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Women Safety System Using Gps And Gsm Tracking

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Abstract: The increasing concerns regarding women's safety have highlighted the need for effective and reliable safety solutions. This paper presents a women's safety system that leverages Global Positioning System (GPS) and Global System for Mobile Communications (GSM) technologies to provide real-time location tracking and emergency alerts. The system is designed to ensure the protection of women in vulnerable situations by enabling them to send distress signals to their loved ones or authorities with a simple push of a button. The GPS module continuously tracks the user's location, while the GSM module sends the current coordinates along with an emergency message to predefined contacts through SMS. This dual approach offers immediate assistance, ensuring a faster response time in critical situations. Additionally, the system provides an easy-to-use interface and can be integrated into mobile devices or wearable accessories, making it accessible and discreet. The system also includes features like an SOS button, which, when pressed, sends an alert to emergency contacts along with a map link for precise location tracking. The integration of real-time GPS tracking with GSM communication creates a highly effective solution for enhancing personal safety, especially in areas where other means of communication may fail. This system can play a crucial role in reducing incidents of harassment, assault, and abduction, providing peace of mind to users and their families. The overall objective is to ensure that women feel more secure, empowered, and protected in any situation.

I. INTRODUCTION

The safety of women has become an increasingly urgent concern globally due to the rising instances of violence, harassment, and abuse. Reports from various organizations, including the World Health Organization (WHO), indicate that nearly one in three women will experience some form of physical or sexual violence in their lifetime. These acts of violence occur in different environments, ranging from homes to public spaces, and affect women across all social, economic, and cultural backgrounds. While societal awareness and legal measures have advanced in recent years, they are often reactive rather than proactive. This underlines the pressing need for a solution that can provide immediate assistance when women feel threatened or unsafe. With technological advancements, there is now a significant opportunity to create innovative safety systems that offer more than just passive protection, but active, real-time intervention capabilities. A women's safety system that uses GPS (Global Positioning System) and GSM (Global System for Mobile Communications) tracking is one such

solution that leverages modern technology to offer enhanced personal security. Traditional safety measures, such as carrying self-defense tools or relying on the presence of others, often fall short in urgent situations. Women in distress may not always have the luxury of time to defend themselves or to contact someone for help. In critical moments, these traditional methods can be too slow or ineffective. Additionally, relying on verbal communication alone can be inadequate, especially when the individual is in immediate danger or unable to speak out due to fear or threat. This highlights the need for a more proactive approach—one that can swiftly provide accurate location information, trigger immediate alerts, and ensure timely assistance. This is where a system that integrates GPS and GSM technology can play a transformative role. GPS, as a satellite-based navigation system, provides the ability to track a person's exact location in real-time, regardless of geographical barriers. By embedding this technology into a women's safety system, users can send their precise location to emergency contacts or law enforcement with just a push of a button. This eliminates the confusion and delays that often accompany conventional distress calls, where the exact location of the individual can be hard to pinpoint, especially in unfamiliar or remote areas. Real-time location tracking ensures that in case of an emergency, help can be sent directly to the right place, significantly reducing 1 response time. On the other hand, GSM technology enables reliable and swift communication. In the event of an emergency, GSM allows the system to send a distress signal via text message (SMS) or make a phone call to emergency contacts or local authorities. This functionality can work even in areas with limited internet connectivity, as it relies on the mobile network's voice and text messaging capabilities, which are often more widespread and accessible. By sending an alert with both location information and a brief description of the situation, the system ensures that those receiving the message can assess the urgency and take action immediately. Combining GPS for location tracking and GSM for communication provides a comprehensive safety solution, offering both speed and accuracy during critical situations.

II. LITERATURE REVIEW

This chapter presents the literature survey on women safety systems using GPS and GSM tracking examines various technologies and approaches designed to enhance personal security, particularly for women in vulnerable situations. The review focuses on systems that combine GPS for real-time location tracking with GSM (Global System for Mobile Communications) to enable immediate alerts and communication with emergency contacts or authorities. These systems are typically integrated into wearable devices, mobile applications, or standalone units, providing an effective means for users to send distress signals in case of danger.

