GOVERNMENT ENGINEERING COLLEGE, SHEOHAR

Project Report
On
GPS & GSM Based Women Tracking System Using Arduino

A report submitted in partial fulfilment of the requirements for the Award of Degree of

BACHELOR OF TECHNOLOGY

In

Electronics & Communication Engineering Department

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DECLARATION OF CERTIFICATE

This is to certify that the work presented in the thesis entitled. "**GPS AND GSM BASED WOMEN TRACKING SYSTEM USING ARDUINO**" which is being submitted by ……. in partial fulfillment of the requirement for the award of Degree of **Bachelor of Technology in Electronics and Communication Engineering** to Government Engineering College, Sheohar is an authentic work carried out under my supervision and guidance.

To the best of my knowledge, the content of this project report does not form a basis for the award of any previous Degree to anyone else.

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CERTIFICATE OF APPROVAL

The forgoing thesis entitled "**GPS AND GSM BASED WOMEN TRACKING SYSTEM USING ARDUINO"**, is hereby approved as a creditable study of research topic and has been presented in
satisfactory manner to warrant its acceptance as prerequisite to the degree for which it has been submitted.

It is understood that by this approval, the undersigned do not necessarily endorse any conclusion drawn or opinion expressed therein, but approve the project for the purpose for which it is submitted.

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ACKNOWLEDGEMENT

We, the members of project titled “**GPS & GSM Based Women Tracking System Using Arduino**”, would like to extend our deepest gratitude to everyone who contributed to the success of this project. This journey has been one of collaboration, learning, and mutual support, culminating in a project that we are proud to present.

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Lastly, we extend our gratitude to each other, the members of this project group. This project was a collaborative effort that required dedication, compromise, and teamwork. We have grown individually and collectively through this experience, gaining not just knowledge but also friendships that we treasure.

This project report is not only a reflection of our hard work but also a testament to the support and guidance we received from all those mentioned above. Thank you for making this journey memorable and our project a success.

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ABSTRACT

In today’s world, women safety has become a major issue as Women's crime is on the rise. Due to an increase in crime, employed women are feeling unsafe as they cannot step out of their house at any given time due to the fear of physical abuse and violence. Now these can be brought to an end with the help of a women safety device. This study suggests a quick-response method to assist women in times of need. With all the technology available to us in recent times, it's not hard to build a safety device for women which will not only generate an emergency alarm but also send a message to your friends, family, or concerned person. When someone is going to harass a woman, she can press the button and her current location information is transmitted as an SMS alert to the pre-defined numbers based on latitude and longitude. The controller used is ARDUNIO UNO R3. It is interfaced with a push button, a GPS module, a GSM modem and an LCD Display (16×2) and a LED.

When the switch is pressed, the controller uses a GSM modem to transfer the current location data from the GPS module to the predetermined phone number. Then immediately the SMS will be sent to the person with location using GPS which can be traced from the google maps. This device will prove to be very useful in saving lives as well as preventing atrocities against women. The main advantage of this system is that the user does not require a Smartphone unlike other applications that have been developed earlier. The use of these project components ensures accuracy which makes it reliable. The system provides with all the features which will leave no stone unturned to help the victim in any kind of emergency situations. In many situations the aid of safety device that will inform the victim's family members may help women feel safer, confident and reduce the chances of harassment.

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CHAPTER – 1

1. INTRODUCTION OF THE PROJECT

A GPS and GSM based women tracking system device is designed to provide real-time location tracking and communication capabilities for women's safety. It utilizes GPS technology to determine the device's location and GSM (Global System for Mobile Communications) technology to transmit this information to a designated recipient, such as family members or authorities, via text messages or through a dedicated app. This device offers peace of mind by allowing users to track their whereabouts and send distress signals in emergency situations, enhancing personal safety and security.

1.1. OBJECTIVE OF THE PROJECT

The objective of using a GPS and GSM-based women tracking system is to enhance safety and security by enabling real-time monitoring and location tracking of women, especially in situations where they may be at risk or vulnerable. Here are some specific objectives.

- Personal Safety.
- Location Tracking.
- Emergency Response.
- Deterrence.
- Autonomy.
- Preventive Measures.

1.2. PRINCIPLE OF THE PROJECT

The principle behind a GPS and GSM-based women tracking system using Arduino is to leverage GPS technology to determine the device's location and GSM (or cellular) technology to transmit that location information to a designated recipient. Here's a breakdown:

1. **GPS Principle**: Global Positioning System (GPS) satellites continuously broadcast signals containing precise time and location information. A GPS receiver, such as the one connected to the Arduino, picks up these signals and calculates its own position based on the time it took for the signals to arrive from multiple satellites.

2. **GSM Principle**: The GSM module allows the device to communicate with the cellular network. It can send SMS messages or use data connections to transmit information. In the tracking system, the GSM module sends the GPS-derived location data to a predefined phone number or server using SMS or internet-based protocols.

3**. Arduino Integration**: The Arduino board acts as the central processing unit, interfacing with both the GPS and GSM modules. It retrieves location data from the GPS module, formats it, and sends it via the GSM module to the designated recipient.

4. **Real-time Tracking**: By combining GPS and GSM technologies, the system enables real-time tracking of the device's location. This allows for continuous monitoring and immediate response in case of emergencies or safety concerns.

Overall, the principle revolves around using GPS for location determination and GSM for

communication, providing a reliable and efficient solution for women's safety and tracking.

1.3. IDEAS FOR WOMEN SAFETY

To improve women's safety, here are several innovative ideas that utilize both technology and community engagement:

1. Smart Jewelry with Emergency Alert Systems: Develop wearable technology such as rings, bracelets, or necklaces that function as discreet safety alarms. These could include GPS tracking and a button that, when pressed, sends an instant alert to pre-selected contacts or emergency services with the user's exact location.

2. AI-Based Surveillance with Anomaly Detection: Implement AI-driven surveillance systems in public areas that can detect unusual behavior or potential threats based on movement patterns, and automatically alert nearby authorities or send warnings to individuals in the vicinity via a mobile app.

3. Women Safety Apps with Community Watch Features: Create a mobile app that not only allows users to send SOS messages but also enables a community watch feature, allowing users to report suspicious activities or unsafe areas, which is then shared anonymously with the app community in real-time.

4. Virtual Safe Walk Service: Offer a service where individuals can request someone to watch them through their phone's camera or stay on a call with them as they walk through less safe areas, especially during late hours. This could be facilitated by volunteers or through a professional service.

5. Self-defense Toolkits Integrated with Smartphones: Develop a series of easy-to-carry and legal self-defense tools that can be integrated with smartphones. For example, a phone case that doubles as a pepper spray or a stun gun, which can be activated quickly and easily if needed.

6. **Education and Empowerment Workshops:** Regularly organize community workshops and educational programs that teach self-defense, legal rights, situational awareness, and how to respond in emergencies. This empowerment through knowledge can significantly enhance personal safety.

7. **Transport Tracking Systems**: Work with public transport authorities to install systems where passengers can anonymously report their journey details and alert contacts if they feel unsafe. This system could include features like emergency buttons on buses and trains or apps that allow real-time tracking of public transport.

8. Safe Zones: Establish clearly marked 'safe zones' in cities that are monitored and have quick access to emergency assistance. These zones would be especially helpful in areas known for higher crime rates or where women feel vulnerable.

CHAPTER – 2

2. ABOUT THE SOFTWARES USED

The GPS and GSM-based women tracking system using Arduino typically involves using various software tools for development and implementation. Here are some common ones :-

2.1. PROTEOUS SOFTWARE

Proteus Design Suite (designed by Labcenter Electronics Ltd.) is a software tool set, mainly used for creating schematics, simulating Electronics & Embedded Circuits and designing PCB Layouts.

In the context of a GPS and GSM-based women tracking system using Arduino, Proteus software facilitates the simulation of the entire system. Here's how it generally works:

1. Circuit Design: First, we design the circuitry using Proteus. This includes integrating Arduino with GPS and GSM modules, as well as any other necessary components such as power supplies and sensors.

