**A Major Project**

**on**

WOMAN SAFETY DEVICE

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF THE DEGREE OF

**BACHELOR OF TECHNOLOGY**

(Electronics & Communication Engineering)



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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

GURU NANAK DEV ENGINEERING COLLEGE LUDHIANA

(An Autonomous College Under UGC ACT)

**GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA**

**CANDIDATE'S DECLARATION**

We hereby certify that the work which is being presented in the Project entitled **WOMAN SAFETY DEVICE** by **AANCHAL KUMARI, AMAN KUMAR, SONU KUMAR** in partial fulfilment of requirements for the award of degree of B.Tech. (Electronics and Communication Engineering) submitted to the Department of Electronics and Communication Engineering at GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA is an authentic record of my own work carried out during a period from AUG 2023 to DEC 2023. The matter presented in this project has not been submitted by me or anybody else in any other University / Institute for the award of B.Tech Degree.

**Signature of the Students**

This is to certify that the above statement made by the candidate is correct to the best of my own knowledge.

**Signature of Project Guide/Guides**

The Major Project Viva-Voce Examination of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ had been held on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and accepted.

**Signature of Internal Examiner** **Signature of External Examiner**

**ABSTRACT**

The increasing concern for women's safety in contemporary society has prompted the development of innovative solutions aimed at providing reliable and instantaneous assistance in emergency situations. This report introduces a cutting-edge solution Woman Safety Device designed to enhance personal security through the integration of advanced technologies. The primary features of this device include real-time tracking, a shocking mechanism, and seamless updates via a dedicated website. Real-time tracking is a pivotal aspect of the Woman Safety Device, leveraging GPS and other location-based technologies to continuously monitor the user's whereabouts. This ensures that the user's location is known at all times, facilitating prompt response in case of emergencies. The device employs state-of-the-art geolocation algorithms to provide accurate and up-to-the-minute tracking information.

To further empower users in potentially dangerous situations, the Woman Safety Device incorporates a shocking mechanism. When activated, this feature delivers a non-lethal yet impactful electric shock, serving as a deterrent and providing an additional layer of self-defence. The intensity of the shock is calibrated to be effective in incapacitating potential threats while prioritizing the user's safety. Additionally, the Woman Safety Device introduces a web-based platform for real-time updates and data management. Users can access a dedicated website to monitor the device's status, review historical tracking data, and receive instant notifications via SMS in case of emergencies. This centralized platform enhances user engagement and ensures that critical information is readily available to both the user and authorized personnel.

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1. **INTRODUCTION & PROJECT FORMULATION**
   1. **OVERVIEW**

In recent years, ensuring the safety and security of women has emerged as a critical societal concern. The Woman Safety Device project aims to address these pressing issues by leveraging technology to create a wearable device that empowers women to feel more secure in their daily lives. This innovative device is designed to provide a sense of reassurance and aid in times of distress by incorporating two key functionalities. Firstly, a dedicated SOS button allows for immediate distress signaling, triggering the transmission of the wearer's location via SMS to predefined contacts or emergency services. Secondly, an integrated shock generator serves as a deterrent and defensive measure, offering an added layer of protection in threatening situations. The significance of such a device cannot be overstated in a world where safety, especially for women, remains a growing concern. By amalgamating technology with a commitment to enhancing personal security, this project endeavours to contribute meaningfully to the ongoing discourse on women's safety. Through this report, we delve into the design, development, functionalities, implementation, and potential impact of the Woman Safety Device, elucidating its potential as a pragmatic solution toward fostering a safer environment for women in our communities. The proposed concept is to build a safety device which will generate an emergency alarm and send a message to the user’s friend, family or to the police. This will also help women or concerned during her trouble and keep others alert. By this process location tracking becomes easy. "848 Indian Women Are Harassed, Raped, and Killed Every Day!!" according to statistics [1]. So, to properly combat this, we developed an approach in which women can self-manage any uncertain event. A day when the media will broadcast more of women’s success rather than harassment, that will be a feat achievement! For a well-groomed 21st century, self-protection became a priority which can be achieved with the help of user-friendly safety device provided with GPS tracking and alert. Our emergency kit is provided with a main switch since by pressing it, the battery will supply required voltage to the preprogrammed controller and the components that are directly connected to ESP8266 such as GSM, GPS as well as shock circuit will start working accordingly. Hence, the proposed device interfaced with IOT will be continuously communicating with cloud to store location info.[2]

* 1. **EXISTING SYSTEM**

Within the realm of women's safety measures, a spectrum of approaches exists, ranging from traditional community-based support to contemporary technological innovations. Traditional methods often revolve around community-driven initiatives fostering awareness and vigilance to create safer environments. Additionally, established emergency hotlines and services provided by law enforcement agencies and non-governmental organizations serve as crucial lifelines during distressing situations.

