Emergency Sos Button Using Gps & Gsm Functionality

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Abstract
Today's culture still places a high priority on women's protection, which calls for creative technical solutions for emergency response in real time. The NodeMCU ESP8266, GSM SIM800C, and GPS NEO-6M are used in this paper's design and implementation of a smart emergency SOS button that transmits distress signals quickly. By only turning on when the push button is hit, the system minimises false triggers and maximises battery usage. When the GPS module is activated, it obtains the current location coordinates, which are subsequently transmitted by SMS to a designated emergency contact through the GSM module. An affordable, dependable, and portable solution appropriate for personal safety applications is guaranteed by the combination of GSM technology with Internet of Things-based communication. This gadget is especially helpful for women who are in distress because it allows them to get help right away by giving trustworthy people their exact location

Keywords: GPS, SIM800, ESP8266, Women Safety, SOS Button

1. INTRODUCTION

With rising rates of violence, harassment, and assault in both urban and rural regions, women's safety continues to be a major global concern. Even if security has been improved in a number of ways, people still require real-time, tech-driven solutions that enable them to get help right away in an emergency. Conventional safety measures, such helpline numbers or mobile applications, frequently need human intervention and could not be available in an emergency. Therefore, improving personal security requires an autonomous, user-friendly emergency alarm system.

The creation of a smart emergency SOS button that uses GSM-based connectivity and the Internet of Things (IoT) to transmit distress signals in real time is presented in this study. A GPS NEO-6M module for accurate location tracking, a GSM SIM800C module for SMS-based communication, and a NodeMCU ESP8266 as the main microcontroller are all included into the suggested system. Because the device only turns on when the push button is hit, it uses very little electricity and doesn't set off false alarms. Real-time coordinates are retrieved by the GPS module upon activation and transmitted by SMS to a designated emergency contact, law enforcement, or family members.

The suggested gadget can be widely used because it is small, economical, and effective. This stand-alone device, in contrast to mobile-based safety apps, is not dependent on internet access, guaranteeing operation even in places with spotty network service. The safety of women in crisis is improved by the dependable and scalable real-time emergency response method offered by the IoT and GSM integration.

2. Literature Survey

Real-time health monitoring systems have been introduced by recent developments in IoT-based wearable technology to improve emergency response and kid safety. Research suggests creating wearable wristbands with sensor modules to monitor critical metrics including location, heart rate, and body temperature. By using Bluetooth Low Energy (BLE), LTE, and GSM modules for continuous data transfer, these gadgets enable remote child monitoring for parents and emergency services. Some systems use machine learning algorithms to examine previously collected health data in order to enhance emergency detection. This allows for automated notifications to be sent out when abnormalities are found. Furthermore, the use of buzzers and camera modules improves the system's capacity to deliver immediate emergency alerts without the need for human participation. The creation of environmentally friendly, sustainable bracelets is further aided by the use of 3D printing technology.[1]

Intelligent safety systems that combine collision detection, emergency response, and health monitoring have been developed as a result of recent developments in IoT and machine learning. In the event of an accident, one of these systems' SOS buttons automatically alerts pre-registered hospitals and guardians. The gadget's functions include collision detection, impact intensity assessment, and alerting users when the severity above a predetermined threshold.

The system can distinguish between little jerks, movements, and real collisions thanks to the incorporation of machine learning methods like K-Nearest Neighbours (KNN) and Support Vector Machines (SVM). Notifications are transmitted by phone, SMS, and email, and a microprocessor analyses sensor data, executes algorithms, and uses GPS tracking to find the closest hospital.

Aside from accident recognition, IoT connectivity enables the device to serve as a versatile safety instrument, incorporating functionalities like a medication reminder for those with chronic health issues or sub-optimal health states. In contrast to earlier systems that depended on pre-stored information, ongoing internet availability, or predictive assessments based on traffic conditions, this approach guarantees immediate responses without relying on external factors. The integration of collision identification, emergency notifications, and health monitoring makes these IoT-based safety systems crucial for road safety, health management, and personal protection. These innovations lead to quicker medical responses, greater accuracy in accident detection, and improved user safety during emergencies.[2]

Concern over women's safety has grown significantly, which has prompted the creation of numerous wearable safety devices and smartphone apps. Through preset button patterns or by taking a picture, users of mobile applications such as "VithU" and "Smart Shehar" can send GPS location and SOS alerts to contacts they have previously saved. However, a major drawback of these apps is that, because attackers frequently restrain victims' hands or disable their devices, victims might not always have access to their phones during an attack.

A more reliable solution combines GPS, GSM, and ESP-32 camera modules to take pictures of the attacker and the area while sending real-time location, call, and message alerts. These stand-alone IoT devices, in contrast to smartphone-based safety apps, operate separately from the victim's phone, guaranteeing that emergency notifications are sent even in the event that the phone is lost or damaged.