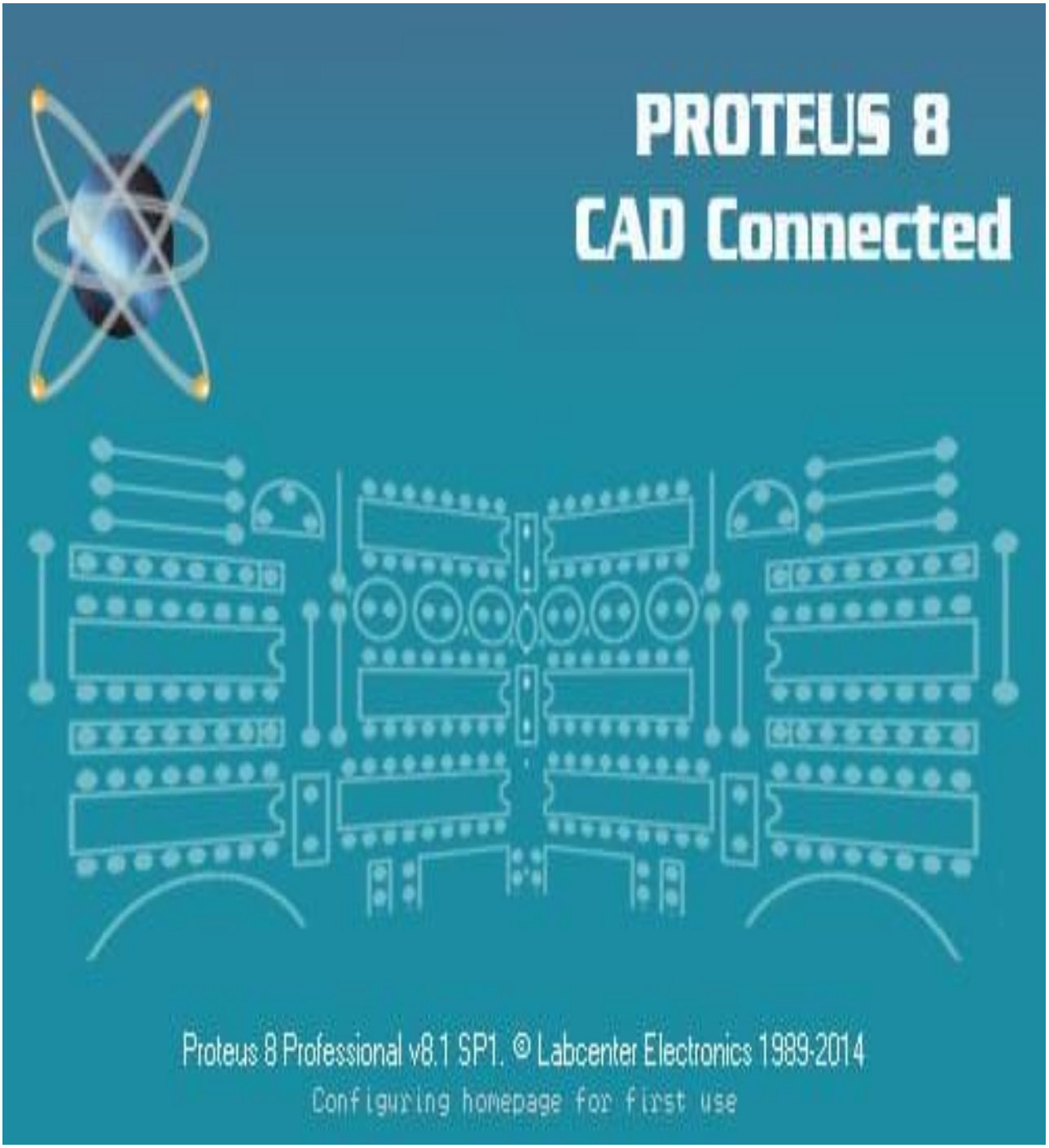
2. Code Simulation: Once the circuit is designed, you write the Arduino code for the tracking system. Proteus allows you to upload and simulate the code, enabling you to see how the system behaves without actually deploying it on physical hardware.

3. Virtual Testing: With the code simulated, you can test the functionality of the system virtually. This involves simulating scenarios such as obtaining GPS coordinates, sending them via GSM to a central server or receiver, and processing incoming commands or messages.

4. Debugging and Optimization: During simulation, you can debug any issues that arise and optimize the code and circuit design for better performance and efficiency.

5. Real-time Monitoring: Proteus provides real-time monitoring capabilities, allowing you to observe the behavior of the system and make adjustments as needed.

Overall, Proteus serves as a valuable tool for designing, testing, and debugging GPS and GSM-based tracking systems using Arduino, helping developers ensure the system's reliability and functionality before deployment in real-world scenarios.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Configuring homepage for first use

2.2. ARDUINO IDE

Arduino Software (IDE)

The Arduino Integrated Development Environment - or Arduino Software (IDE). It contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.

Arduino Language

- Simplified C/C++.
- Based on the wiring project.
- Peripheral libraries, LCD, sensors, 12C.

Writing Sketches

Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension.ino The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom righthand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

CHAPTER – 3

3. ARCHITECTURE

To create an Arduino-based women tracking system using GPS and GSM modules, we would need to design a system that can determine its geographic location via GPS and transmit that location to a predefined mobile phone or server via GSM. This type of system is particularly useful for safety and tracking applications, where quick location determination is crucial.

The architecture of a GPS and GSM-based women tracking system using Arduino involves integrating various hardware components and software programming to create a device that can accurately track location and communicate it via GSM (Global System for Mobile Communications). This type of system is particularly useful for ensuring the safety and security of individuals by enabling real-time location tracking and communication abilities in emergency situations. Below is the description of the main components of such a system and how they are integrated using an Arduino as the central controller.

Software Architecture:

1. Firmware Programming for Arduino:
Arduino IDE: Used for writing, compiling, and uploading the code to the Arduino board.
GPS Library (e.g., TinyGPS++): Used to interface with the GPS module, parse the GPS data, and extract required details like coordinates and timestamps.
GSM Library (e.g., SIM800L Library): Used to manage GSM functionalities like sending SMS or making HTTP requests.

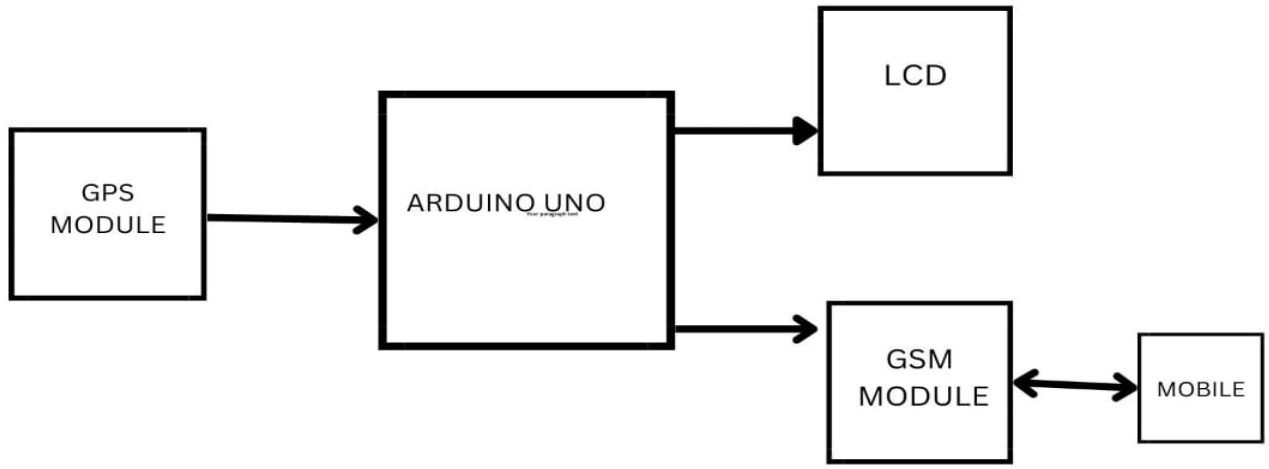
2. GPS Data Handling:
Data Parsing: The Arduino reads serial data from the GPS module and uses the GPS library to parse this data into usable location coordinates and other relevant information.
Data Formatting: Formats location data into a structured format (e.g., JSON) if needed for transmission over GSM.

3. GSM Module Interaction:
SMS Sending: The firmware can command the GSM module to send an SMS with the current location link (possibly using Google Maps URLs).
Data Transmission: Alternatively, the system might send data to a web server via HTTP GET/POST requests for real-time web-based tracking.

4. Web Server (if applicable):
Backend API (e.g., using Node.js, Python Flask, etc.): Accepts location data from the GSM module and stores it in a database.
Database (e.g., MySQL, MongoDB): Stores location data along with timestamps.
Security: Implements authentication and authorization to ensure that location data can only be accessed by authorized users.

5. User Interface:
Web Application: Provides a real-time map view of the tracked individual's location. It can use frameworks like React or Angular for the frontend and APIs for fetching data.
Mobile App: A mobile app (iOS/Android) that communicates with the backend to display location and possibly provide navigation or alert functionalities.

3.1. BLOCK DIAGRAM



The current design is an embedded application system. Arduino is based tracking system using GPS and GSM modules. This system is used for tracking and positioning of any location by using Global Positioning System (GPS) and Global System for mobile communication (GSM). Tracking is a process in which one can track the location in form of latitude and longitude. GPS coordinates are the value of allocation. A GPS system consists of group of satellites and well-developed tools as receiver. GPS module consist of U- blox, NEO6M module and GPS antenna. It can be interfaced with UART, USB, SPI and DDC. NEO-6 modules include one configurable UART interface for serial communication.

GPS receiver is the main device in this system. This component receives the coordinates from the satellite for each and every second, with date and time. The use of GPS receiver is processed by the microcontroller to extract its latitude and longitude values.The microcontroller processes this data and sends the information to the mobile phone. It gives the precise information about location. A program has been developed that it is used to locate the exact position of the vehicle and also true navigated track of the moving vehicle on Google map.

