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Women's Safety Device With Real Time Location Tracking And Sos (Save Our Souls) Alert

[1]Hrishikesh Bodhe, [2]Kunal Talmale, [3]Trupti Chimote, [4]Vrushali Kamdi, [5]Mrs. Archana Parmar

[1]UG Student, [2]UG Student, [3]UG Student, [4]UG Student, [5]Assistant professor
[1]Department of Electronics and Telecommunication
[1]Priyadarshini College Of Engineering, Nagpur, India

Abstract : Women's safety is a growing concern in today's world, and technology can play a vital role in providing quick assistance during emergencies. In today's era of equal rights, women are actively participating in all fields and working in both regular and odd shifts. However, public spaces, transport, and streets have become unsafe, making women hesitant to step out freely. The constant fear of safety prevents them from moving without worry, especially during late hours. In critical situations, a woman will feel more secure if she has access to a reliable safety device. We propose a device that integrates multiple components into a wearable "Smart Gadget" that continuously communicates with a smartphone connected to the internet. This gadget includes a self-defense application to help escape dangerous situations and can be used in places like bus stops, railway stations, offices, and markets. The project focuses on a women's safety system using an SOS button integrated with IoT. The system is designed using Arduino IoT Cloud, NodeMCU, and an OLED display, with communication facilitated via the ESPNOW protocol. When the SOS button is pressed, the receiver unit logs the GPS coordinates on the cloud and sends an emergency alert via SMS to a designated caretaker using Twilio. The Arduino IoT application displays real-time location data, enabling quick response and tracking. This system ensures a fast, reliable, and efficient emergency response, enhancing women's safety.

Index Terms : **Safety, Emergency alerts, GPS, NodeMCU, Wireless, ESPNOW , Twilio, Real-time monitoring**

I. INTRODUCTION

In today's world, women's safety is a growing concern. Numerous incidents of harassment and violence highlight the need for reliable safety measures. This project focuses on developing a smart safety device that leverages modern technology to provide quick emergency assistance. The device features a real-time location tracking system using GPS and an SOS button, enabling users to send alerts to emergency contacts instantly. With a single push, the user can share their location and notify loved ones if they feel threatened. Designed to be lightweight and portable, the device is easy to carry and use daily. Additionally, it includes a rechargeable battery powered by solar energy, ensuring functionality even in outdoor settings.

This IoT-based system is built using Arduino IoT Cloud for seamless data logging and real-time monitoring. It integrates a NodeMCU microcontroller for data processing and an OLED display for status updates. The SOS button, implemented with NodeMCU D1 Mini, communicates wirelessly using the ESPNOW protocol. Upon activation, the receiver logs GPS coordinates on the cloud and sends an emergency alert via Twilio. The Arduino IoT application then visualizes the user's real-time location, allowing responders to track the device efficiently.

Unlike traditional mobile-based safety applications, this standalone device operates independently, ensuring reliability even when a smartphone is unavailable. This project aims to provide a user-friendly, robust, and cost-effective solution to enhance women's security in public spaces, workplaces, and remote areas. By leveraging IoT technology, this system offers an efficient emergency response mechanism, empowering women with increased personal security and peace of mind.

II. LITERATURE SURVEY

Mahesh Anandache, Rohit Mattikalli, Hemant Desai, Mahadevappa Mitagar, **"Design and Development of Advanced Device for Women Safety".** This research paper presents an IoT-based safety device designed to protect women in distress situations. The device integrates GPS, NodeMCU ESP8266, and IFTTT (If This Then That) to send real-time location-based SMS alerts when the SOS button is pressed. The main aim is to provide instant help by notifying emergency contacts with accurate location details.[1]

Shweta Bharade, Manasvi Babrekar, Tejal Patil **"Women's Safety Device Using NodeMCU and GPS".** The paper presents a women's safety device designed as a smart wearable band. The device utilizes an ESP8266 microcontroller (NodeMCU) connected to a Wi-Fi network to send emergency alerts. When the push button on the band is pressed, an alert notification with live GPS location (using the Neo-6M GPS module) is sent to predefined emergency contacts via the Blynk app. The system also includes a buzzer for immediate alerting of nearby people. The goal is to provide women with an easily accessible emergency response system in critical situations.[2]

