LoRa-BASED LONG RANGE SAFETY TRACKER FOR WOMEN's AND CHILD

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Keywords:

LoRa, Women Safety, GPS Tracking, IoT, Emergency Alert, Panic Button, Real-Time Tracking

Introduction:

1. In recent years, ensuring women's safety has emerged as a critical societal concern, particularly in remote and less secure regions where immediate assistance is not readily accessible. The increasing number of safety-related incidents highlights the necessity for a dependable and efficient emergency response system. Existing safety solutions largely rely on internet connectivity or cellular networks, which may not function effectively in rural or low-network areas, thereby limiting their usability in critical situations.
2. To overcome these limitations, the present project proposes the development of a LoRa-based Long Range Safety Tracker for Women. LoRa (Long Range) technology is a low-power, wide-area communication protocol that enables long-distance data transmission, making it highly suitable for emergency communication in areas with limited connectivity. The system incorporates a GPS module to provide accurate real-time location tracking of the user.
3. In the event of an emergency, the user can activate a panic button, which triggers an alert message along with precise location coordinates to predefined contacts or concerned authorities. This feature ensures timely communication and facilitates immediate assistance. The system is specifically designed to function efficiently even in environments with poor or no internet connectivity, thereby enhancing its reliability and effectiveness.

Objectives:

1. To develop a women and child safety system using LoRa technology for long-range and low-power communication.
2. To integrate GPS for real-time location tracking during emergency situations.
3. To design a panic alert mechanism to send emergency notifications with location details.
4. To ensure reliable operation in areas with limited or no internet connectivity.

Methodology:

1. Portable transmitter (user) and receiver (secure location) design.
2. ESP32 integrated with switch, LoRa, display, buzzer, and battery.
3. Switch press triggers SOS signal and buzzer alert.
4. LoRa transmits emergency signal to receiver.
5. Receiver displays alert and activates alarm.
6. Rechargeable battery with low-power operation.
7. Wearable device for quick emergency use.

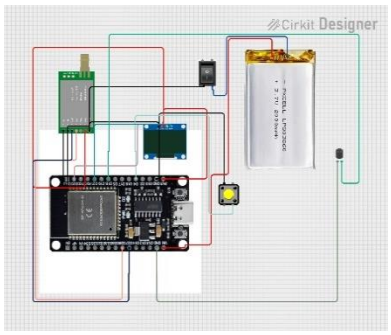

Fig 1.1 Receiver

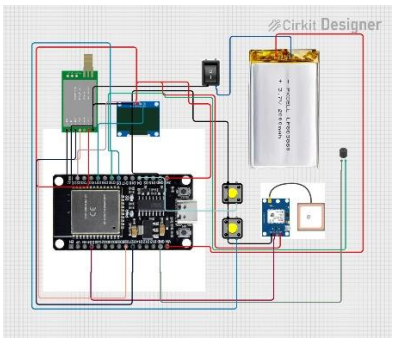

Fig 1.2 Transmitter

Fig 1.3 LoRa Model

Result and Conclusion:

1. The proposed LoRa-based women and child safety system was successfully developed and tested. The system can transmit emergency alerts over long distances using LoRa communication, even in low-network areas. The GPS module sends accurate real-time location details along with the alert when the panic button is pressed. The system demonstrated reliable performance, with alerts delivered within a maximum response time of 1 minute. It also operates with low power consumption, making it suitable for continuous use.
2. Based on the results, the proposed system is simple, cost-effective, and effective in enhancing the safety of both women and children safety. It provides a reliable solution for emergency communication in remote and low-network areas.

Project Outcome & Industry Relevance:

The proposed LoRa-based long-range safety tracker for women delivers a reliable and low-power solution for emergency communication by transmitting real-time alerts and location data over long distances, even in low-network areas. The system is portable, cost-effective, and suitable for continuous use. From an industrial perspective, it is highly relevant to IoT, smart security, and personal safety domains, with potential applications in wearable devices, smart city systems, public transport, and workplace safety solutions.

Working Model vs. Simulation/Study:

The project is implemented as a working model using real hardware components like LoRa, microcontroller, and GPS. It demonstrates real-time alert transmission and location tracking, ensuring practical validation and reliability compared to simulation-based studies.

Project Outcome & Learnings:

The project resulted in the development of a LoRa-based long-range safety tracker that enables reliable emergency alert transmission and real-time location tracking, particularly in areas with limited network connectivity, thereby contributing to improved personal safety for women. During the process of designing, implementing, and analyzing the system, we gained practical exposure to IoT-based development, including LoRa communication, GPS integration, and microcontroller programming. The project also enhanced our understanding of hardware–software integration, low-power communication systems, and the challenges involved in building a dependable real-world safety solution.

References:

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Future Scope:

The future scope of this project includes:

1. Integration of GSM or mobile application support for direct alert communication.
2. Addition of sensors such as heart rate and motion sensors for automatic emergency detection.
3. Optimization of battery performance for longer usage and efficient power management.
4. Development of a rechargeable and portable wearable device such as a smart band or pendant.
5. Enhancement of real-time tracking through a mobile application interface.
6. Inclusion of features like audio recording or camera for improved security.