3.2. COMPONENTS REQUIRED

1. ARDUINO UNO R3

The Arduino Uno R3 is a microcontroller board based on a removable, dual-inline-package (DIP) ATmega328 AVR microcontroller. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs). Programs can be loaded on to it from the easy-to-use Arduino computer program. The Arduino has an extensive support community, which makes it a very easy way to get started working with embedded electronics. The R3 is the third, and latest, revision of the Arduino Uno.

In this project, the Arduino board acts as the central processing unit. Here's a simplified overview of how it works:

- **GPS Module**: The GPS module is connected to the Arduino Uno R3 board. It receives signals from GPS satellites to determine the device's current location coordinates (latitude and longitude).

- **GSM Module**: The GSM module is also connected to the Arduino Uno R3. It enables communication with a mobile network, allowing the device to send SMS messages or make calls.

- **Data Processing**: The Arduino Uno R3 processes data received from both the GPS and GSM modules. It may use algorithms to interpret GPS coordinates, calculate distances, and determine if the user is within a predefined safe zone or has deviated from it.

- **Alert System**: Based on the processed data, the Arduino Uno R3 triggers alerts if the user moves outside the designated safe zone or encounters any predefined danger. These alerts can be sent via SMS or calls using the GSM module.

- **Power Supply**: The Arduino Uno R3 is powered either by a battery or an external power source. It manages power consumption efficiently to ensure prolonged operation.

Overall, the Arduino Uno R3 serves as the brain of the tracking system, facilitating the integration of GPS and GSM modules to enable real-time tracking and communication.

2. SIM 900D (GSM)

The primary purpose of GSM is to establish a globally recognized and standardized framework for mobile communication that offers efficient voice and data services, ensures security, supports international roaming and enables universal access to mobile communication for people around the world.

GSM (Global System for Mobile Communications) modules work with microcontrollers, such as Arduino, through serial communication. Here's a general overview of how they interact:

- **Serial Communication:** GSM modules typically communicate with microcontrollers via UART (Universal Asynchronous Receiver-Transmitter) serial communication. The microcontroller sends commands and receives responses from the GSM module using serial communication protocols.

- **AT Commands**: GSM modules understand a set of standardized commands known as AT commands. These commands are sent by the microcontroller to the GSM module to perform various functions such as making calls, sending SMS messages, connecting to networks, and accessing data services.

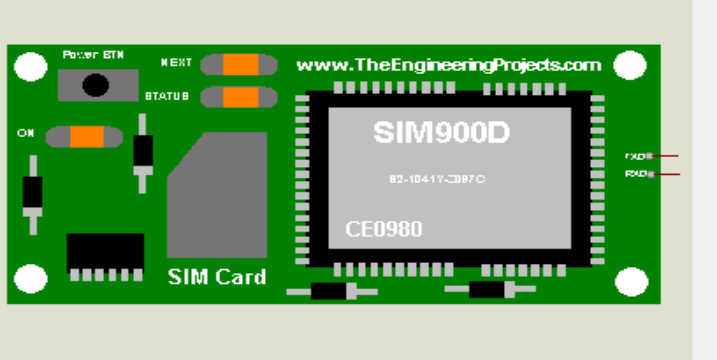
- **Hardware Connection**: The GSM module is connected to the microcontroller via the UART pins (TX and RX pins) on both devices. The microcontroller sends AT commands to the GSM module through the TX pin, and the GSM module responds with data or acknowledgments through the RX pin.

- **Initialization**: Before using the GSM module, the microcontroller typically sends initialization commands to configure the module and establish communication parameters such as baud rate, network settings, and power management options.

- **Data Exchange**: Once initialized, the microcontroller can send AT commands to the GSM module to perform specific tasks, such as sending text messages, making phone calls, or accessing internet services. The GSM module processes these commands and responds accordingly, providing feedback or performing the requested actions.

- **Error Handling**: The microcontroller monitors the responses from the GSM module to ensure that commands are executed successfully. Error handling routines can be implemented to handle communication errors, timeouts, or unexpected responses from the GSM module.

overall, the interaction between GSM modules and microcontrollers involves serial communication using AT commands, enabling the microcontroller to control and communicate with the GSM module for various telecommunication tasks.



3. GPS

The Global Positioning System (GPS) is a satellite-based navigation and surveying system for determination of precise position and time, using radio signals from the satellites, in real time or in post-processing mode.

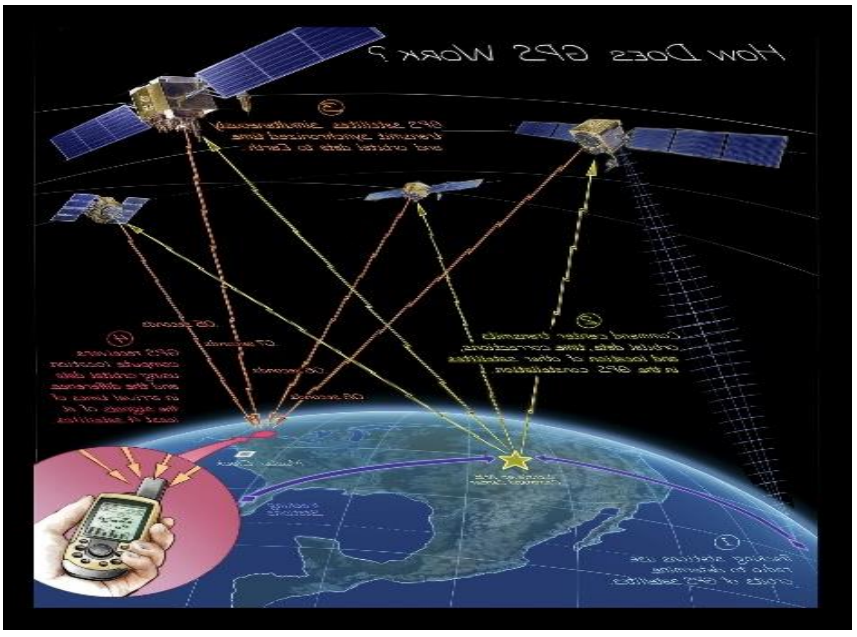
GPS is being used for numerous applications in diverse fields like
aircraft and ship navigation, surveying, geodetic control networks, crustal deformation studies, cadastral surveys, creation of GIS databases, time service, etc., by various organizations.

The GPS, which consists of 24 satellites in near circular
orbits at about 20,200 Km altitude, now provides full coverage with signals from minimum 4 satellites available to the user, at any place on the Earth. By receiving signals transmitted by minimum 4 satellites simultaneously, the observer can determine his geometric position (latitude, longitude and height), Coordinated Universal Time (UTC) and velocity vectors with higher accuracy, economy and in less time compared to any other technique available today.

GPS Segments:
The Global Positioning System basically consists of three segments: the Space Segment, The Control Segment and the User Segment.

Features of GPS Satellites:
Some of the important features of the GPS satellites are as follows (see Fig. 2):
- Design Life: 5 years (with expendables stored for 7 years)
- On orbit weight: 430 kg.
- End-of-life power: 400 W.
- Power Source: 5m2.

Applications of GPS system:
- Connecting remote islands to mainland Geodetic Control Networks.
- Determination of a precise geoid using GPS data.
- Earth rotation and Polar Motion Studies from GPS data.
- Estimating gravity anomalies using GPS.
- Marine Geodesy: positioning of oceanic stations, buoys etc.
- Earthquake monitoring: Crustal movements of the order of few cm/year.



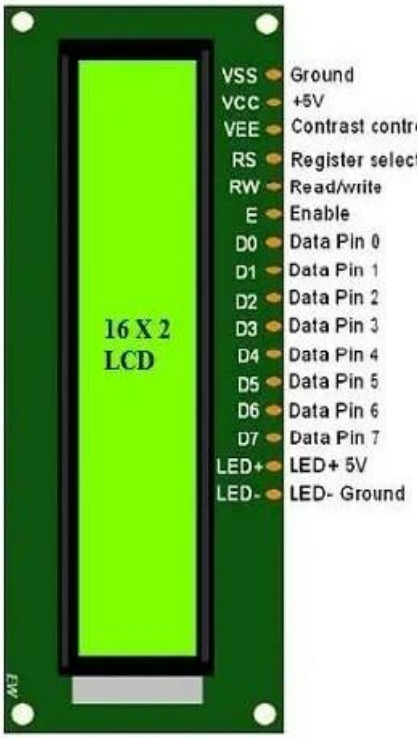
4. LCD DISPLAY

It is a flat – panel display or other electrically modulated optical device that uses the light-modulating properties of liquid crystals.

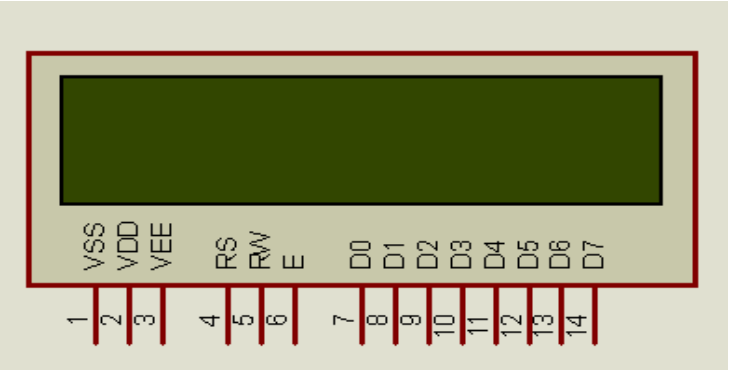
The term LCD stands for liquid crystal display. It is one kind of electronic display module used in an extensively range of applications like various circuits and devices like mobile phones, calculator, computer, TV sets etc.

