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Women Security System using GSM, GPS and Voice Command

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Abstract - Women security continues to be a major concern on a global scale. The World Health Organisation (WHO) reports that one in three women worldwide are victims of physical or sexual abuse, usually at the hands of a family member.The Women Security System is a cutting-edge technology created to improve women's safety and security under trying circumstances. It uses GSM, GPS, and voice command. The protection of women is becoming a greater concern, particularly in remote or vulnerable places, where standard security measures frequently fail to deliver prompt aid. By combining voice command, GPS, and GSM (Global System for Mobile Communications) technology into a small, user-friendly security system, this project seeks to solve this problem.The system's main goal is to give women a quick, dependable, and easy option to ask for assistance when they feel endangered. It provides a useful solution for everyday usage and is easy to carry thanks to its user-friendly and portable design.

Keywords - Women Security System, Global System for Mobile Communications, Global Positioning System, Voice Command, user-friendly, quick, dependable, endangered, portable design.

1.INTRODUCTION

In order for women and girls to live, work, and engage in society without fear of violence, harassment, or discrimination, women's security is an essential component of social progress. It includes digital security and physical protection. In past years, there have been many laws implemeted to ensure that a woman is safe in public. Other than laws, woman were also advised to carry pepperspraysin order to protect themselves from danger. Practically pepperspraysare not reliable as they get completed and are not available in every departmental store.

The quick development of technology presents fresh chances to enhance individual security. Many restrictions can be overcomed by combining Voice Command, Global Positioning System (GPS), and Global System for Mobile Communications (GSM) technologies. Using GSM technology, emergency services or pre-established contacts can receive real-time distress signals via text message or phone call. Responders can locate the person more rapidly and precisely thanks to real-time location tracking made possible by GPS technology. A hands-free solution is provided by the voice command feature, which guarantees that the system may be engaged without the user having to physically touch the device.

The understanding that women encounter a variety of security threats that are not always manageable with traditional approaches is what inspired the creation of this women's security system. Women should feel empowered to respond swiftly and covertly in an emergency, whether they are travelling alone, in a public setting, or at home. Designing a system that combines various technologies in an easy, economical, and efficient way is a crucial component of our project. In circumstances where conventional procedures would not work, it seeks to empower women to express their grief and share their location without resorting to physical violence.

2. THEORETICAL IMPLEMENTATION

Figure 1 shows the block diagram lists the procedure followed in the women security system and how SMS is sent when any danger occurs:

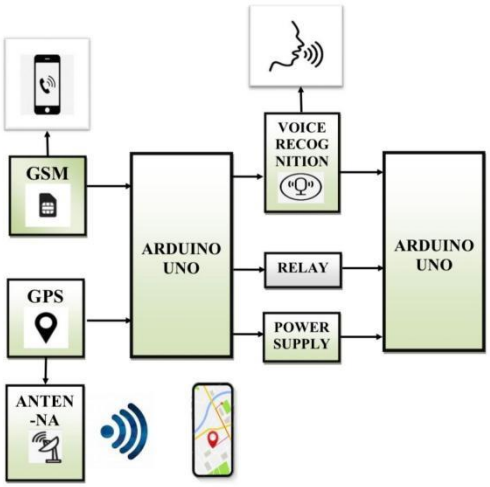

FIGURE 1 Block Diagram of Women Security System

The implementation of the Women Security System begins with the selection of core components, such as the GSM module for communication, GPS module for location tracking, and a microphone and speaker for voice recognition. The central processing unit that connects all the parts is the microcontroller, usually an Arduino or Raspberry Pi. Assembling the hardware for the system entails integrating the voice recognition system and attaching the GPS and GSM modules to the microcontroller. Following hardware assembly, software is created to guarantee smooth communication between all modules, enabling the system to process voice commands for emergency activation, transmit distress messages, and collect GPS positions.

Maintaining GSM connectivity in remote places and guaranteeing dependable GPS signal gathering in urban areas presented challenges during the assembling process. By strategically positioning the GPS antenna and modifying the software to retry message broadcasts in the event that the first attempt failed, these problems were resolved. After the components were successfully put together, the system was ready for testing and could be carried around.

