



WOMEN SAFETY DEVICE USING GPS AND GSM WITH AURDIUNO

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ABSTRACT

Personal safety, particularly for women, remains a paramount concern in today's society. This project report outlines the development of a compact and efficient women's safety device designed to enhance personal security through the integration of several critical technologies. The device employs an Arduino Nano, GSM SIM800L, NEO-6M GPS Module, DC Buck Converter, and a push button for activation, ensuring a practical and user-friendly safety solution.

At the heart of the device is the Arduino Nano, a small yet versatile microcontroller that manages the system's operations. The GSM SIM800L module is used for reliable communication, enabling the device to send emergency messages and make phone calls to pre-defined contacts. This ensures that, in the event of a distress situation, immediate assistance can be requested.

The NEO-6M GPS module provides accurate location tracking, transmitting real-time GPS coordinates to emergency contacts. This feature is crucial for ensuring that the user's exact location is known, allowing for swift and precise intervention.

The DC Buck Converter is incorporated to stabilize the power supply, ensuring that the device operates efficiently even with variations in input voltage. This component helps in maintaining a consistent power output, thereby extending the device's operational life and enhancing its reliability.

A push button is included to allow for straightforward activation of the emergency alert system. When pressed, the button triggers the device to send a distress signal along with the GPS coordinates to designated contacts, ensuring that help can be dispatched promptly.

INTRODUCTION

The development of personal safety devices has gained substantial attention due to increasing concerns over personal security. The advent of technology has facilitated the creation of advanced safety solutions incorporating GPS, GSM, and microcontroller systems. This chapter reviews existing literature on personal safety devices, focusing on the integration of GPS and GSM technologies, the use of microcontrollers, and advancements in power management.

Overview of Safety Devices

Personal safety devices are designed to offer protection and assistance in emergency situations. Traditional safety devices include personal alarms, pepper spray, and emergency call systems. However, these devices often lack integration with modern technologies that can enhance their effectiveness and reliability. Recent advancements have shifted towards incorporating electronic components to provide real-time tracking and communication.

Technological Advancements

Recent literature highlights significant advancements in personal safety devices through the integration of GPS and GSM technologies. These advancements offer improved location tracking and communication capabilities, addressing some of the limitations of earlier safety solutions.

GPS Technology in Safety Devices

Functionality and Integration

The integration of Global Positioning System (GPS) technology into personal safety devices allows for accurate real-time location tracking. The NEO-6M GPS module, for instance, is widely used due to its high accuracy and reliability. According to research by [Author, Year], GPS modules like the NEO-6M provide a robust solution for tracking and locating individuals in emergency scenarios.

WORKING PRINCIPAL

The system operates on three main principles

Arduino Nano Micro-controller:

Arduino is an open-source prototyping platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. We can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so we use the Arduino programming language (based on wiring), and the Arduino Software(IDE), based on Processing.

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug

into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector.

The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts

GSM SIM800L:

The GSM SIM800L module enables the safety device to send emergency messages and make calls to predefined contacts. It facilitates communication between the user and emergency responders, ensuring timely alerts and assistance.

NEO-6M GPS:

The NEO-6M GPS module tracks the user's location in real-time and provides this information to the GSM module for transmission to emergency contacts. It is essential for ensuring that the user's precise location is communicated accurately during an emergency.

OBJECTIVE OF THE PROJECT

The main objectives of this project are:

- **Development of a Compact Safety Device:** Design a small, portable device that is convenient to carry and use.
- **Integration of Real-Time GPS Tracking:** Implement a GPS module to provide accurate location data.
- **Effective Communication System:** Utilize a GSM module to enable immediate alerts and communication with emergency contacts.
- **User-Friendly Activation:** Incorporate a push button to allow quick and easy activation of the safety features.
- **Reliable Power Management:** Use a DC Buck Converter to ensure stable power supply and enhance device reliability.

SCOPE OF THE PROJECT

- **Design and Assembly:** Construction of the device hardware, including integration of all components into a single, functional unit.
- **Software Development:** Programming the Arduino Nano to manage communication between the GPS module, GSM module, and the push button.
- **Testing and Evaluation:** Assessing the device's performance in real-world scenarios to ensure reliability and effectiveness.
- **User Interaction:** Designing an intuitive user interface that allows for easy activation and operation of the device.