This display is mainly preferred for multi-segment light – emitting diode and seven segments. The main benefits of using this module are in expensive, simply programmable animations .

LCD are available to display arbitrary images which can be displayed or hidden , such as preset words , digits and 7 segment displays as in a digital clock. They use some simple technology , except that random images are made up of a large number of pixels , while other displays have greater elements.



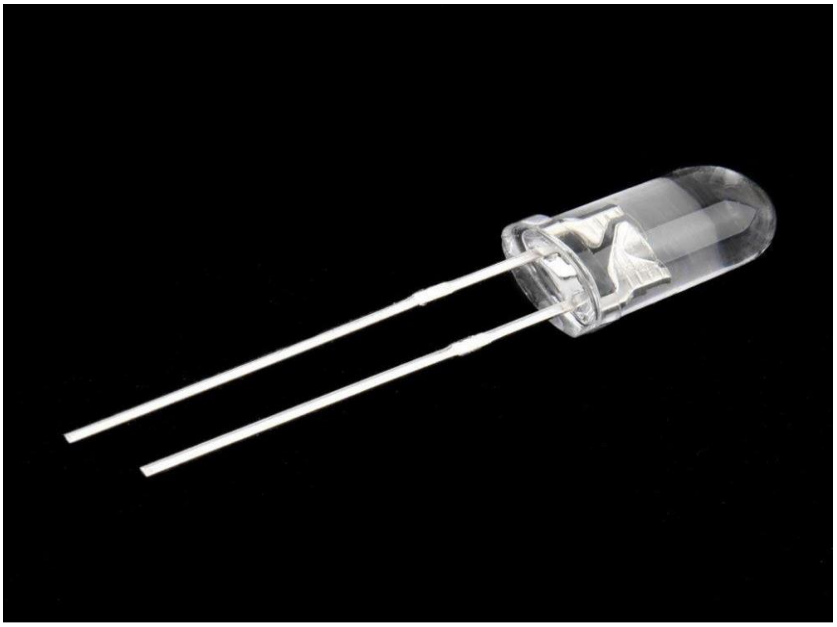
The operating voltage of this LCD is 4.7 V – 5.3 V . it includes two rows where each row can produce 16 – characters .The alphanumeric LCDs alphabets & numbers is displayed can work on two modes like 4-bit & 8 bit. These are obtainable in blue & green backlight . it displays a few custom generated characters.



5. LED DISPLAY

It is a two – lead semiconductor light source. It is p-n junction diode that emits light when activated.

When a suitable voltage is applied to the leads , electrons are able to recombine with electron holes within the device , releasing energy in the form of photons.



6. BUZZER

It is used as an alarm to the nearby people so that. they may understand that that someone is in need**.**

It is a simple device which can generate beeps and tones. Working principle of the device is piezoelectric effect. The main component of this device is a piezo crystals , a special material that change shape when a voltage applied to it.

7. POWER SUPPLY

The Arduino can be powered either by the external source or by the USB. The way it should get powered is selected automatically. Peripheral power can come one and the other from a battery.

power supply that can handle both the Arduino board and the additional components such as the GPS module and GSM module. A common choice is a 5V power supply, as Arduino boards usually operate at 5V.

Battery: A rechargeable lithium-ion battery or a set of AA batteries can be used to power the system, providing portability External power adapter: You can use a dedicated power adapter that plugs into a wall socket to power the Arduino and its peripherals.

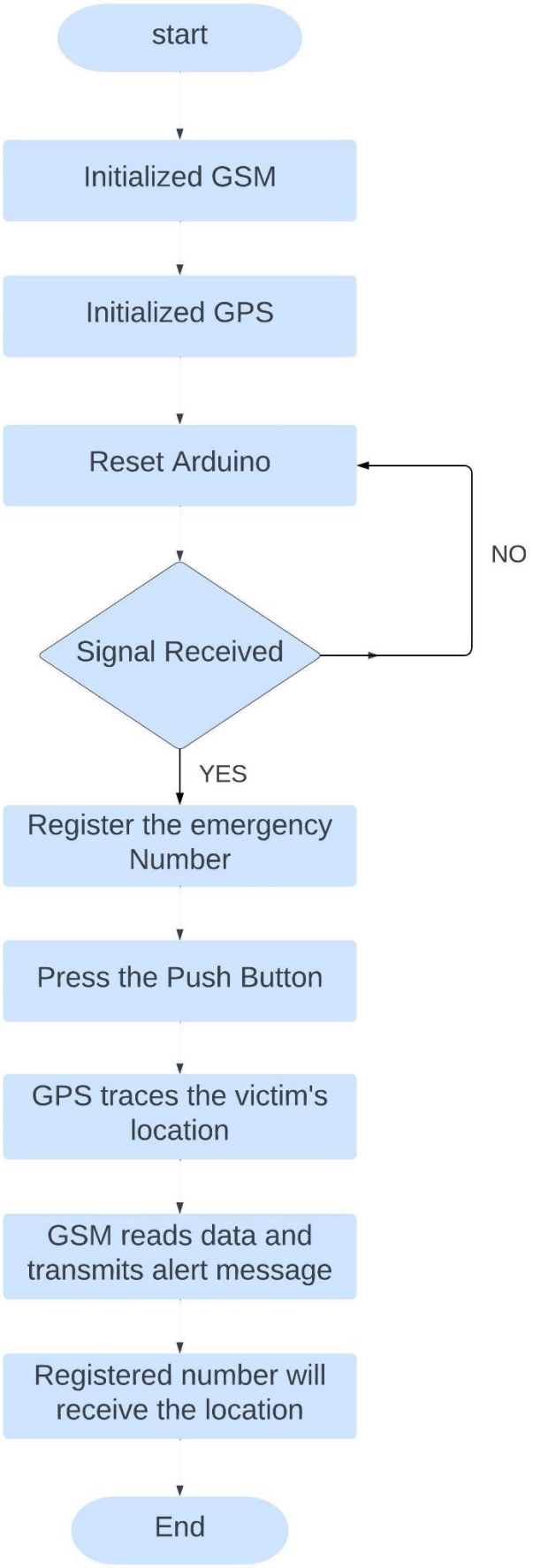
8. PUSH BUTTON

This is one of the simplest form of switch- single pole just means it has one input line and one output line which only connect when the switch is pushed. That is when activated the gap between input and output is closed and so current will flow.