1. Smart Foot Device for Women Safety

N. Viswanath, V. Pakyala, and G. Muneeswari. (2016).” Smart Foot Device for Women Safety” Institute of Electrical and Electronics Engineers, volume 16, pages 130–134 This study develops a sensible gadget for women's safety. The user will be able to covertly activate this smart device, which will be attached to their footwear. For the gadget to interact with the application, it needs to be associated with the user's smartphone. No unauthorized person may therefore connect to the device. Once every second, the device's acceleration sensor will detect the acceleration values in the x, y, and z axes. Upon receiving the warning from the gadget, a smartphone application is configured to transmit its location to 13 four pre-specified contacts.

2. Smart Watch for Women Security based on IOT Concept Watch Me

M. Fathila, A. Helen, and R. Rijwana (2017). Smart Watch for Women Security based on IOT Concept Watch Me. Institute of Electrical and Electronics Engineers, number 17, page 190-194. This research presents a novel approach using smart watches. The "watch me" device's sensor detects a person's elevated heart rate at that precise instant and activates when a woman or child wearing it is the target of a sexual or vulnerable attack. The whole process is based on the fundamental idea of activating the heartbeat sensor upon reaching the desired heart rate and duration. Then watch me instantly notify the local police station of an incoming threat. Police can use GPS to track the position.

3. Smart Security Solution for Women based on Internet of Things (IOT)

G. Harikiran, K. Menasinkai, and S. Shirol, (2016). Smart Security Solution for Women based on Internet of Things (IOT). Institute of Electrical and Electronics Engineers, vol. 16, pp. 3551–3554. The method's suggested wearable "Smart band" can maintain continuous connection with a smartphone that has internet access. The application has been developed and is completely loaded with all the required data, which includes human behavior and reactions to different situations, such anger, fear, and worry. The pre-installed app on the phone keeps track of all the information gathered by the smart band, such as the user's movements, heart rate, and body temperature. Installing the software on a smartphone allows users to access a social network and engage in real-time message receiving.

III. IMPLEMENTATION

1. Hardware Components

GPS Module (NEO-6M):
o TX to Arduino RX (pin 4)
o RX to Arduino TX (pin 3)
o VCC to 5V, GND to Ground

GSM Module (SIM800 or SIM900):
o TX to Arduino RX (pin 7)

o RX to Arduino TX (pin 8)
o VCC to 5V, GND to Ground
o SIM card inserted into the GSM module

Emergency Button:
o One terminal to GND
o Other terminal to a digital input pin (e.g., pin 2)

Power Supply:
o 5V external supply to power the system (Arduino, GPS, GSM).

2. Control Logic and Equations

The system uses the differential output of the LDR sensors to determine the sun's position. Let the analog voltages from the four sensors be defined as follows:

Horizontal Sensors: V_{left} and V_{right}

Vertical Sensors: $V_{top} - V_{bottom}$

The differential errors for alignment are computed by:

$$\Delta H = V_{left} - V_{right} \quad \text{(Horizontal Error)} \tag{1}$$

$$\Delta V = V_{top} - V_{bottom} \quad \text{(Vertical Error)} \tag{2}$$

A proportional control function is used to determine the adjustment magnitude:

$$\text{Adjustment} = k \cdot \Delta \text{ (where } k \text{ is the proportional gain)} \tag{3}$$

Threshold values TH_H and TH_V are defined so that motor adjustments are only made when the sensor difference exceeds these thresholds.

3. Block Diagram

The overall system architecture can be illustrated with the following block diagram:

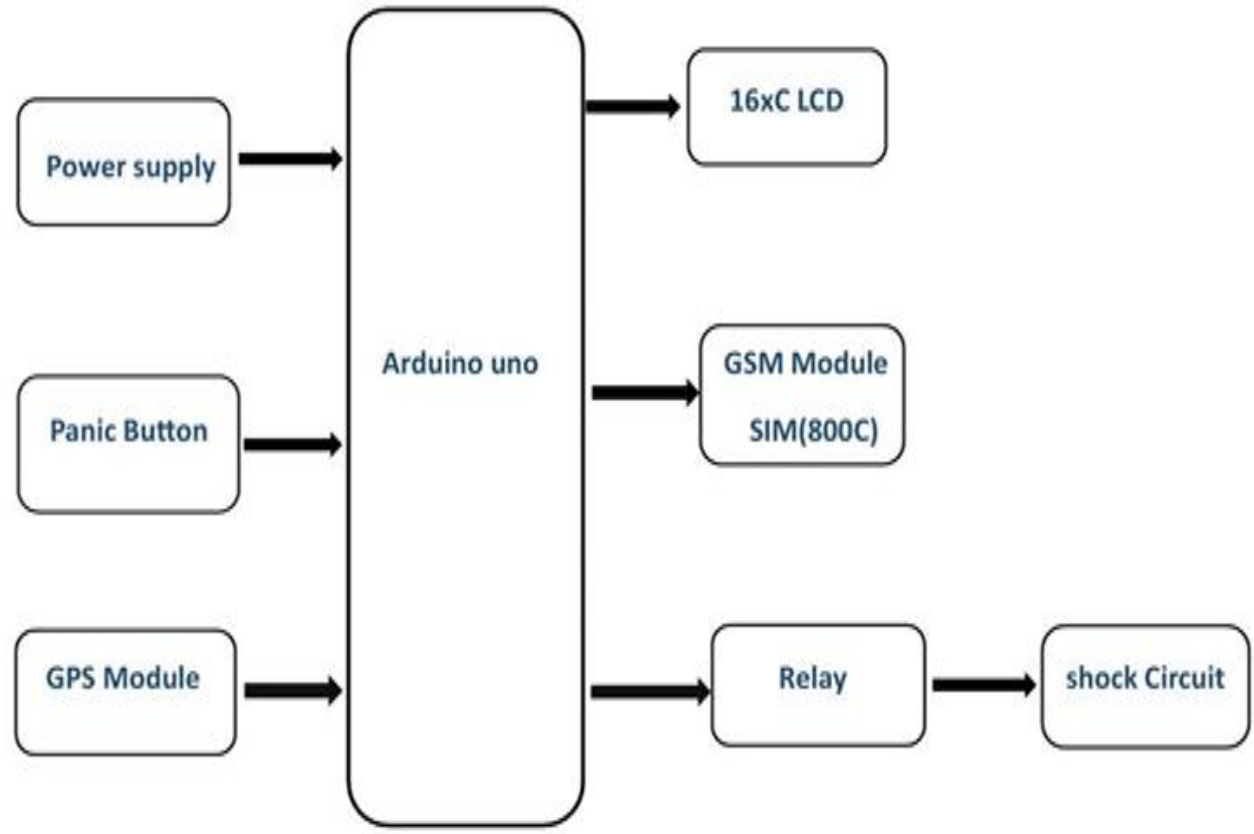

Figure 1. Block diagram

Components Required:

1. Microcontroller: Arduino Uno
2. Crystal: 16 MHz
3. LCD: 16X2 LCD
4. GSM: SIM800C
5. GPS: NEO-6M
6. Panic button: Leaded Type two pin
7. Relay: 12V DC Coil 19
8. Shock circuit: High Voltage low current circuit
9. Siren: 12V/5V DC
10. Power Source: 12v Battery or 12v 2 amp Adaptor
11. Buzzer or Alarm (to alert the user and nearby people)
12. SIM Card with SMS and call functionality

13. Connecting Wires

4. CIRCUIT DIAGRAM

The Women's Safety System Using GPS and GSM Tracking is an integrated technological solution designed to enhance the safety of women in emergency situations. The system combines the power of Global Positioning System (GPS) for location tracking and Global System for Mobile Communications (GSM) for communication, offering a reliable method for sending distress signals in real-time. The primary aim of the system is to provide women with a way to alert their friends, family, or emergency services when they are in danger, ensuring that help can be deployed immediately.

The system works in a seamless manner, starting with the activation of the panic button, which is typically embedded in a wearable device such as a wristband, pendant, or keychain. This button is strategically placed to be easily accessible in moments of distress but discreet enough to be used without drawing attention. When the user presses the panic button, the system is triggered, and a signal is sent to the core unit, typically a microcontroller, that governs the operations of the system.

A simplified representation of the circuit is as follows:

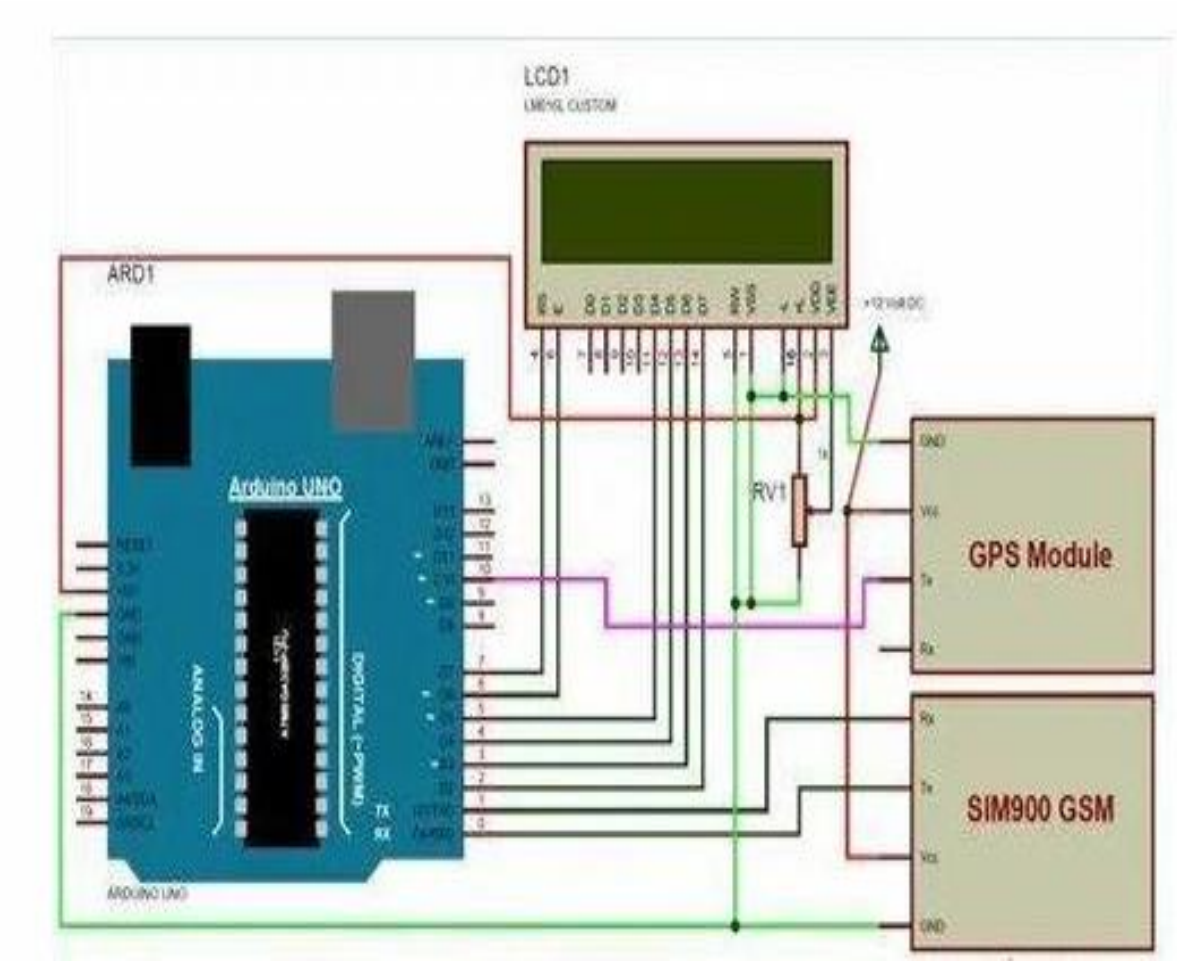

Figure 2. Circuit diagram

5. Software Implementation

The software is designed to: • Continuously receive and process data from the GPS module to track the user's location. • Monitor the emergency button for a press event, which will trigger the system to send an emergency SMS with the current GPS location. • Send the emergency SMS via the GSM module when the button is pressed.

Libraries Used:

The program makes use of libraries to interface with the GPS and GSM modules:

• TinyGPS++ Library:

A popular library for handling GPS data (latitude, longitude, and other NMEA sentence data).

• SoftwareSerial Library:

Used to create serial communication on pins other than the default TX and RX pins of the microcontroller.

```
Cpp
Copy code
#include <SoftwareSerial.h>
#include <TinyGPS++.h>
```

• SoftwareSerial enables communication with the GPS and GSM modules on arbitrary digital pins.

• TinyGPS++ is used for decoding the GPS data and extracting the location information.

