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Women's Safety Using GPS and GMS Module

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Abstract : *This paper presents a GPS- and GSM-based women's safety system designed to provide emergency alerts and location information. The proposed system uses an Arduino Uno, SIM800L GSM module, NEO-6M GPS module, RF modules, push buttons, and an active buzzer. When the emergency button is activated, the system is designed to obtain GPS coordinates and transmit an alert with location information to a predefined contact. The prototype aims to provide a low-cost, portable, and accessible approach to emergency assistance.*

Keywords: Global System for Mobile Communication (GSM), Global Positioning System (GPS), Short Message Service (SMS).

I. INTRODUCTION

Personal safety is an important concern in modern society, particularly when individuals travel alone or find themselves in emergency situations. The availability of a quick and reliable way to communicate an emergency and share location information can help trusted contacts respond more effectively. Advances in embedded systems, wireless communication, and satellite-based positioning have made it possible to develop compact and affordable safety devices.

The proposed Women's Safety Using GPS and GSM Modules system is designed to provide an emergency alert mechanism using an Arduino Uno as its main controller.

The system integrates a SIM800L GSM module for cellular communication and a NEO-6M GPS module with an antenna for obtaining geographical coordinates. Push buttons provide manual input for emergency activation, while a 5 V active buzzer provides a local audible indication. RF modules can be incorporated for wireless communication with a compatible remote unit, depending on the implemented circuit.

When the user activates the emergency button, the controller initiates the programmed emergency procedure. The GPS module supplies location data when a valid satellite fix is available. The Arduino processes the received coordinates and prepares the emergency information. The GSM module can then send a text message containing the location information to a predefined contact, provided that the cellular network, SIM card, power supply, and firmware are functioning correctly. The buzzer can provide an audible alert to indicate the activation of the system.

The major objective of this project is to develop a low-cost, portable, and easy-to-operate safety device using commonly available electronic components. The use of an Arduino Uno simplifies system development and allows the control logic to be modified according to the required functionality. The combination of GPS and GSM technologies provides both location acquisition and remote communication, while the push buttons allow the user trigger an alert without navigating a mobile application.

The system also has practical limitations. GPS positioning may be delayed or unavailable in indoor environments, and GSM communication depends on cellular coverage and adequate power. The prototype should therefore be considered an additional safety aid rather than a replacement for emergency services or other safety measures. Its reliability must be evaluated through practical testing under different operating conditions.

The remainder of this paper describes the related work, hardware components, proposed system architecture, methodology, prototype implementation, testing procedure, and conclusions.

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TABLE I. HARDWARE COMPONENTS

Sr. No.	Component	Function
1	Arduino Uno	Main controller
2	SIM800L GSM Module	Sends emergency SMS
3	NEO-6M GPS Module with Antenna	Provides location coordinates
4	RF Transmitter and Receiver	Wireless communication
5	Push Button	Emergency activation
6	5 V Active Buzzer	Audible alert
7	3.7 V Li-ion Battery	Power supply

This paper proposes a wearable safety device based on Arduino, GSM and GPS technologies. The main objective is to provide an emergency alert facility through a simple button operation. When the user activates the device, the system uses GPS to obtain location information and GSM to communicate the alert to previously stored contacts. The use of Arduino makes the system relatively straightforward to develop and suitable for a student-level embedded-system project [1].

This research presents a safety system that combines GPS, GSM, a heartbeat sensor and an ESP-CAM. The GPS receiver obtains latitude and longitude information from satellites. The GSM module is used to communicate emergency information, while the additional sensor and camera components provide further monitoring capabilities.

Compared with a basic GPS-and-GSM device, this approach includes additional features that can make the system more informative. However, adding multiple modules can increase hardware complexity, power requirements and overall cost [2].

This paper describes an Arduino-based wearable safety device that uses GPS and GSM to send the user's location to designated contacts and authorities. It also discusses a wireless sensor network and compares the proposed IoT-powered system with a Bluetooth-enabled safety system.

An important aspect of this research is its consideration of different communication technologies. GPS and GSM provide location and cellular communication, whereas Bluetooth-based systems have different connectivity requirements. This makes the paper useful for understanding why a GSM-based alert mechanism may be appropriate when a smartphone or nearby Bluetooth connection is not available [3].