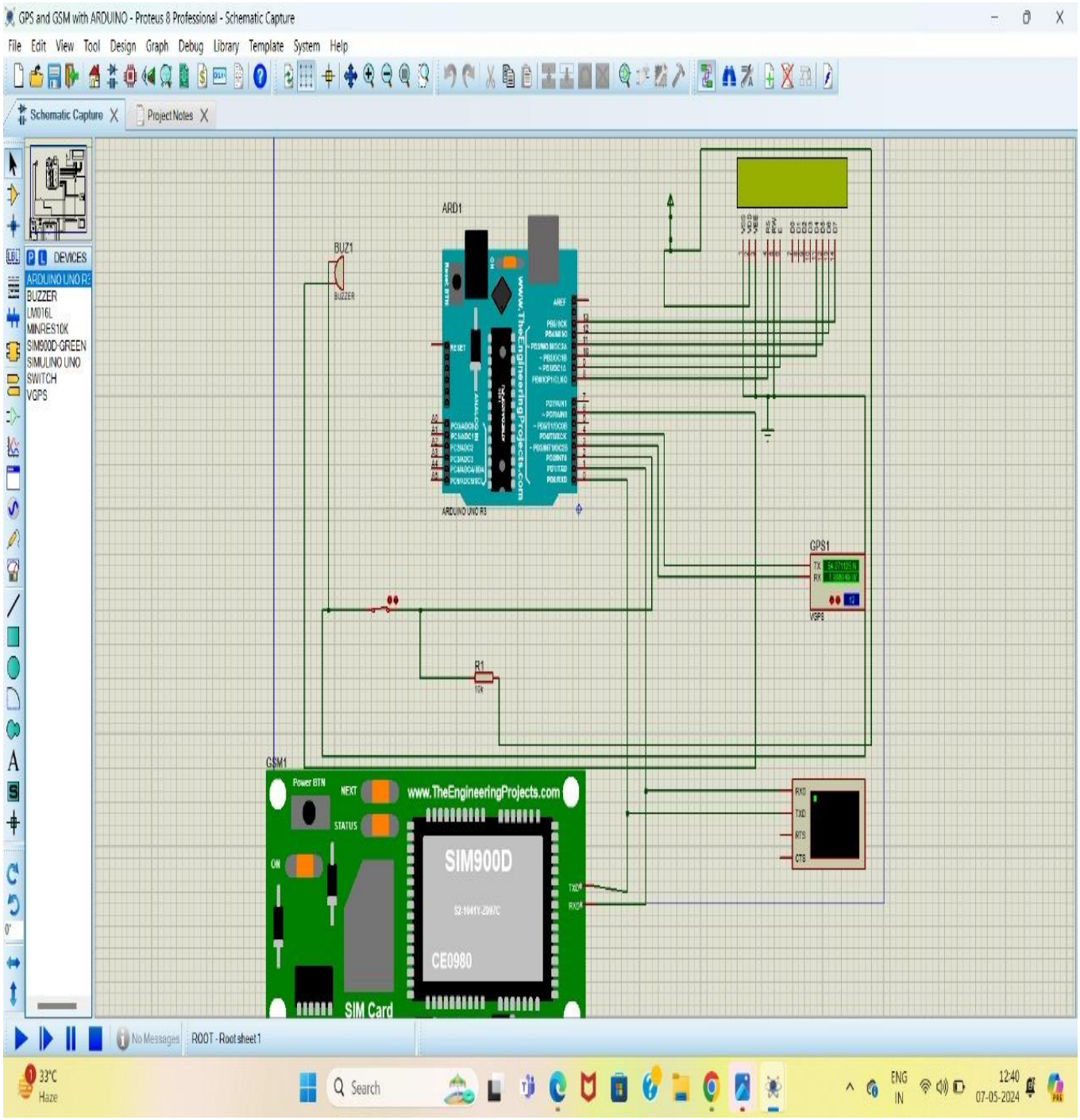
9. CONNECTING WIRES

Connecting wires are used to establish connections between different components of the system. Connecting wires connect the components together in circuits.

3.3. FLOW CHART



3.4. LAYOUT


GPS and GSM with ARDUINO - Proteus 8 Professional - Schematic Capture
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Schematic Capture
Project Notes
DEVICES
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BUZZER
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3.5. WORKING

The main purpose of our project is to provide security to the women from dangerous situations. This device consists of a key or button which can be pressed by the women when she is in need or when she feels insecure. As the switch is pressed by the women the microcontroller gets the command and it takes the current latitude and longitude value of the victim with the help of GPS module. Not only this, the pulse sensor also becomes active and starts sensing the pulse value of the victim and sends this value to the microcontroller.

The microcontroller switch ON the buzzer present in the device so that nearby people may notice the critical condition and may come to rescue. And microcontroller sends the SMS of current location and pulse reading to the registered mobile number of the family member and police with the help of GSM module. The GSM sends the current location and other data at every 10sec so that if victim is changing its current location continuously then that can be easily traced by police. And this GSM module also calls the family member and police station. In case if the pulse reading also goes abnormal then the microcontroller command the GSM module to send the pulse reading by SMS and to call the ambulance so that the immediate medical help can be provided.

The proposed system consists of a dual alerts that is buzzer and message is sent through GSM. This system can be turned on by a woman in case she even thinks she would be in trouble. This Project presents a women safety detection system using GPS and GSM modems. The system can be interconnected with the alarm system and alert the neighbours. This detection and messaging system is composed of a GPS receiver, GPS Receiver gets the location information from satellites in the form of latitude and longitude. The user receives the information from GSM which receives the processed information from the Microcontroller. A GSM modem is interfaced to the MCU. The GSM modem sends an SMS to the predefined mobile number. When a woman is in danger and in need of self – defence then she can press the switch, which is allotted to her. By pressing the switch, the entire system will be activated then immediately a SMS will be sent to concern person with location using GSM and GPS.

In this project we use Arduino R3 and we are using one GPS module and GSM module. We are using , so we are capturing the data latitude and longitude from a GPS position and here we are using one GSM module sim 900L. we are using we are sending sms alert with google link format sending. And 5v power supply , 16*2 LCD display whatever the process is going on continue show on the display called GPS . GPS data is showing , sending sms , women intravell like that we are monitoring the data on the LCD display and here we use one push button then it will come to the closer loop it will gives the buzzer alert called alarm.

Overall , the system enables real time tracking and monitoring of the device ‘s location using GPS and GSM technology , providing a valuable tool for ensuring the safety and security of individuals , especially women , in various situations.

CHAPTER – 4

ASPECTS

4.1. BENEFITS

While the GPS and GSM Based Woman Tracking System using Arduino offers significant benefits in enhancing women's safety, it also has several drawbacks that need to be considered:

1. Enhanced Safety and Security : The primary benefit of the project is the enhanced safety and security it provides to women. By enabling real-time tracking and communication, the system offers reassurance to users and their loved ones, particularly in potentially unsafe or unfamiliar environments.

2. Quick Response in Emergencies : In case of emergencies such as accidents, harassment, or attempted assaults, the system allows for quick response and assistance. Users can activate emergency alerts with their precise location, enabling authorities or designated contacts to intervene promptly.

3. Peace of Mind : Knowing that they have access to a reliable safety device can significantly contribute to the peace of mind of women, especially when traveling alone or in situations where they may feel vulnerable.

4. Customizable Alerts : The project allows for customizable alerts and predefined triggers, empowering users to tailor the system to their specific needs and preferences. This customization enhances the effectiveness of the system and ensures that it aligns with the user's individual safety concerns.

5. Portability and Accessibility : The compact design and wireless connectivity of the system make it highly portable and accessible. Users can easily carry the device with them wherever they go, ensuring continuous protection without hindering their mobility.

6. User-Friendly Interface : Incorporating user-friendly interfaces such as LED indicators or LCD displays enhances the usability of the system. Clear feedback on the system's status and operation improves the overall user experience and ensures ease of use, even in stressful situations.

7. Community Safety Initiatives : The project can be extended to support broader community safety initiatives, such as neighborhood watch programs or women's shelters. By contributing to collective security and support, the system fosters a safer and more inclusive environment for everyone.

8. Empowerment and Independence : Providing women with access to reliable safety tools can empower them to lead more independent lives. The project empowers women to navigate their surroundings with confidence, knowing that they have a proactive safety measure in place.

Overall, the GPS and GSM Based Woman Tracking System using Arduino offers a comprehensive approach to addressing women's safety concerns, with benefits ranging from enhanced security and quick response in emergencies to empowerment and community support. By leveraging technology to prioritize safety and well-being, the project has the potential to make a meaningful impact on the lives of women and contribute to building safer communities for all.

4.2. DRAWBACKS

While the GPS and GSM based women tracking System using Arduino offers significant benefits in enhancing women's safety, it also has several drawbacks that need to be considered:

1. Dependency on Satellite and Network Coverage : The system relies heavily on the availability of GPS satellite signals and GSM network coverage. In remote or densely built-up areas, where signals may be weak or unavailable, the system's effectiveness could be compromised, leading to inaccurate location tracking or communication failures.

2.Power Consumption : Continuous operation of GPS and GSM modules can drain the system's battery quickly, especially if used extensively. This could limit the system's autonomy and require frequent recharging, potentially leaving the user vulnerable in case of prolonged emergencies.

4.3. REMEDIES

To address the drawbacks of the GPS and GSM Based Woman Tracking System using Arduino, several remedies can be implemented:

1. Redundant Systems and Localization Techniques: Incorporate redundancy by integrating multiple positioning technologies such as GPS, GLONASS, and Galileo. Additionally, implement localization techniques like dead reckoning or Wi-Fi positioning to improve accuracy and reliability, especially in areas with poor GPS signal reception.

2. Power Management Optimization: Implement power-saving strategies such as sleep modes for modules, dynamic power management algorithms, and low-power components to extend battery life. Furthermore, explore alternative power sources like solar panels or kinetic energy harvesting to supplement battery power.

3. False Alarm Mitigation: Introduce intelligent algorithms and sensors to filter out false alarms by considering contextual information such as movement patterns, environmental conditions, and user behavior. Additionally, incorporate user confirmation mechanisms to verify emergency situations before initiating alerts.

4. Cost Reduction Strategies: Explore cost-effective alternatives for hardware components, utilize open-source software solutions, and leverage economies of scale through bulk purchasing or partnerships with manufacturers. Additionally, seek funding opportunities from government grants, NGOs, or corporate sponsorships to subsidize system costs for marginalized communities.

5. Privacy-Enhancing Measures: Implement robust data encryption techniques, anonymize or pseudonymize location data, and provide users with granular control over data sharing and consent settings. Furthermore, conduct regular privacy audits and engage with privacy advocates to ensure compliance with relevant regulations and ethical standards.

6. User-Friendly Interfaces and Support: Design intuitive user interfaces with simplified setup procedures, interactive tutorials, and multilingual support to cater to diverse user demographics. Provide comprehensive documentation, online forums, and helplines for troubleshooting assistance and user guidance.

By implementing these remedies, the GPS and GSM Based Woman Tracking System using

Arduino can overcome its drawbacks.

4.4. APPLICATIONS

A women tracking system based on Arduino, GPS, and GSM can have various applications, primarily focused on enhancing safety and security. Here are some potential applications:

1. Personal Safety: Women can carry a small device equipped with GPS and GSM modules that can send their location to predefined contacts or authorities in case of an emergency, allowing for quick response and assistance.

2. Travel Safety: Especially useful for solo travelers or those in unfamiliar areas, the system can provide real-time location updates, ensuring that someone knows their whereabouts at all times.

