CONCLUSION

In conclusion, the proposed wearable women's safety device offers an innovative and reliable solution to enhance personal safety in emergency situations. By integrating an ESP32 microcontroller, GPS, and a cloud-based monitoring system, the device ensures real-time location tracking and immediate alerts to emergency contacts when activated. The system's use of IoT technology provides a seamless, scalable approach to safety, while its low power consumption and user-friendly design make it suitable for daily use. This solution not only addresses the limitations of existing wearable safety devices but also opens the door for future enhancements, such as the integration of biometric or environmental sensors. Ultimately, the proposed system aims to provide women with an added layer of security, empowering them to feel safe and supported in critical situations. With further refinement and testing, this device has the potential to become an essential tool in personal safety, demonstrating the impact of STEM innovation in improving quality of life.

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