T. Sowmya D. Triveni, D. Keerthana, A. Vasantha Laxmi, K. Padma Priya, G. Kavya **"Women's Safety System Using IoT".** The paper presents an IoT-based women's safety system that integrates multiple hardware components for real-time emergency response. The system consists of an Arduino UNO, GSM module (SIM900A), GPS module (Neo-6M), IoT module (ESP8266), Accelerometer sensor (ADXL345), Buzzer, Panic Button, and LCD display. When a woman feels unsafe, she can press the panic button, triggering the system**.** [3]

Mohamad Zikriya, Parmeshwar M G, Shanmukayya R Math, Shraddha Tankasali, Dr. Jayashree D Mallapur., **"Smart Gadget for Women's Safety Using IoT".** The paper proposes a smart wearable gadget designed for women's safety, integrating multiple technologies to ensure protection in critical situations. The device continuously communicates with a smartphone connected to the internet and provides both self-defense and emergency alert mechanisms.

Mohhamad Fajar Wicaksono, Myrna Dwi Rahmatya**, "IoT for Residential Monitoring Using ESP-NOW Protocol".** The paper presents a residential monitoring system using IoT and the ESP-NOW protocol, designed to enhance home security. The system integrates multiple ESP8266 microcontrollers, allowing security personnel and homeowners to monitor their houses via a web application and Android app. The system detects intrusions, gas leaks, and fires and sends real-time notifications through the LINE messaging app and a web-based dashboard.[6]

III. BLOCK DIAGRAM

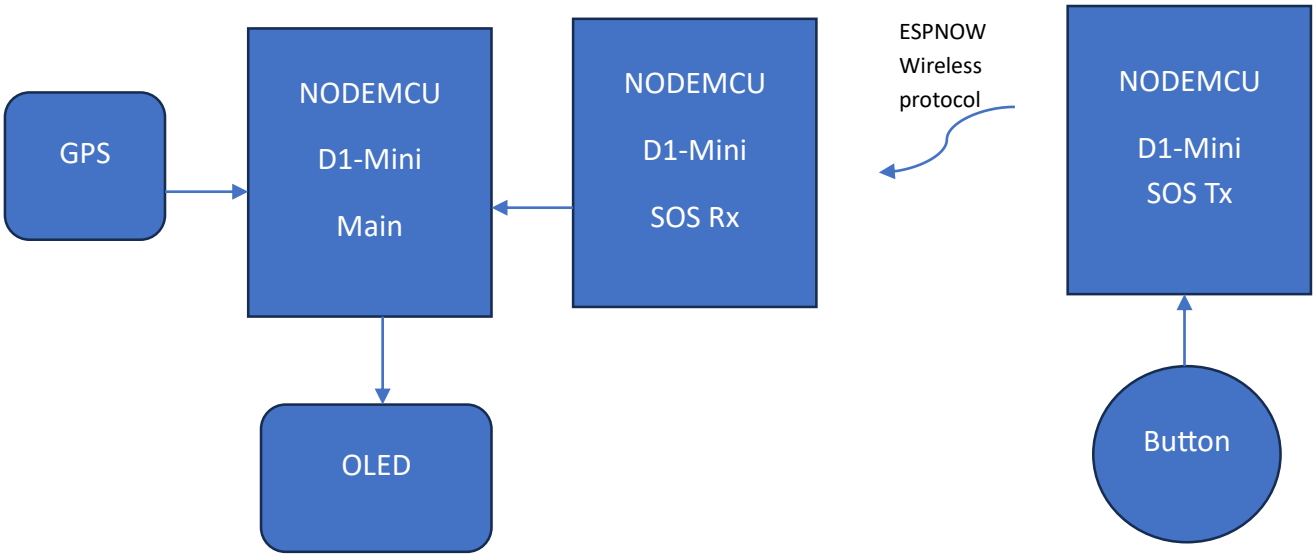

FIG.3. Block Diagram

Figure 3 shows block diagram of the project, where a NodeMCU D1 Mini is used as the main processing unit, powered by a lithium-ion battery. Connected to it is a GPS module that continuously tracks the user's location. An OLED display is used to provide real-time status updates. The system also includes an SOS transmission and reception module, implemented using two additional NodeMCU D1 Mini units. The SOS Tx unit is connected to a push button, which, when pressed, sends an emergency alert wirelessly using the ESP-NOW protocol to the SOS Rx unit. The received signal is then processed by the main NodeMCU to trigger an alert, display emergency messages on the OLED screen, and send the user's location to predefined contacts. This architecture ensures reliable communication, quick response, and real-time location tracking to enhance women's safety.