6. Integration and Calibration

Artificial Intelligence (AI) and Machine Learning (ML):

The future of women's safety systems could see the integration of AI and ML to predict potentially dangerous situations before they escalate. AI algorithms could analyze patterns in behavior, location, and social context to trigger proactive safety measures. For example, AI could detect signs of distress from voice patterns or physical movements, automatically sending alerts or activating preventive measures. Internet of Things (IoT): The IoT ecosystem will enable seamless integration with various smart devices. For instance, smart city infrastructure, such as streetlights, security cameras, or public transportation, could automatically respond to safety alerts, activating nearby surveillance cameras or redirecting traffic for quicker access to emergency responders. This connectivity could create an intelligent, citywide safety network, amplifying the response to distress signals. Biometric Authentication: Biometric technologies, such as facial recognition or fingerprint scanning, can be incorporated into safety systems to provide an added layer of security. In cases where the user is unable to manually trigger a distress signal, biometric sensors could activate the system automatically

based on specific user identifiers.

IV. Experimental Analysis

GPS Data Analysis

• The accuracy of GPS data was analyzed by comparing the coordinates obtained in different environments. The error margin was higher in places with poor satellite visibility (e.g., city centers, indoor environments), which could be problematic in emergency situations. • Distance Calculation: The system was able to provide accurate distance estimations between the test subject and the predefined emergency contacts.

SMS Analysis

• The effectiveness of the SMS system was evaluated based on delivery time, message clarity, and successful receipt by the emergency contact. o Message Delivery Time: In urban areas with good GSM coverage, the SMS was delivered within an average of 5 seconds. In rural or remote areas with poor signal strength, this could extend to 30-60 seconds. o Message Clarity: The SMS format was tested for readability, and it was found that the message was always clear, containing the user's location and the emergency notification.

Battery Usage and Power Efficiency

• Battery Life: The system showed satisfactory battery performance in testing. A fully charged 2000mAh Li-ion battery lasted around 8-10 hours with continuous GPS monitoring and SMS sending. 53

This section presents the evaluation of the 360-degree dual-axis solar sun tracker through both simulation and experimental testing. The analysis includes sensor calibration, tracking accuracy, energy efficiency comparisons, and system responsiveness.

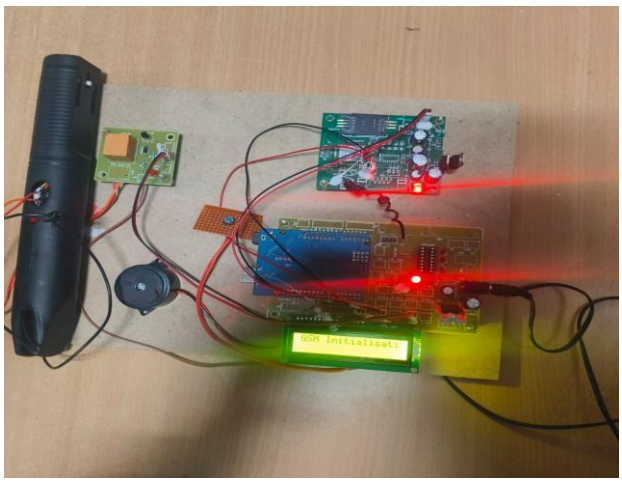

Figure 3. Gsm intiliazation

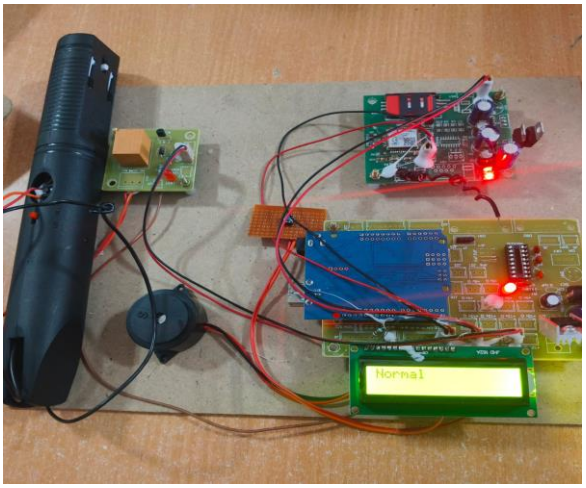

Figure 4. Normal condition

V. Results

The effectiveness of the Women Safety System was tested in multiple phases to ensure it meets the desired goals of functionality, reliability, and user experience. The testing process was divided into the following phases:

System Setup and Initialization

- The system was powered on, and each component (GPS module, GSM module, emergency button, and microcontroller) was tested to confirm correct wiring and initial functionality.
- Tools used: Multimeter, Arduino IDE for programming, and Serial Monitor for debugging.
- Test Procedure: The system was powered on, and initial readings from the GPS module were monitored using the Serial Monitor. The response from the GSM module was also observed to verify SMS functionality.