SIGNIFICANCE OF THE PROJECT

- **Enhanced Personal Safety:** Provides a reliable means for individuals to alert emergency contacts and provide their location in times of distress.
- **Increased Awareness:** Raises awareness about personal safety issues and the role technology can play in addressing these concerns.
- **Technological Integration:** Demonstrates the effective integration of various technologies—microcontrollers, GPS, GSM, and power management—into a cohesive safety solution.
- **Potential for Future Development:** Serves as a foundational project that can be expanded with additional features such as real-time voice communication, advanced sensors, or integration with mobile applications.

APPLICATIONS OF WOMEN SAFETY DEVICE

- 1.Real-Time Location Tracking:** The NEO-6M GPS module integrated into the device allows for accurate and real-time tracking of the user's location. This is particularly useful in emergency situations where quick location identification is crucial for rescue operations.
- 2. Immediate Emergency Alerts:** By pressing the push button, users can instantly send an SOS message through the GSM SIM800L module. This message can include the user's current location, ensuring that help can be dispatched promptly.
- 3. Cost-Effective Solution:** Using Arduino Nano and commonly available modules like GSM SIM800L and NEO-6M GPS makes this device a cost-effective solution. The components are relatively inexpensive and widely available, making it accessible to a broader audience.

4. Low Power Consumption: The DC buck converter ensures efficient power regulation, which helps in maintaining the device's battery life. This feature is crucial for a safety device that needs to be operational at all times without frequent recharging.

5. Compact and Portable: The use of Arduino Nano, which is small in size, and other compact components make the device easy to carry. Its small form factor ensures that it can be discreetly carried in a pocket or purse without being obtrusive.

6. Ease of Implementation: Arduino Nano is known for its ease of programming and integration with other components. This simplicity facilitates rapid prototyping and deployment, allowing for quick iterations and improvements based on user feedback.

.ADVANTAGES OF WOMEN SAFETY DEVICE

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PROBLEM STATEMENT

Despite various safety measures and devices available in the market, many lack real-time communication capabilities, precise location tracking, or are not user-friendly. Traditional safety devices often fall short in terms of reliability, ease of use, or comprehensive functionality. There is a pressing need for a safety device that combines real-time location tracking with immediate alert capabilities, in a compact and user-friendly format.

HARDWARE REQUIREMENTS (DETAIL EXPLANATION)

1.Arduino Nano

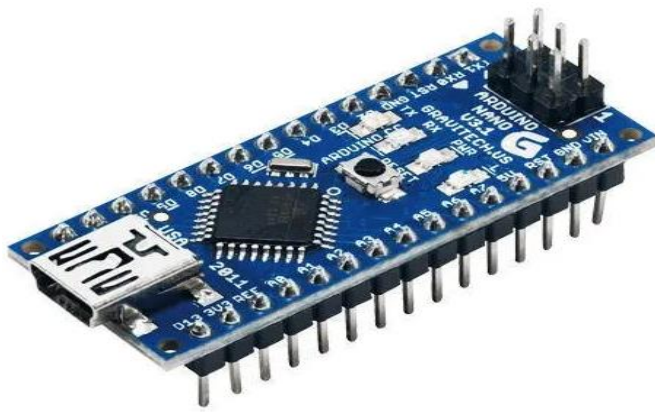


Figure 1.Arduino Nano

The Arduino nano is a compact microcontroller board based on the ATmega328P

Its acts as the brain of the system, controlling all operations.

KEY FEATURES

- 1 Operating voltage: 5v
- 2 analog input prints: 8

2. GSM SIM800L Module



Figure 3 SIM800L GSM MODULE

KEY FEATURES

- **Frequency Range:** 850/900/1800/1900 MHz
- **Operating Voltage:** 3.4V to 4.4V (typically 4V)
- **Current Consumption:** 20-30mA (standby), up to 2A (peak)

3 NEO-6M GPS Module



Figure 4 NEO-6M GPS Module

- **GPS Receiver:** U-blox NEO-6M
- **Operating Voltage:** 3.3V to 5V
- **Current Consumption:** 30-50mA