Enhancing emergency communication, lowering reliance on mobile devices, and guaranteeing real-time distress signal transmission are the main goals of advancements in IoT-driven women's safety solutions. The goal of these developments is to offer a more dependable and useful method of personal security in emergency scenarios.[3]

Concerns regarding emergency response, health monitoring, and senior safety have grown dramatically as the aging population continues to grow. According to studies, a significant portion of the elderly population, especially those with dementia and Alzheimer's disease (AD), frequently become disoriented or run the risk of dying as a result of their incapacity to get assistance. IoT-based personal tracking devices that combine GPS and GPRS technology to offer real-time location tracking and emergency alerts have been proposed as a solution to these problems. With the help of these gadgets, family members and caregivers can keep an eye on the elderly from a distance and act quickly in an emergency.

Wi-Fi positioning, RFID, ZigBee, base station triangulation, and GPS are just a few of the location techniques used by contemporary tracking solutions. The most popular of these is GPS technology because of its great accuracy, wide coverage, and lack of reliance on other infrastructure. GPS provides accurate navigation and location tracking, even in remote areas, in contrast to base station-based positioning, which depends on mobile networks and has lower accuracy.

GPRS technology is utilized for data transmission in order to enable real-time communication. Effective SMS, internet access, and multimedia transmission over wireless networks are made possible by GPRS, which facilitates packet-switched communication. Devices with GPS modules like SIM28 and GSM/GPRS modules like SIM900 have been widely used for emergency assistance and tracking elderly people. They offer a low-power, affordable solution for ongoing monitoring.[4]

The safety and mobility of people with visual impairments continue to be major concerns, particularly in crowded urban settings where potential hazards and obstacles raise the possibility of accidents. It becomes difficult to move independently without an efficient navigation aid, frequently necessitating the help of guides or caregivers. IoT-based assistive technologies, such as smart blind sticks with GPS tracking, GSM communication, and ultrasonic sensors, have been developed to address these issues. The smart stick's built-in ultrasonic distance sensor allows for real-time obstacle detection, informing the user via haptic feedback or a buzzer. Furthermore, GPS tracking ensures the safety of visually impaired people by enabling parents and guardians to keep an eye on their whereabouts in real time. SOS alerts are sent to pre-specified contacts via the GSM module in emergency situations, ensuring prompt assistance when required. For visually impaired people, these features improve security, mobility, and navigation, encouraging increased independence.

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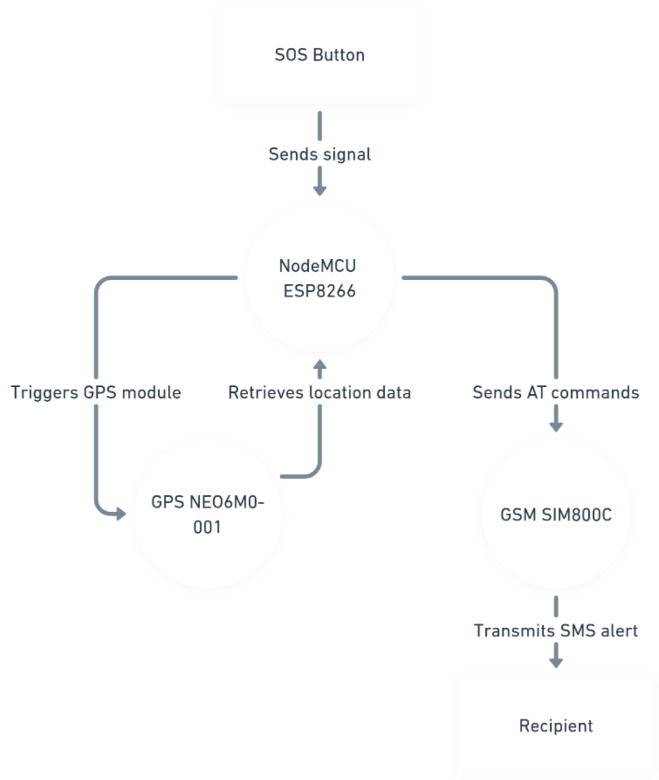

Fig. 1. Process Plan

METHODOLOGY

A. System Architecture

Module of Input: SOS Button: A tactile push button that is attached to a specific NodeMCU digital input pin. To maintain a specified logic level when the button is not in use, a pull-up resistor is used.
Module for Processing: As the main controller, the NodeMCU ESP8266 controls the collection of sensor data, processes SOS button input, and communicates with GPS and GSM modules.
Module for Sensing: When requested, GPS NEO6M0-001 provides real-time location information, including latitude and longitude. A serial interface connects the GPS module to the NodeMCU. Module for Communication: The GSM SIM800C Quad is in charge of transmitting location-based SMS messages. Through serial communication, the GSM module interfaces with the NodeMCU, which uses AT commands to send SMS.

B. Hardware Implementation

Choosing and Connecting Components: The NodeMCU ESP8266 was chosen because of its integrated Wi-Fi, programming simplicity, and ample I/O for peripheral module interface.
GPS NEO6M0-001: Selected due to its low power consumption and accuracy. It uses the UART interface to communicate with the NodeMCU.