IV. METHODOLOGY

We are using a NodeMCU for this project, together with a GPS module to track the user's location and an LED display to provide real-time status updates. This system is designed to enhance women's safety by enabling automatic SOS alerts. In case of distress, the user can press an SOS button, which triggers an alert containing the GPS location to predefined contacts via an twilio api. Additionally, the LED display provides immediate feedback, confirming that the alert has been sent. A rechargeable lithium-ion battery, along with a charging module, ensures continuous operation. The system is compact, making it easy to carry and use in emergencies.

The above methodology is implemented with the following devices-:

ESP8266 Microcontroller Module: The ESP8266 module serves as the brain of the women's safety device. It is a low-cost Wi-Fi microcontroller with built-in connectivity, making it suitable for IoT-based applications. The ESP8266 is responsible for processing data from sensors like the SOS button, communicating with the GPS modules for emergency alerts, and controlling the buzzer and other actuators to ensure quick response in critical situations.

FIG.4.1. ESP8266

GPS Module: GPS modules are used to determine the real-time location of an object. They receive signals from multiple satellites and calculate the time taken for the signals to reach the receiver. Based on this data, the module determines the exact latitude and longitude, allowing accurate tracking of position and movement.

FIG.4.2. Neo-6M GPS Module

OLED Display: The OLED display serves as the visual interface of the women's safety device. It is a compact, low-power display that provides clear visibility even in low-light conditions. The OLED display is responsible for showing real-time information such as device status, GPS coordinates, emergency alerts, and battery level, ensuring that the user stays informed about the device's operation and safety features.

FIG.4.3. OLED Display

Power Supply: A stable power supply is essential to ensure the continuous operation of the women's safety device. This involves using a lithium-ion battery along with a charging module to provide reliable and long-lasting power. The power system is designed to support all components, including the ESP8266, sensors, GPS module, and OLED display, ensuring uninterrupted functionality during emergencies.

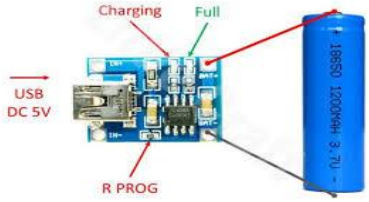

FIG.4.4. Lithium-ion battery along with a charging module

Buzzer : A buzzer in a women's safety device acts as an immediate alert system, producing a loud sound when the SOS button is pressed to attract attention and deter potential threats. It provides audible confirmation that an emergency alert has been sent and can startle an attacker, giving the user a chance to escape.

FIG.4.5. Buzzer

V. WORKING

The SOS Transmitter Unit is a compact, wearable device designed for emergency situations. It consists of a Node-MCU D1 Mini, an SOS button, and a buzzer. When the user presses the SOS button, the Node-MCU D1 Mini instantly transmits a distress signal to the receiver unit using the ESP-NOW protocol. Simultaneously, the onboard buzzer produces a loud alert sound to attract attention and potentially deter an attacker. This system ensures that an emergency alert is sent even if the user cannot access their smartphone. The Receiver & Alert System processes distress signals and takes immediate action. It includes a Node-MCU (Receiver Unit), a communication module, GPS Module (NEO-6M), OLED Display, and a buzzer. When an SOS signal is received via ESP-NOW, the Node-MCU retrieves GPS coordinates from the GPS module and logs real-time data to the Arduino IoT Cloud. The communication module then sends an SMS alert via Twilio API to a predefined contact, including latitude, longitude, and a Google Maps link for tracking. The buzzer is activated to provide an audible alert, while the OLED display shows real-time status updates, ensuring proper system functionality during emergencies.