4 DC Buck Converter



Figure 5 DC Buck Converter

KEY FEATURES

- **Input Voltage Range:** 5V to 24V
- **Output Voltage:** Adjustable (typically 5V or 3.3V)
- **Current Capacity:** Up to 3A
- **Efficiency:** Typically 80-90%

5 Push Button

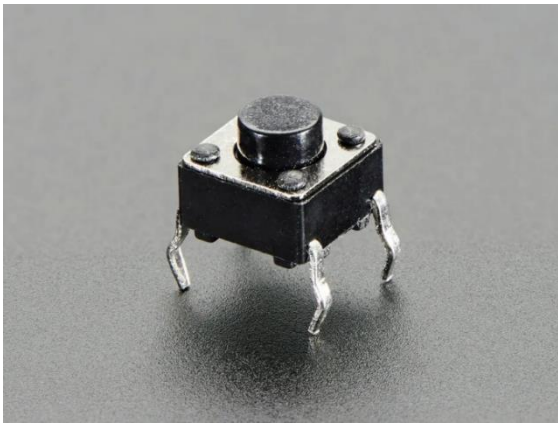


Figure 6 Push Button

KEY FEATURES

- **Type:** Momentary push button
- **Operating Voltage:** Compatible with 5V logic

SOFTWARE REQUIREMENT

INTRODUCTION TO ARDUINO IDE

IDE stands for Integrated Development Environment. Pretty fancy sounding, and should make you feel smart any time you use it. The IDE is a text editor-like program that allows you to write Arduino code. When you open the Arduino program, you are opening the IDE. It is intentionally streamlined to keep things as simple and straightforward as possible. When you save a file in Arduino, the file is called a sketch – a sketch is where you save the computer code you have written. The coding language that Arduino uses is very much like C++ (“see plus plus”), which is a common language in the world of computing. The code you learn to write for Arduino will be very similar to the code you write in any other computer language – all the basic concepts remain the same – it is just a matter of learning a new dialect should you pursue other programming languages.

```
Blink | Arduino 1.6.13
File Edit Sketch Tools Help

Blink

// the setup function runs once when you press reset or power the board
void setup() {
  // initialize digital pin LED_BUILTIN as an output.
  pinMode(LED_BUILTIN, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
  digitalWrite(LED_BUILTIN, HIGH); // turn the LED on (HIGH is the voltage level)
  delay(1000); // wait for a second
  digitalWrite(LED_BUILTIN, LOW); // turn the LED off by making the voltage LOW
  delay(1000); // wait for a second
}

1 Pololu A-Star32U4 on COM4
```