This paper presents an IoT-based safety system using an ESP32 microcontroller, SIM900A GSM module and GPS module. The system allows the user to activate an emergency alert through a physical button or mobile application. After activation, it sends an SMS containing geographical coordinates to predefined contacts. It also describes automatic voice calling and location monitoring through a mobile application.

The use of both SMS and voice calls provides two communication methods. The ESP32 acts as the main controller and coordinates the different modules. The wearable design is intended to make the system portable [4].

This paper proposes an emergency safety device that sends the user's latitude and longitude to selected mobile numbers through GSM. The location information can be viewed using Google Maps. Its description also discusses pre-activation, periodic location updates, camera-related features and battery management.

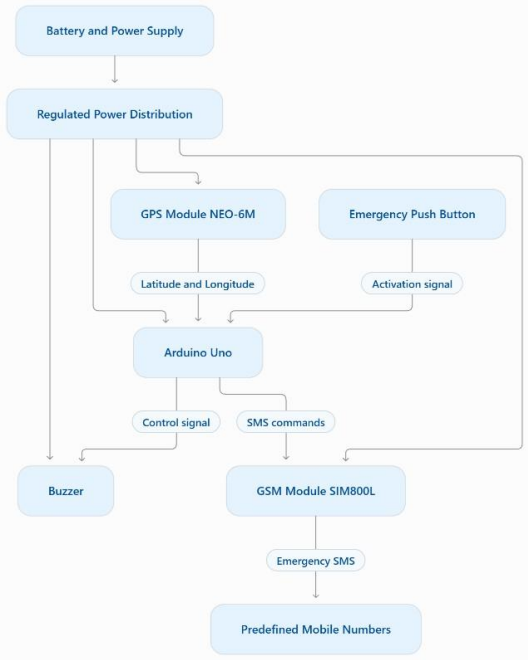
The important contribution of this work is its focus on providing location information to emergency contacts rather than simply sending a general distress message. It also discusses the limitations of systems that rely entirely on the user pressing a button during an emergency [5].

This paper describes a wearable system using an Arduino microcontroller, GPS module, GSM module, panic switch, buzzer and LCD. During normal operation, the GPS module receives location information and transfers it to the Arduino. When the panic switch is activated, the Arduino processes the coordinates and instructs the GSM module to send an SMS to predefined emergency contacts. The buzzer provides an audible alert, while the LCD displays system status.

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The paper reports that the GPS module captured location data under normal outdoor conditions and that the GSM module sent SMS alerts within a few seconds of activation. However, the paper does not provide enough numerical performance measurements in the sections reviewed to establish a precise response-time or location-accuracy benchmark [6].

II. BLOCK DIAGRAM



The block diagram represents the working process of the proposed women's safety system. The GPS module receives satellite signals and sends the user's location coordinates to the Arduino Uno. When the emergency push button is pressed, the Arduino processes the location data and sends commands to the GSM module to transmit an emergency SMS to predefined contacts. The buzzer produces an audible alert, while the power supply provides energy to all the connected components.



Fig1: Hardware Components

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III. COMPONENT DESCRIPTION AND THEIR FUNCTIONS

1. Arduino Uno Microcontroller

The Arduino Uno is the main controlling unit of the proposed system. It is based on the ATmega328P microcontroller and is responsible for coordinating all connected hardware components. It receives the emergency signal from the push button, processes geographical information from the GPS module and sends control commands to the GSM module. It also controls the buzzer during emergency activation.

2. GPS Module (NEO-6M)

The NEO-6M GPS module is used to determine the geographical location of the user. It receives signals from GPS satellites and calculates the location in terms of latitude and longitude. The GPS module communicates with the Arduino Uno through serial communication. The Arduino processes the received coordinates and prepares them for transmission through the GSM module.

3. GSM Module (SIM800L)

The SIM800L GSM module is responsible for wireless communication in the proposed system. It uses a SIM card and a compatible cellular network to send SMS messages.

When the emergency button is pressed, the Arduino sends AT commands to the GSM module. The module then transmits an emergency SMS containing the available GPS coordinates to predefined mobile number.

4. LM2596 Step-Down Voltage Converter

The LM2596 is a DC-to-DC step-down converter used to reduce a higher input DC voltage to a lower regulated output voltage. It helps provide a suitable power supply for electronic modules that require different operating voltages. The output voltage can be adjusted using the onboard potentiometer and should be checked with a multimeter before connecting the components.