Fig. 2. Neo6M

GSM SIM800C Quad: Compatible with AT command-based control, this device supports multi-band GSM/GPRS.

Fig. 3. SIM800C

Fig. 4. Push Button

SOS Button: Attached to a NodeMCU digital pin using the proper pull-up setup. Circuit Design: The modules are integrated on a single PCB or breadboard by the circuit design.

Important design factors consist of: Power Supply: To guarantee that the GSM and GPS modules receive a steady voltage and current, a regulated power supply is supplied. Signal Conditioning: If there are problems with voltage compatibility between modules, level shifting may be used.

3. Software/Firmware Development and Implementation

Environment of Development: The Arduino Integrated Development Environment (IDE) is used to program the NodeMCU. Included are pertinent libraries for GSM control, GPS parsing (such as TinyGPS++), and serial communication

The implementation of algorithms: The essential functionality is described in the following order: Button Press Detection: The NodeMCU keeps an eye on the SOS button's condition at all times. The system starts the emergency procedure when it detects a press (with the proper debouncing).

GPS Data Acquisition: To extract valid latitude and longitude values, the microcontroller sends a request to the GPS module, which parses the received NMEA sentences. SMS Alert Transmission: After identifying the location, the NodeMCU creates an SMS message and instructs the GSM module to send it to a pre-coded phone number using AT commands. Handling Errors: The code incorporates error-checking procedures to

error-checking routines to handle cases such as unavailable GPS data or GSM transmission failures.

4. System Integration & Testing

Module Integration: Every module is first examined separately:

GPS Module: Confirmed to provide precise location retrieval in a range of environmental circumstances.

GSM Module: AT command sequences were used to test the module's ability to send SMS successfully.

The SOS button has been verified to deliver a dependable trigger signal.

Completely Testing: By mimicking emergency button presses, the fully integrated system is examined.

The test confirms: precise GPS data parsing and retrieval. The SMS alert was properly composed and sent.

prompt response from the GSM module, guaranteeing that the right pre-coded phone number receives the SMS.

Debugging and Optimization: The system is debugged using logging mechanisms and serial output. The main goals of optimization are to minimize power consumption during idle time, ensure robust error handling, and speed up response times

5. Conclusions

In this paper, we have presented the design and implementation of an emergency SOS button system that integrates a NodeMCU ESP8266, GSM SIM800C Quad module, and GPS NEO6M0-001. The system is engineered to operate with a single button press, which triggers the retrieval of real-time location data from the GPS module and the immediate dispatch of an SMS alert to a pre-coded phone number via the GSM module. Experimental evaluations have demonstrated the robustness and reliability of the system in accurately relaying critical location information under various conditions.

This IoT-based solution underscores the potential for modern embedded technologies to address urgent safety challenges, providing a cost-effective, user-friendly, and energy-efficient approach to emergency communication. Future work will focus on further optimization, scalability improvements, and integration with broader safety networks to enhance its applicability in real-world emergency scenarios.

analytics, and integration with smart city infrastructures. Predictive analytics may be made easier by this connectivity, enabling proactive resource allocation and emergency response

RESULT

- When the user presses the SOS button, the circuit should use GPS to determine the user's current location and send an SMS with the location and emergency message string to the pre-coded number. The GPS should record the user's current location in both latitude and longitude format when they press the button.
- The system ought to start the emergency alert procedure when the user hits the SOS button.
- To obtain the current location in latitude and longitude format, the microcontroller needs to turn on the GPS module.
- The necessary coordinates should be extracted from the GPS data by the microcontroller.
- An SMS with the following information should be formatted and sent by the GSM module to a pre-designated emergency contact: o Latitude o Longitude
- A string for an emergency message, such as "Emergency! Please help."
- Recipient should receive the emergency message.

6. FUTURE SCOPE

A promising basis for improving personal safety through quick, location-based emergency communication is shown by the current emergency SOS button system. Future developments and line
of inquiry consist of:

1. Improved Communication Capabilities: Adding more communication protocols (like Wi-Fi and LTE) could increase coverage and dependability in places where GSM network connectivity is inadequate. Adding two-way communication capabilities, like voice or video streaming, could help users and emergency personnel communicate in real time.
2. Connecting the device to cloud services or centralized IoT platforms would allow for remote monitoring, thorough data.
3. Battery Optimization and Power Management: Studies into energy harvesting and low-power consumption strategies may prolong battery life, guaranteeing that the device runs for prolonged periods of time in emergency situations.
4. User Interface and Customization: By improving the user interface, users may be able to set custom alert thresholds, modify emergency contact details, and keep an eye on the status of their devices in real time, for example, by using a companion smartphone application.
5. Scalability and Adaptability: Upcoming research can concentrate on expanding the system's functionality for a range of uses, such as integration with smart home systems, wearable technology, and automobiles. The technology's impact on public safety could be increased by tailoring it for various user groups, such as the elderly, young people, or people with disabilities

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