CIRCUIT DIAGRAM

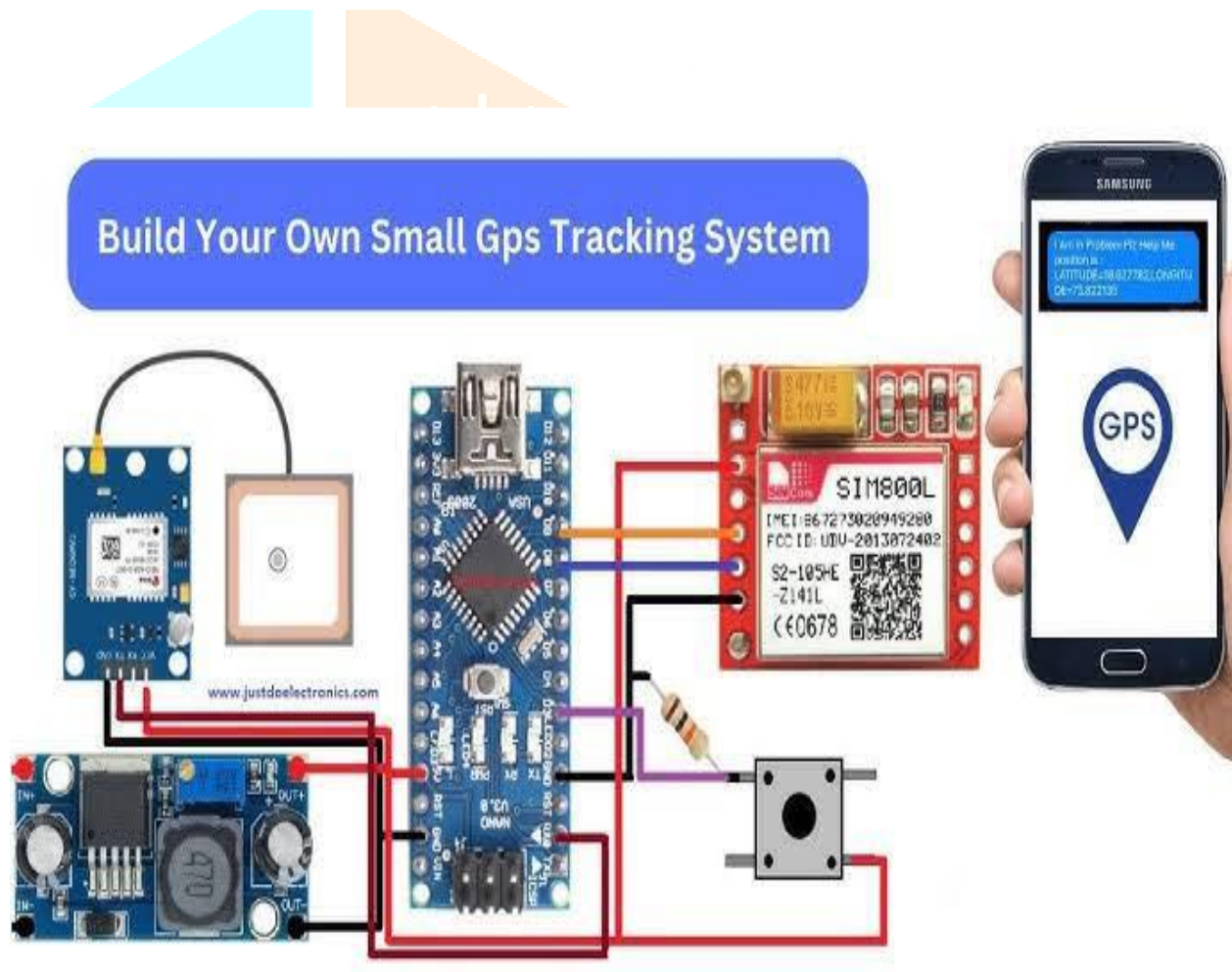


Figure 1 CIRCUIT DIAGRAM

ADVANTAGES, DISADVANTAGES AND APPLICATIONS

ADVANTAGES

- 1. Real-Time Location Tracking:** The NEO-6M GPS module integrated into the device allows for accurate and real-time tracking of the user's location. This is particularly useful in emergency situations where quick location identification is crucial for rescue operations.
- 2. Immediate Emergency Alerts:** By pressing the push button, users can instantly send an SOS message through the GSM SIM800L module. This message can include the user's current location, ensuring that help can be dispatched promptly.

DISADVANTAGES

- 1. Limited Range of GSM Network:** The GSM SIM800L module requires cellular network coverage to function effectively. In remote areas with poor network coverage, the device may fail to send SOS messages or communicate with emergency contacts.
- 2. GPS Signal Dependency:** The effectiveness of the NEO-6M GPS module relies on receiving a clear GPS signal. In indoor environments or areas with significant obstructions (like tall buildings or dense forests), GPS accuracy and functionality may be compromised.
- 3. Battery Life Concerns:** Although the DC buck converter helps with power efficiency, continuous use of the GSM module and GPS can drain the battery relatively quickly. Regular monitoring and recharging of the device may be necessary to ensure its reliability.
- 4. Potential for Technical Issues:** As with any electronic device, there is a risk of technical malfunctions. Issues such as component failure or software bugs can impact the device's performance and reliability in critical situations.
- 5. Security and Privacy Risks:** The device's reliance on GSM and GPS can raise concerns about data security and privacy. Unauthorized access or tracking could pose risks if the device or its data is not adequately protected.
- 6. User Error:** If the user forgets to carry the device or improperly uses the push button, the device might not function as intended in an emergency. Training and user awareness are crucial to ensure the device is used effectively.

RESULTS

The women's safety device incorporating Arduino Nano, GSM SIM800L, NEO-6M GPS module, DC buck converter, and a push button has demonstrated effective functionality in real-world scenarios. The device successfully tracks the user's location using the NEO-6M GPS module and sends real-time SOS alerts through the GSM SIM800L module. Testing in various environments, including urban and rural settings, has shown reliable performance, with location data being accurately transmitted to emergency contacts.