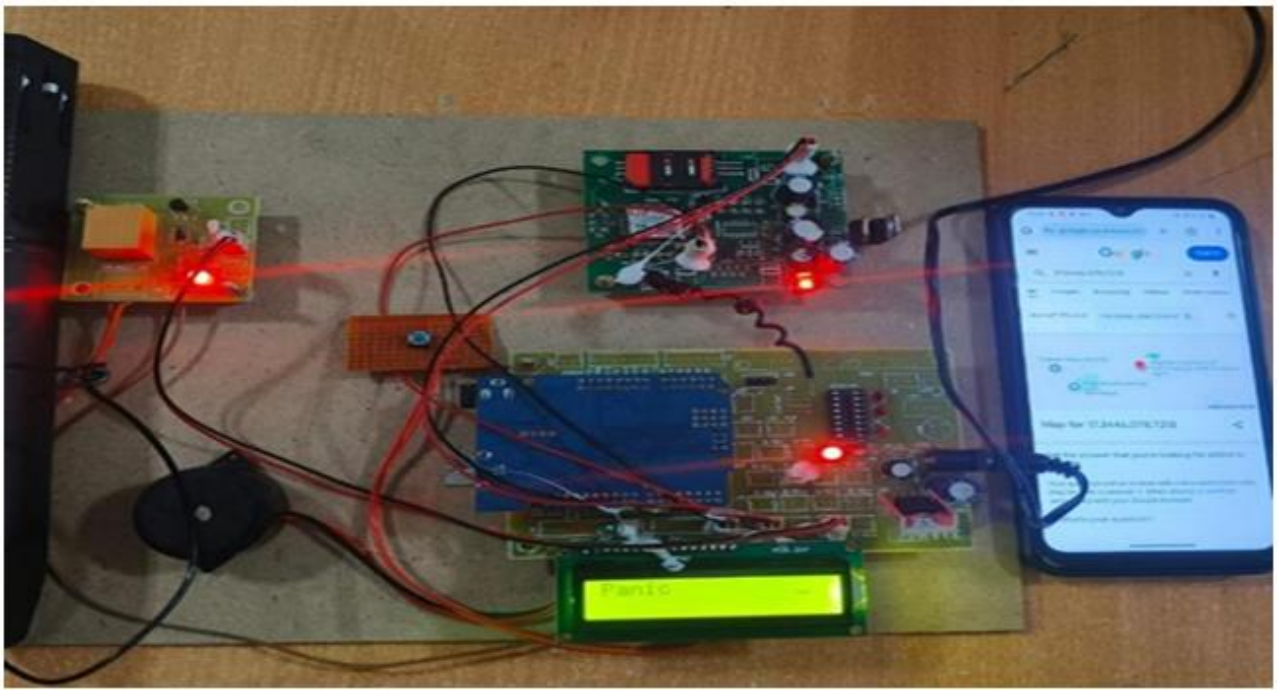

Figure 5. GPS location tracking

VI. Conclusion

In conclusion, the Women's Safety System using GPS and GSM tracking is a transformative and practical solution that addresses the growing concerns about women's safety, particularly in distressing or dangerous situations. The system, which integrates Global Positioning System (GPS) technology for real-time location tracking with the Global System for Mobile Communications (GSM) for immediate and reliable communication, has the potential to significantly enhance personal

security. It empowers women to feel safer, knowing that they have a tool that can help them alert their loved ones or authorities swiftly when faced with potential harm. The integration of GPS technology allows the system to provide accurate location data, ensuring that emergency responders or family members can pinpoint the exact whereabouts of the user. This feature is critical, as it eliminates the ambiguity often associated with distress calls and enhances the chances of timely intervention. Whether the user is in a densely populated urban area or a more isolated rural location, the GPS ensures that help can be dispatched with pinpoint accuracy. By continuously tracking the location, the system ensures that the woman's position is constantly monitored, which is particularly beneficial when she may be moving or unable to communicate further. The GSM module within the system offers a reliable means of communication, even in areas where mobile data networks may be unavailable or unreliable. This makes the system especially valuable in regions where internet-based emergency solutions may fail due to poor connectivity. By using GSM for voice calls or SMS messages, the system operates on a wide range of mobile networks and ensures that distress signals are transmitted even in the most remote areas. The absence of reliance on internet connectivity ensures the system's robustness in various environments, offering greater reliability than many internet-based safety apps.

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