3. Domestic Violence Prevention: In situations where there's a risk of domestic violence, the system can alert authorities or support networks if the wearer enters predefined danger zones or experiences sudden movements indicating potential danger.

4. Child Safety: The system can be adapted for child safety as well, providing parents with peace of mind by allowing them to track their child's location remotely.

5. Elderly Care: Similar to child safety, the system can be used to track elderly family members who may need assistance or monitoring, especially if they have cognitive impairments or are prone to wandering.

6. Campus Safety: Universities and colleges can implement such systems to enhance campus safety, allowing students to alert campus security or designated contacts in case of emergencies.

7. Employee Safety: Companies with employees working in remote or potentially hazardous locations can use this system to track their employees' whereabouts and ensure their safety.

8. It can be used for safety of womens , by inserting this device in ladies purse.

9. It will be used for children tracking during school time by inserting this device in school bags.

10. It will also be used in vehicle tracking and safety system.

Overall, the application of a women tracking system based on Arduino, GPS, and GSM technology has the potential to significantly improve safety and security in various settings.

CHAPTER – 5

CONCLUSION

The project "GPS and GSM Based Women Tracking System Using Arduino" was conceived as a safety-enhancing tool specifically aimed at improving the security of women by leveraging modern technology. The integration of GPS for location tracking and GSM for communication provided a robust framework for developing a reliable safety device that can be used in emergency situation.

Objective Achievement : The primary objective of this project was to design and implement a compact, cost-effective, and easy-to-use tracking system that women could carry. The device was in providing real-time location data and facilitate quick communication with emergency contacts or law enforcement through the GSM network. The results demonstrated that these objectives were successfully met. The system was able to accurately determine geographical locations using the GPS module and effectively communicate these coordinates via SMS through the GSM module when the panic button was activated**.**

System Design and Implementation:*
The system utilized an Arduino microcontroller as the central processing unit, which controlled the GPS module for obtaining geographic coordinates and the GSM module for sending these coordinates to predefined phone numbers. The inclusion of a panic button enabled the user to trigger an immediate alert manually. The compact design of the device ensured it was portable and easy to carry, essential for a personal safety device.

Testing and Validation: Throughout the development phase, the system underwent rigorous testing to ensure accuracy and reliability. Various scenarios were simulated to test the effectiveness of the GPS tracking and the reliability of the GSM communication in different environmental conditions and geographic locations. The tests confirmed that the system maintained functionality in diverse settings, providing accurate location data and timely SMS alerts.

Challenges and Solutions: Several challenges were encountered during the project, including issues with GPS signal loss in certain areas and delays in GSM network response times. These were addressed by optimizing the antenna design for better signal reception and selecting more reliable network service providers. Additionally, power management was improved to extend the battery life of the device, crucial for ensuring the system remains operational in extended emergency situations.

Future Enhancements: Looking ahead, the project could be expanded in several ways. The integration of a more user-friendly interface, perhaps through a mobile app, could enhance user interaction and functionality. Additionally, incorporating more advanced power-saving modes and perhaps solar charging could address battery life issues for longer operational periods. Another potential improvement could be the use of more precise and faster-positioning GPS chips or the integration of alternative technologies such as Wi-Fi positioning to complement the GPS data, especially in urban environments where GPS signals can be obstructed.

Conclusion: In conclusion, the "GPS and GSM Based Women Tracking System Using Arduino" project successfully demonstrated a practical application of integrated technologies for enhancing women's safety. The system proved to be effective in providing real-time tracking and communication in emergency situations, thereby potentially aiding in the prevention of hazardous incidents.

5.1. FUTURE SCOPE

The project "Women Tracking System Using Arduino," which integrates GPS and GSM technology, presents several opportunities for future development and expansion to enhance its functionality and adaptability. The future scope of this project could include various technological and application-based advancements.

In future working with the changing and improved technology in the future, this already well-functioning safety device can be upgrade can be upgrade for the betterment of the people.

With this being worked on the internet connectivity, it can be improved working without internet usage, with a shock generator, audio recorder, and voice detection. We can also interface this system with smartphone or mobile and laptop. We can use this safety device in hand bags, luggage, vehicle etc . By using Nano size materials, the kit size get reduced.

1. Integration with Mobile Apps: Developing a dedicated mobile application could significantly enhance user experience and functionality. The app could provide real-time tracking, history logs, route mapping, and more sophisticated alert systems. This would make the system more accessible and user-friendly for both the user and their emergency contacts.

2. Improved Hardware Design: The current system could benefit from a more compact, robust, and ergonomic hardware design that would make the device more wearable and less intrusive. Waterproofing, extended battery life, and solar charging capabilities are other potential improvements that could increase usability.

3. Enhanced Positioning Technologies: Incorporating additional positioning technologies such as Wi-Fi, Bluetooth, or even LBS (Location-Based Services) could provide more accurate and reliable location tracking, especially in urban areas where GPS signals may be weak or obstructed.

4. Advanced Communication Options: Beyond GSM for sending SMS alerts, future iterations could include data connectivity options (like 4G/5G or Wi-Fi) to transmit data in real time to a central server or cloud-based system. This could enable continuous monitoring and more complex data analysis.

5. AI and Machine Learning: Implementing AI and machine learning algorithms could provide predictive insights, anomaly detection, and more personalized safety recommendations based on the user’s behavior patterns and frequent locations.

6. Health Monitoring Features: Integrating health monitoring sensors, such as a heart rate monitor or a fall detector, could add another layer of safety, providing alerts not only for location-based emergencies but also for medical emergencies.

7. Multi-User Support and Community Safety Networks: Expanding the system to support multiple users simultaneously could allow for the creation of community-based safety networks, where users can opt-in to share their location with others in their community or group in real-time during emergencies.

8. Autonomous Alert System: Implementing features that automatically detect unusual patterns or emergencies (such as sudden stops, deviations from typical routes, or impacts) without user intervention could make the system proactive rather than reactive.