Numerous obstacles that needed careful consideration and problem-solving arose during the installation and testing stages. Maintaining GPS accuracy in indoor or urban settings where satellite signals could be interfered with was one of the biggest concerns. In these situations, the system was made more efficient by adjusting the location of the GPS antenna and enhancing the software to deal with weak or absent signals. To guarantee that some kind of position data was always sent, the system was set up to send in the distress message using the last known coordinates in case the GPS module was unable to receive a signal.

The voice recognition system has to be taught to deal with different speech patterns and noisy surroundings. At first, the system was having trouble identifying emergency commands apart from background noise. In order to address this problem, we included sophisticated speech processing techniques that enhanced the precision of voice command detection by eliminating superfluous noise. To make the system more user-friendly for people from a variety of backgrounds, it was further improved to recognise various accents and speaking speeds.

3.METHODOLOGY

The methodology of this project involves the design, development, and testing of a Women Security System that integrates GSM, GPS, and Voice Command technologies. It includes the following components:

1. System Design and Architecture: The creation of the hardware and software architecture required to combine voice command capabilities, GPS functionality, and GSM functionality into a single small device.

2. Prototyping: The development of a functional prototype that can be put to the test in actual situations. The system will be further improved and optimised using this prototype as the foundation.

3. Testing and Evaluation: To make sure it functions well in a variety of settings, the system will be put through extensive testing in a range of scenarios and environments. System dependability, location tracking precision, voice command efficacy, and user-friendliness will all be evaluated.

4. User Interface Development: The user interface will be created so that the user can interact with the system, manage emergency contacts, and modify settings. The user interface will be straightforward and intuitive.

5. Cost-Effective Solution: Because of its cost-effective design, the device will be available to a wide spectrum of women, particularly those who live in rural or lower-income areas.

6. Limitations: The system will be dependent on GPS and GSM networks, which might not perform well in isolated or rural locations with inadequate network coverage. The system's usefulness will be constrained by the device's physical dimensions and battery life, despite its tiny form.

Battery Life: One limiting aspect will be how long the system can operate continuously on a single charge.

Voice Recognition Accuracy: The voice command system's accuracy may be impacted by background noise or speech obstructions.

Network Coverage: The GPS and GSM systems depend on cellular network coverage, which isn't always present.

4. TECHNOLOGICAL COMPONENTS

4.1.GSM TECHNOLOGY: The Women Security System relies heavily on GSM (Global System for Mobile Communications) technology, which offers a reliable way to communicate in an emergency. Because GSM uses mobile networks, it may transmit and receive data over great distances, including position data and distress signals. Even in remote locations with inadequate infrastructure, the system uses GSM modules to
connect to authorities or emergency contacts, guaranteeing that alerts are issued immediately in an emergency.

The security system's GSM module functions by interacting with the microcontroller, which handles user input like button presses and voice commands. A predefined distress message is sent by the GSM module to a list of emergency contacts by voice call or SMS when the system is turned on. This guarantees prompt assistance, irrespective of the user's location. In places where Wi-Fi or mobile data may not be available, the ability to send messages and conduct calls without requiring an internet connection is very crucial.

4.2.GPS TECHNOLOGY: The GPS (Global Positioning System) plays a pivotal role in ensuring the accuracy and effectiveness of the Women Security System. At least four satellites are used in the GPS system's operation to send signals to the security system's GPS receiver. The position of the satellites and the time the signal was sent are both contained in these signals. The GPS module determines the user's distance from each satellite by measuring the time it takes for the signal to travel from the satellite to the receiver. With this information, the GPS system uses a technique known as trilateration to determine the user's precise location on the surface of the Earth.The GPS coordinates (latitude and longitude) are transmitted to emergency contacts through the GSM module after the position has been established. In order to guarantee that warnings are transmitted and contain precise position information, GPS and GSM technology must be integrated. Emergency personnel can locate the user more quickly thanks to the accurate position data, which eliminates the need for verbal descriptions or ambiguous instructions.

4.3.VOICE COMMAND TECHNOLOGY: With the use of this technology, users may voice orders to activate the system, convey distress signals, and connect with emergency contacts without having to physically touch the gadget. To ensure that users can control the system hands-free, especially in stressful or dangerous situations where they might not be able to manually touch buttons, voice recognition modules or software are essential.The technology is set up to identify particular vocal commands that cause different things to happen. Commands like "Help," "Emergency," or "Alert," for instance, can immediately trigger the distress signal, causing the system to notify emergency contacts via phone or SMS. These commands are processed by the speech

recognition software of the system, which examines sound patterns and compares them to pre-programmed instructions kept in the microcontroller of the device. The system responds instantly to commands, such as contacting an emergency hotline or providing location information to emergency contacts.