The women’s safety device enables real-time monitoring by continuously logging GPS location data to the Arduino IoT Cloud. This allows for live location tracking, ensuring the user's movements can be monitored remotely. A caretaker or emergency contact can access the Arduino IoT Cloud dashboard or mobile app to check the user’s current position at any time, enhancing safety and quick response in emergencies.

VI. RESULT

A women’s safety device leverages advanced technology to ensure quick emergency response and real-time tracking. It consists of an SOS Transmitter Unit and a Receiver & Alert System, enabling seamless communication during distress situations. The wearable transmitter unit, equipped with a D1 Mini, SOS button, and buzzer, allows users to trigger an alert instantly. When the SOS button is pressed, a distress signal is sent via ESP-NOW to the receiver unit, which includes a NodeMCU, communication module, GPS module, OLED display, and buzzer. The receiver retrieves real-time GPS coordinates, logs data to Arduino IoT Cloud, and sends an SMS alert via Twilio API with a Google Maps tracking link. Additionally, an audible buzzer alert enhances awareness, while the IoT Cloud dashboard or mobile app enables caretakers to monitor the live location. By integrating IoT and cloud technology, this system enhances women’s safety, improves emergency response times, and ensures reliable location tracking.

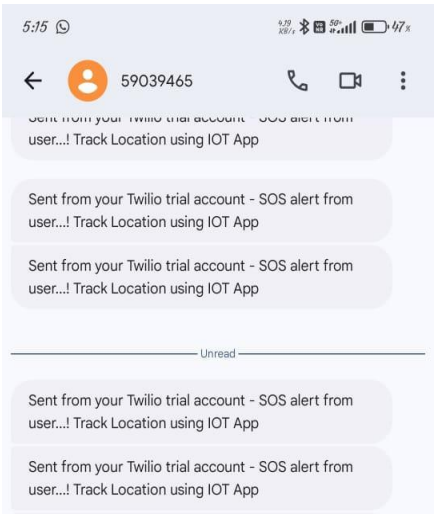

FIG.6.1. SMS

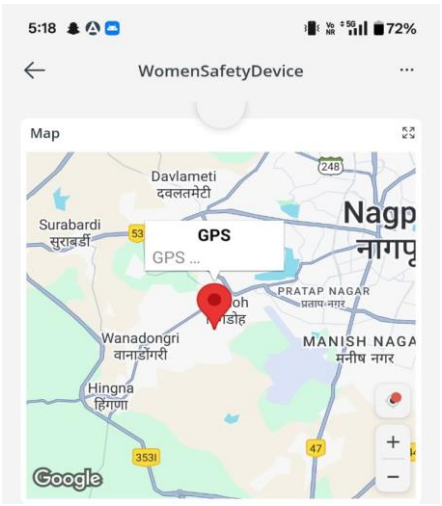

FIG.6.2.Location

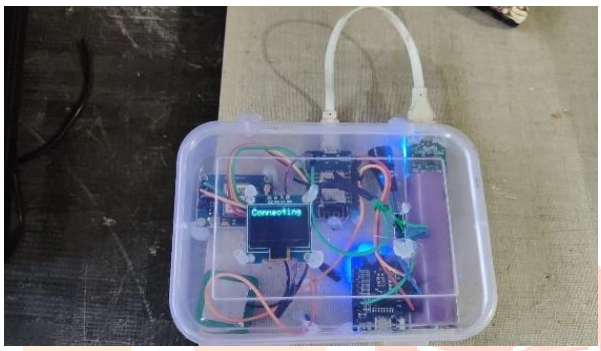

FIG.6.3. Final Model

VII. CONCLUSION

In conclusion, the implementation of a women's safety device represents a crucial step toward enhancing personal security in public and private spaces. By integrating sensors, IoT technology, and real-time communication modules, such devices offer numerous benefits, including instant emergency alerts, location tracking, and rapid response capabilities. Through features like SOS alerts and motion detection, these systems empower individuals with proactive safety measures, reducing response time in critical situations. Additionally, by leveraging technology to improve personal security, women's safety devices contribute to a safer society, promoting confidence and independence. As safety concerns continue to rise, investing in advanced security solutions becomes essential for fostering a more secure and inclusive environment.

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