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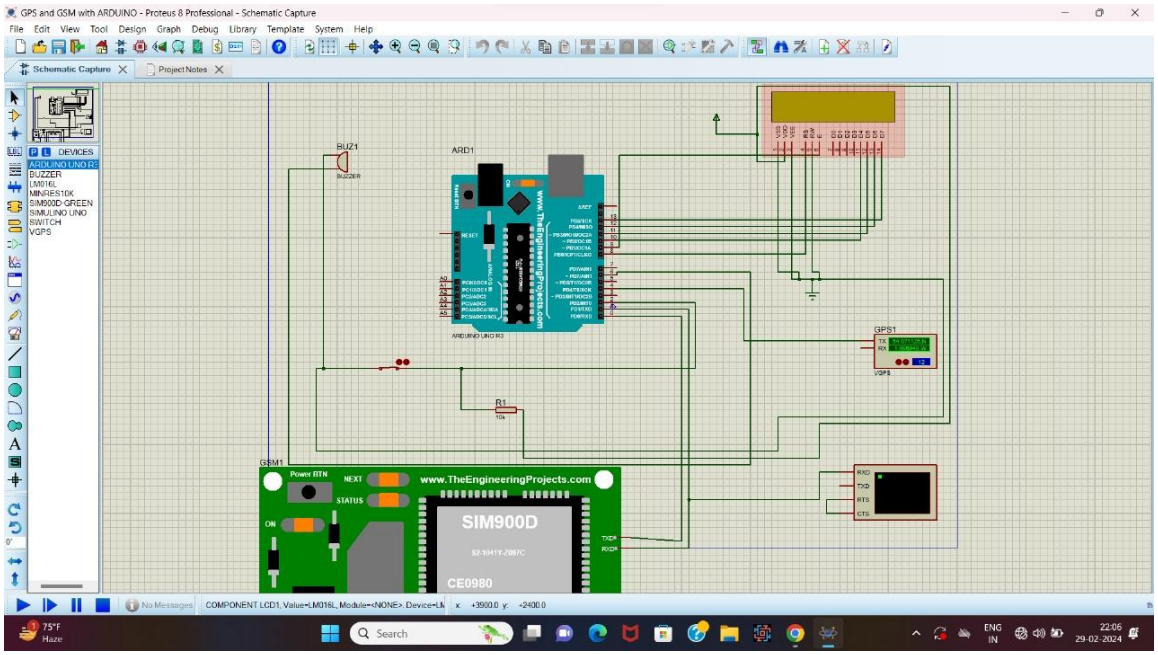
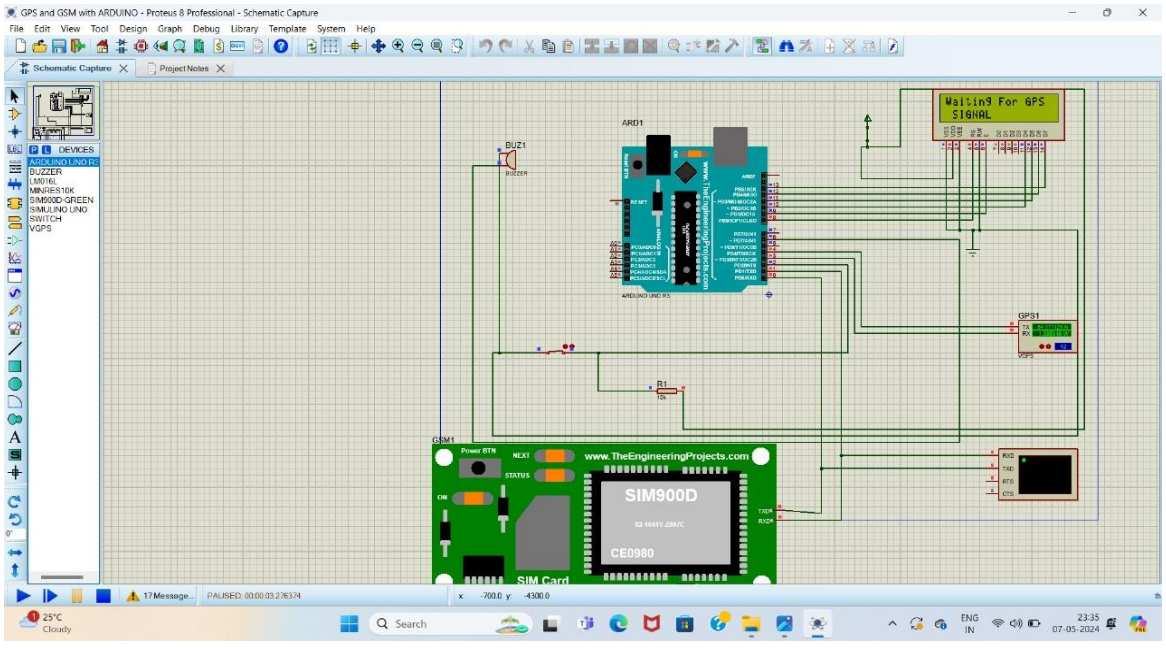
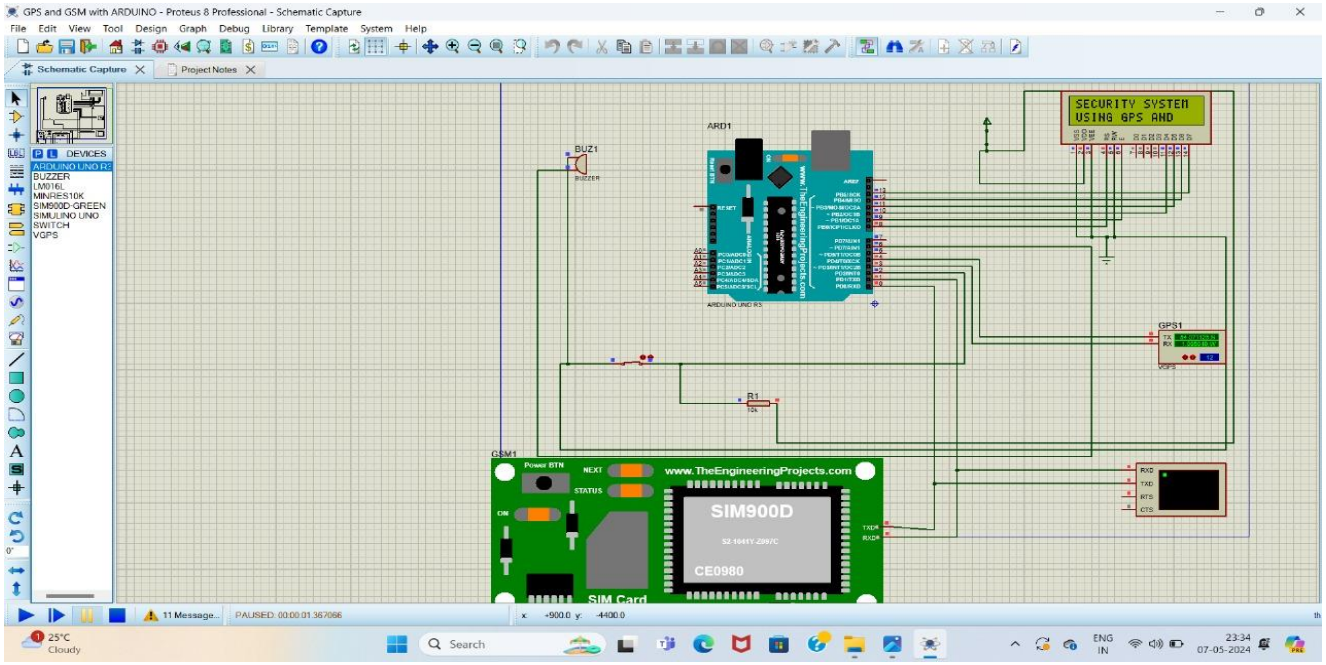
7. APPENDIX