5. HARDWARE COMPONENTS

5.1.ARDUINO UNO: One of the most widely used microcontroller boards for embedded systems applications and prototyping is the Arduino Uno, which is utilised by engineers, students, and hobbyists. It offers a basic foundation for creating interactive electronic projects and is based on the ATmega328P microcontroller.

Fig 1: Arduino UNO

5.2.GSM MODULE: A GSM Module is a gadget that uses the Global System for Mobile Communications (GSM) protocol to enable connection with a mobile network. It has the ability to make voice calls, send and receive SMS messages, and use GPRS to connect to the internet.

Fig 2: GSM Module

5.3.GPS MODULE: A GPS module is a device that uses the Global Positioning System (GPS) to send location data to a microcontroller or embedded system. It can give altitude, speed, and time information in addition to tracking geographic position (latitude, longitude). Vehicle tracking, navigation systems, and numerous more applications requiring exact location data make extensive use of GPS devices.

Fig 3: GPS Module

5.4.Voice Command Module: An apparatus that enables a system (usually an embedded system or microcontroller) to recognise and process speech commands is called a voice command module.Voice-controlled applications including robotics, voice-based automation systems, and smart home appliances frequently employ this module.

Fig 4: Voice Command Module

5.5: Relay: Relays are electrically powered switches that let you use a low-power signal to control a high-power circuit. It is an electromagnetic device that regulates the flow of electricity in a circuit by using an electromagnetic to operate a series of contacts, either open or closed. Relays are frequently used to safely and effectively switch high-current or high-voltage loads in automation, control systems, and electronic equipment.

Fig 5: Relay

ARDUINO CODE

```
#include <SoftwareSerial.h>

// Define GSM module pins
SoftwareSerial gsmSerial(7, 8);  // RX, TX for GSM
SoftwareSerial gpsSerial(4, 3);  // RX, TX for GPS

// Define pin connections
#define BUTTON_PIN 2
#define RELAY_PIN 5

void setup() {
  Serial.begin(9600);
  gsmSerial.begin(9600);
  gpsSerial.begin(9600);

  pinMode(BUTTON_PIN, INPUT_PULLUP);
  pinMode(RELAY_PIN, OUTPUT);

  Serial.println("Women Security System Initialized");
}

void loop() {
  if (digitalRead(BUTTON_PIN) == LOW) {
    Serial.println("Emergency Button Pressed!");
    digitalWrite(RELAY_PIN, HIGH);  // Activate relay (alarm or buzzer)
    delay(5000);
    digitalWrite(RELAY_PIN, LOW);

    String location = getGPSLocation();
    sendEmergencyAlert(location);

    delay(5000);  // Prevent multiple triggers in a short time
  }
}

String getGPSLocation() {
  String latitude = "NA", longitude = "NA";
  while (gpsSerial.available()) {
    String gpsData = gpsSerial.readStringUntil('\n');
    if (gpsData.startsWith("$GPRMC")) {
      int latIndex = gpsData.indexOf(",N,");
      int lonIndex = gpsData.indexOf(",E,");
      if (latIndex > 0 && lonIndex > 0) {
        latitude = gpsData.substring(latIndex - 9, latIndex);
        longitude = gpsData.substring(lonIndex - 10, lonIndex);
      }
      break;
    }
  }
  return "Latitude: " + latitude + ", Longitude: " + longitude;
}

void sendEmergencyAlert(String location) {
  gsmSerial.println("AT+CMGF=1");  // Set SMS mode
  delay(1000);
```

```
gsmSerial.println("AT+CMGS=\"+91XXXXXXXX
XX\"");  // Replace with guardian's number
   delay(1000);
   gsmSerial.print("Emergency Alert! Help
Needed!\nLocation: " + location);
   delay(1000);
   gsmSerial.write(26);  // Send SMS
   Serial.println("Emergency Message Sent!");
}
```

6. WORKING

The working of the Women Security System is based on the interaction between three primary components: The GSM module, the GPS module, and the voice command system. When activated, the system performs the following steps:

1.Voice Command Activation:
The user can issue a predefined voice command like "Help," **"**Emergency," or "Alert" to activate the system. The voice recognition module processes the command, which triggers the emergency response features.