5. Emergency Push Button

The emergency push button is the main input component of the proposed safety system. It allows the user to manually activate the emergency alert. When the button is pressed, it sends a digital signal to the Arduino Uno. The Arduino detects this signal and initiates the emergency notification process.

7. Power Supply / Battery

The power supply or rechargeable battery provides the electrical energy required to operate the complete system. It supplies power to the Arduino Uno, GPS module, GSM module and other connected components. A suitable power supply is important for reliable operation, especially during GSM transmission, when the module may require high current.

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IV. RESULT

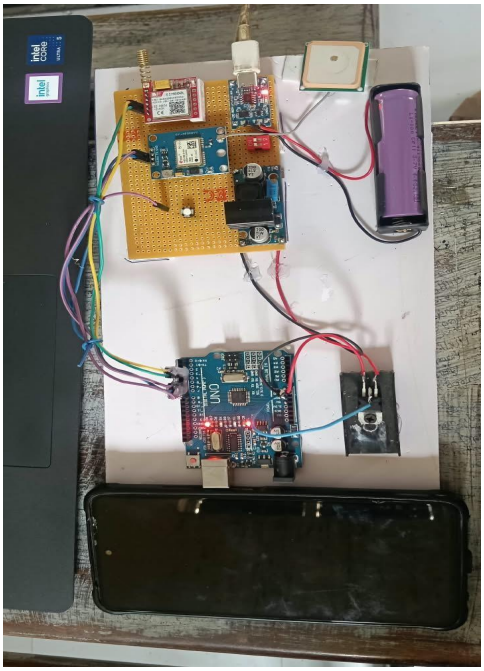


Fig2 : Result before getting network

The proposed Women's Safety System using GSM and GPS was designed to provide emergency alerts with the user's geographical location. When the emergency push button is pressed, the Arduino Uno processes the signal and obtains location coordinates from the GPS module. The GSM module then sends an SMS containing the location details to predefined emergency contacts. The buzzer produces an audible alert to indicate system activation.

The system demonstrates the integration of GPS-based location tracking and GSM-based emergency communication. It provides a simple and portable approach to emergency alert generation.

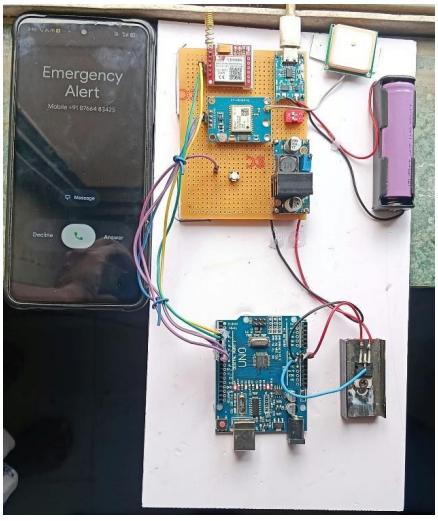


Fig3 : Result after getting network

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V. CONCLUSION AND FUTURE SCOPE

The proposed Women's Safety System Using GSM and GPS Module provides a microcontroller-based solution for emergency alert generation and location tracking. The system integrates Arduino Uno, NEO-6M GPS, SIM800L GSM,
LM2596 voltage converter, emergency push button and buzzer to perform emergency communication.

When the emergency button is activated, the Arduino processes the input signal and obtains geographical coordinates from the GPS module. The GSM module uses the cellular network to transmit an SMS containing the location information to predefined emergency contacts. The buzzer provides an additional audible indication of emergency activation.

The proposed system offers a simple, portable and cost-effective approach to location-based emergency communication.

Its practical performance depends on GPS signal availability, cellular network coverage, power stability and proper hardware integration. Thus, the project demonstrates the application of embedded systems and wireless communication technologies in personal safety applications.

In the future, the proposed Women's Safety System can be enhanced by integrating IoT technology and cloud-based platforms for real-time location monitoring. A dedicated mobile application can be developed to provide live location tracking and emergency notifications. Additional sensors such as accelerometers and heartbeat sensors can be incorporated for automatic emergency detection. Voice-calling functionality can also be added to improve emergency communication. Battery optimization techniques can be implemented to increase operating time and system efficiency. Furthermore, advanced positioning technologies can improve location availability in areas with weak GPS signals. The overall hardware can be redesigned using a compact PCB and wearable enclosure to make the system more portable, reliable and suitable for practical applications.

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