7.1. SNAPSHOTS



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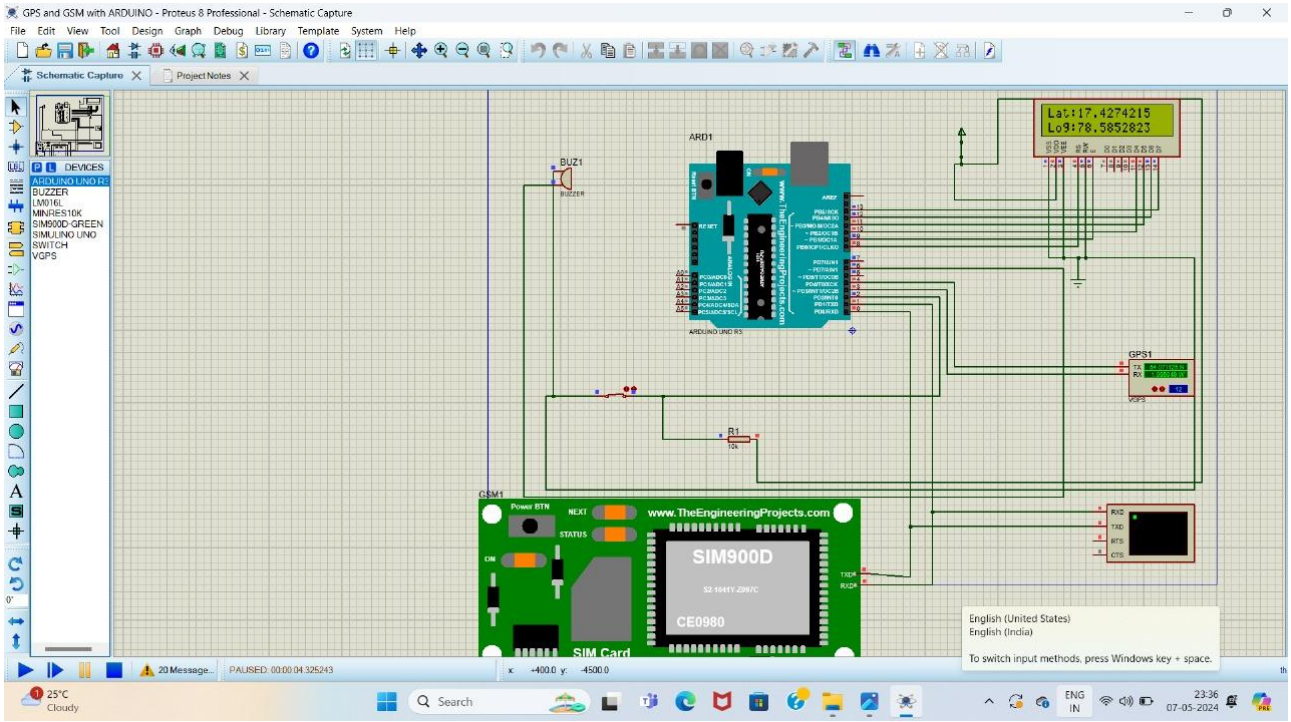
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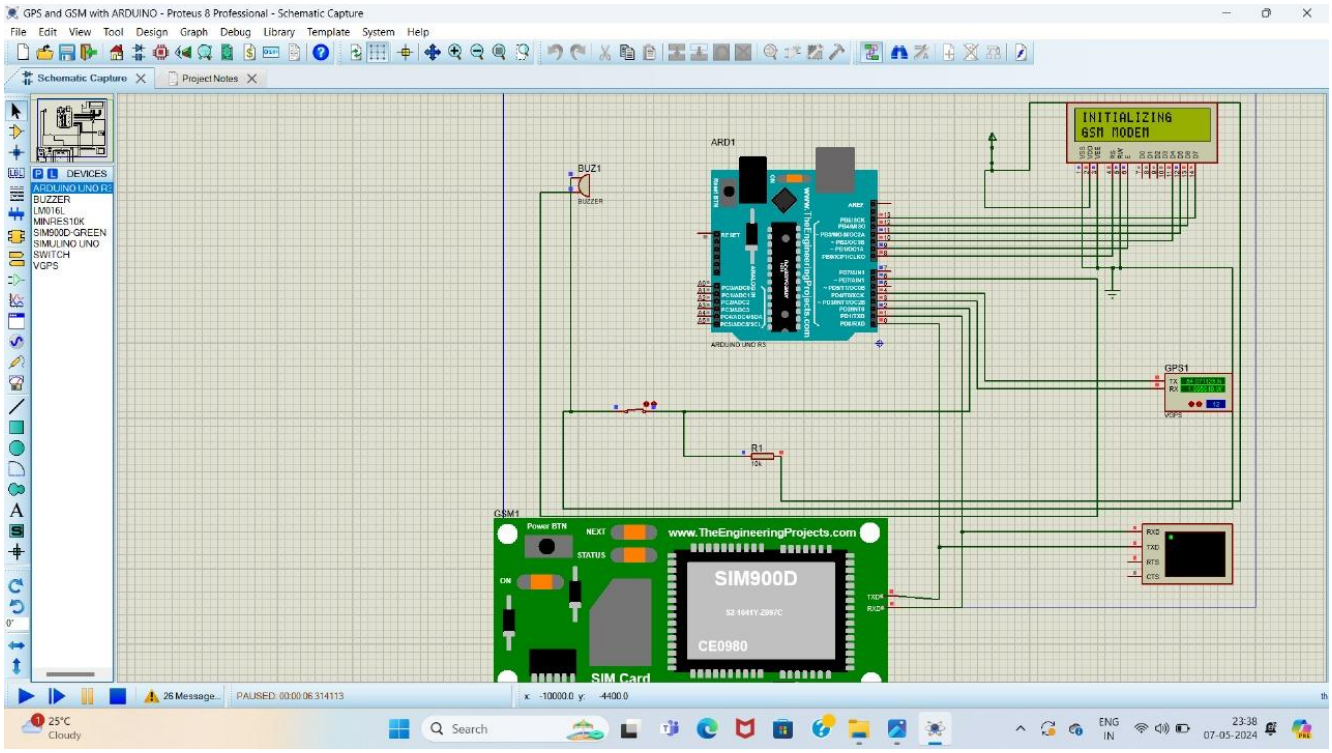
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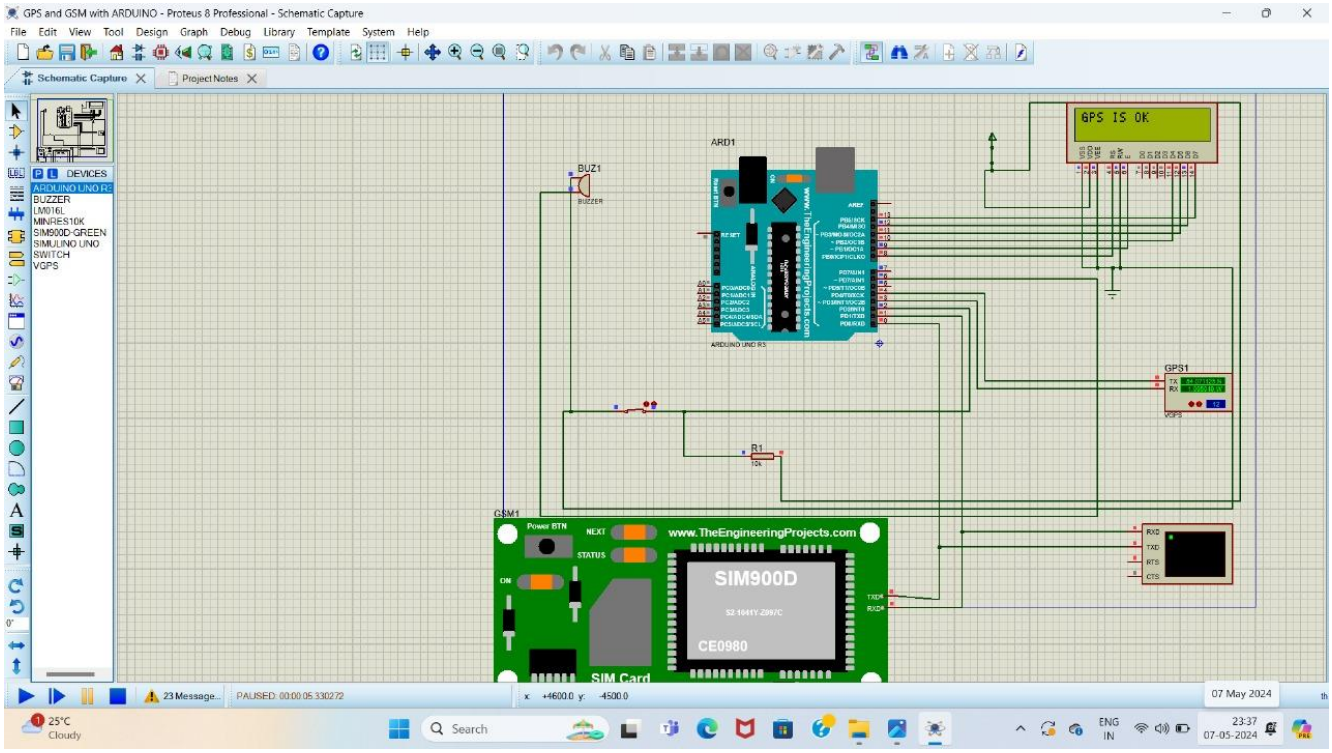
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7.2. CODE

```
#include <LiquidCrystal.h>
#include <SoftwareSerial.h>

LiquidCrystal lcd(8, 9, 10, 11, 12, 13);
SoftwareSerial gpsSerial(4, 3); // RX, TX
SoftwareSerial gsmSerial(8, 9);  // RX, TX

void initModule(String cmd, char *res, int t) {
  while (1) {
    Serial.println(cmd);
    delay(100);
    while (Serial.available() > 0) {
      if (Serial.find(res)) {
        Serial.println(res);
        delay(t);
        return;
      } else {
        Serial.println("Error");
      }
    }
    delay(t);
  }
}

void setup() {
  lcd.begin(16, 2);
  Serial.begin(9600);
  gpsSerial.begin(9600);
  pinMode(2, INPUT);
  pinMode(6, OUTPUT);
  pinMode(5, OUTPUT);
  pinMode(7, OUTPUT);

  digitalWrite(6, LOW);
  digitalWrite(5, LOW);
  digitalWrite(7, LOW);

  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("ARDUINO BASED");
  lcd.setCursor(0, 1);
  lcd.print("WOMEN SAFETY ");
  delay(1000);
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("SECURITY SYSTEM");
  lcd.setCursor(0, 1);
  lcd.print("USING GPS AND ");
  delay(1000);
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("GSM MODULE -");
  lcd.setCursor(0, 1);
```

```
  lcd.print("SHOCK CKT");
  delay(1000);
  lcd.clear();

  lcd.setCursor(0, 0);
  lcd.print("Waiting For GPS");
  lcd.setCursor(0, 1);
  lcd.print(" SIGNAL ");
  delay(1000);
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Lat:17.4274215");
  lcd.setCursor(0, 1);
  lcd.print("Log:78.5852823");
  delay(1000);
  lcd.clear();

  lcd.setCursor(0, 0);
  lcd.print("GPS IS OK");
  delay(1000);
  lcd.clear();

  lcd.setCursor(0, 0);
  lcd.print("INITIALIZING");
  lcd.setCursor(0, 1);
  lcd.print("GSM MODEM");
  delay(1000);
  initModule("AT", "OK", 1000);
  initModule("AT+CMGF=1", "OK", 1000);

  lcd.setCursor(0, 0);
  lcd.print("INITIALIZED");
  lcd.setCursor(0, 1);
  lcd.print("SUCCESSFULLY");
  delay(1000);
  lcd.clear();

  // Initialize SoftwareSerial communication for GPS and GSM modules
  gpsSerial.begin(9600);
  gsmSerial.begin(9600);

  // Initialize GSM module
  gsmSerial.println("AT");
  delay(1000);
  gsmSerial.println("AT+CMGF=1"); // Set SMS mode to text
  delay(1000);
}

void loop() {
  if (gpsSerial.available() > 0) {
    String gpsData = gpsSerial.readStringUntil('\n');
    if (gpsData.startsWith("$GPGGA")) {
      // Parse GPS data to get latitude and longitude
      String latitude = getValue(gpsData, ',', 2);
      String longitude = getValue(gpsData, ',', 4);
```

```
      // Print latitude and longitude for debugging
      Serial.print("Latitude: ");
      Serial.println(latitude);
      Serial.print("Longitude: ");
      Serial.println(longitude);

      // Send location via SMS
      sendSMS("Latitude: " + latitude + ", Longitude: " + longitude);
    }
  }
}

// Function to extract values from a string
String getValue(String data, char separator, int index) {
  int found = 0;
  int strIndex[] = {0, -1};
  int maxIndex = data.length() - 1;

  for (int i = 0; i <= maxIndex && found <= index; i++) {
    if (data.charAt(i) == separator || i == maxIndex) {
      found++;
      strIndex[0] = strIndex[1] + 1;
      strIndex[1] = (i == maxIndex) ? i + 1 : i;
    }
  }

  return found > index ? data.substring(strIndex[0], strIndex[1]) : "";
}

// Function to send SMS
void sendSMS(String message) {
  gsmSerial.print("AT+CMGS=\"+7901888484\"\r\n"); // Replace with recipient's phone
number
  delay(1000);
  gsmSerial.print(message);
  delay(1000);
  gsmSerial.write(0x1A);
  delay(100);
}
```