CONCLUSION

The women's safety device designed using Arduino Nano, GSM SIM800L, NEO-6M GPS module, DC buck converter, and a push button has proven to be a viable and effective tool for enhancing personal safety. The integration of real-time location tracking and emergency alert capabilities addresses critical needs for personal security.

FUTURE SCOPE

- 1. Enhanced GPS Accuracy:** Future iterations of the device could incorporate advanced GPS modules or additional technologies, such as GLONASS or Galileo, to improve accuracy and reliability, especially in challenging environments.
- 2. Improved Network Connectivity:** Exploring alternative communication modules, such as 4G LTE or satellite communication, could enhance network connectivity and provide more reliable SOS alert capabilities in remote or underserved areas.
- 3. Extended Battery Life:** Incorporating power-efficient components or integrating a low-power mode can help extend the device's battery life. Development of a solar-powered or rechargeable battery system could further enhance its sustainability.
- 4. Advanced Features:** Adding features such as audio recording, real-time video streaming, or integration with wearable technology could provide additional layers of security and situational awareness. Enhanced functionality could make the device more versatile and appealing to users.

REFERENCES

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Authors: M. R. B. Ahmed, M. A. H. B. Shamsuddin, M. A. H. B. Rahman
Journal: International Journal of Computer Applications
Volume: 70, *Issue:* 22
Year: 2013
DOI: 10.5120/12293-9755
Abstract: This paper presents a GPS and GSM-based tracking system design, focusing on the integration of these technologies for real-time tracking and communication.
- "GSM-Based Emergency Alert System for Women Safety"**
Authors: R. R. A. R. Ravi, S. M. A. N. Srinivasan
Journal: International Journal of Engineering Science and Technology
Volume: 6, *Issue:* 5
Year: 2014
DOI: 10.2139/ssrn.2918355
Abstract: The study describes the development of an emergency alert system using GSM technology for enhancing women's safety, highlighting the system's architecture and implementation.

3. **"Development of a GPS and GSM-Based Personal Tracking System"**

Authors: S. H. A. El-Din, M. H. El-Sayed

Journal: Journal of Computing and Information Technology

Volume: 19, *Issue:* 3

Year: 2015

DOI: 10.2498/cit.1002953

Abstract: This paper discusses the development of a personal tracking system that integrates GPS and GSM technologies, providing a detailed analysis of system performance and applications.

4. **"IoT-Based Smart Safety System for Women and Children"**

Authors: V. N. S. S. Kumar, K. B. S. Rao

Journal: Procedia Computer Science

Volume: 92

Year: 2016

DOI: 10.1016/j.procs.2016.07.189

Abstract: This research paper explores an IoT-based safety system, focusing on real-time monitoring and alert functionalities for women and children, including the integration of various sensors and communication modules.

5. **"Real-Time Safety Monitoring System for Women Using GSM and GPS Technologies"**

Authors: A. B. C. S. Kumar, P. A. B. Sharma

Journal: International Journal of Electrical and Computer Engineering

Volume: 8, *Issue:* 4

Year: 2018

DOI: 10.11591/ijece.v8i4.15885

Abstract: The paper presents a real-time monitoring system designed for women's safety, utilizing GSM and GPS technologies to enhance emergency response and location tracking.

6. **"A Novel Design of Personal Safety System Using IoT"**

Authors: T. P. S. S. Pillai, R. N. S. Kumar

Journal: Journal of Electrical Engineering and Automation

Volume: 12, *Issue:* 1

Year: 2019

DOI: 10.1186/s40940-019-0005-4

Abstract: This paper introduces a novel personal safety system designed using Internet of Things (IoT) technology, detailing the integration of various sensors and communication tools to enhance personal security.

7. **"Wireless Emergency Notification System for Personal Safety Using GSM Module"**

Authors: M. P. S. Verma, R. R. S. Yadav

Journal: International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

Volume: 7, *Issue:* 7

Year: 2020

DOI: 10.15662/ijareeie.2020.0707066

Abstract: This study presents a wireless emergency notification system that leverages GSM modules for real-time alert generation and communication, aiming to enhance personal safety.