2.GPS Location Tracking: Upon activation, the GPS module immediately begins tracking the user's real-time location. This data, which includes the precise latitude and longitude, is then transmitted along with the distress signal.

3. GSM Communication: After the voice command is recognized and the location is determined, the GSM module sends a distress message containing the user's GPS coordinates. This message is sent to pre-configured emergency contacts, such as family members, friends, or even local authorities.

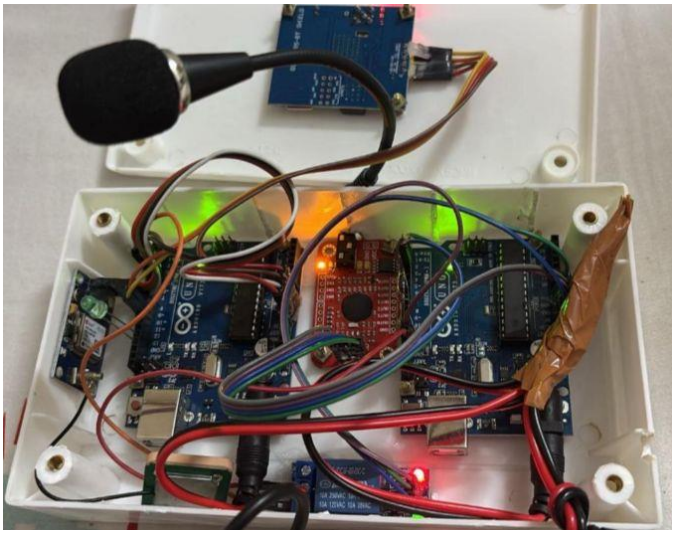

Fig : Working Model of Women Security System using GSM, GPS and Voice Command

7. RESULTS

The Women Security System using GSM, GPS and Voice Command is very feasible and it can be used very easily when someone is in danger. When the voice is detected, it sends an emergency message to the contacts which are saved by using GSM and GPS.

8. CONCLUSION:

The Women Security System, which makes use of voice command, GPS, and GSM technology, is a creative and practical way to improve personal safety. Through the integration of these three technologies, the system guarantees that women experiencing distress can effortlessly notify emergency contacts of their position and circumstances without requiring face-to-face communication. The system is perfect for emergency situations since the GSM module enables quick communication via SMS or phone calls, the GPS module guarantees precise location monitoring, and the voice command feature enables hands-free system activation. This set of technologies maintains a high degree of security and responsiveness while offering a smooth user experience.

The system's ability to offer real-time support in emergency situations has been confirmed by its successful deployment and testing. Because of its user-friendly design, the user can activate the device with basic vocal commands even when they are in a panic. This system is a dependable instrument that gives any lady in crisis a sense of security and

reassurance thanks to the GPS module's precise position monitoring and the GSM module's dependable communication capabilities.

The system is the perfect answer for personal safety because of its portability and simplicity. Its capacity to provide location data and real-time notifications gives users comfort in knowing that assistance will be promptly sent when they need it. With more technological developments, this system might develop into a more complete safety solution that incorporates more sensors or even AI-based functions for automated emergency detection. As a result, the system may be even more proactive in protecting people in different emergency scenarios.

To sum up, the Women Security System is a major advancement in personal safety technology. For ladies in need of emergency assistance, the voice command, GPS, and GSM features provide a dependable and user-friendly option. The current system offers significant value and has the potential to develop into an even more advanced instrument to guarantee women's safety in the future, even though there is room for development.

9. FUTURESCOPE:

Although the GPS module performs best in open areas, problems may arise in cities or places with limited satellite visibility. Future versions of the system might address this by including extra location-tracking technologies, like Bluetooth-based positioning or Wi-Fi, which could provide more precise coordinates in areas with weak GPS signals. Furthermore, including indoor positioning systems could guarantee accurate tracking in inside environments like malls, public transportation, or structures with restricted access to GPS satellites.The voice recognition feature is another area that may use improvement.Even though the existing system can recognise emergency commands with accuracy in a variety of scenarios, its dependability will be greatly increased if it can operate in crowded or noisy locations. In order to improve the system's ability to recognise voice instructions over background noise, future iterations may employ sophisticated machine learning techniques for noise filtering. Additionally, enhancing the system's support for additional languages and its capacity to identify various dialects and accents will increase its accessibility and inclusivity for a larger audience.

10. REFERENCES

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