In tandem with these traditional avenues, technological advancements have introduced a new dimension to women's safety. Mobile applications equipped with SOS features, real-time location tracking, and emergency alert functionalities have gained prominence. Moreover, the emergence of wearable devices designed specifically for safety purposes has attempted to address security concerns. These wearables often feature basic SOS functionalities and location tracking capabilities.

However, while these solutions represent significant strides, they are not without limitations. Many existing systems rely heavily on manual intervention, requiring individuals to actively trigger alerts or seek assistance, which may not always be feasible or safe in threatening scenarios. This reliance on manual activation can impede the immediacy and discreetness required in emergency situations. Furthermore, challenges persist in the precision and accuracy of location tracking, impacting the effectiveness of these measures. Accessibility and affordability issues also hinder the widespread adoption of these technologies, particularly among vulnerable populations.

As such, there exists a palpable need for innovative solutions that overcome the limitations of current systems. There is a growing demand for more integrated, reliable, and user-friendly safety devices that seamlessly amalgamate various functionalities into a cohesive and responsive unit. These devices should bridge the gaps identified within the existing framework, offering quicker, more precise, and discreet aid to individuals facing threatening situations, thereby significantly enhancing the safety and security of women in their daily lives.

* 1. **OBJECTIVES OF PROJECT**

The primary objectives of the 'Woman Safety Device' project encompass a holistic approach to enhancing the safety of women in vulnerable situations. Foremost, the project aims to develop a cutting-edge device that ensures immediate distress signaling capabilities. This involves creating a mechanism for users to seamlessly trigger distress signals, accompanied by real-time location transmission to designated contacts or authorities. Emphasizing usability, the device is designed to be portable, intuitive, and readily accessible during emergencies. Additionally, the integration of precise and reliable location-tracking technology, such as GPS, serves as a pivotal objective, providing accurate location data crucial for swift assistance. As an added security measure, the optional implementation of a shock generator aims to offer a self-defense mechanism. Complementing these primary objectives are secondary goals, including the development of a secure web-based platform. This platform enables the logging, recording, and secure display of transmitted location data, ensuring robust privacy and security measures are in place. Furthermore, considerations for scalability and affordability are embedded in the project, facilitating future mass production and accessibility. Compliance with pertinent safety standards and legal regulations forms an integral part of the project, ensuring adherence to electronic device standards and data privacy laws. Lastly, the project emphasizes a user-centric approach by seeking continuous feedback through trials or surveys, allowing iterative improvements in functionality and user experience.

1. **PROJECT DESIGN**
   1. **PROJECT PERSPECTIVE**

The "Woman Safety Device" project aims to address the pressing need for enhanced safety measures for women facing potentially threatening or unsafe situations. In recent times, concerns regarding women's safety have escalated, highlighting the necessity for innovative solutions to mitigate risks and provide immediate assistance in distressing circumstances.

The project's primary scope involves the development of a portable safety device equipped with distress signaling functionalities and optional self-defense mechanisms. The objectives encompass the following key aspects:

* **Immediate Distress Signaling:** Designing a device capable of instantly transmitting distress signals along with accurate location data to predefined contacts or authorities upon activation.
* **User-Centric Design:** Creating a compact, user-friendly device that is easily accessible and intuitive to operate, ensuring usability during emergencies.
* **Enhanced Safety Measures:** Integrating GPS technology for precise location tracking and an optional shock generator circuit for added security.
* **Data Management Platform:** Developing a secure web-based platform to record and display transmitted location data for authorized access.

The significance of this project lies in its potential to revolutionize the landscape of women's safety by offering a proactive and accessible solution. By providing a reliable and rapid means of signaling distress and transmitting location information, the device aims to empower women and improve response times in critical situations. Moreover, the accompanying web platform offers an additional layer of support by facilitating data management and ensuring the accountability and traceability of distress signals. This project aligns with societal needs, emphasizing the importance of technological advancements in fostering a safer environment and empowering individuals to navigate their surroundings with confidence.

* 1. **PROJECT FUNCTIONS**

The "Woman Safety Device" encompasses several essential functions designed to ensure the safety and security of users in potentially vulnerable situations. The core function of the device revolves around providing immediate assistance in distress situations. Upon activation through a dedicated SOS button, the device initiates the following actions:

* **Distress Signal Transmission:** Instantly sends distress signals via SMS to pre-defined contacts or authorities.
* **Location Information Transmission:** Simultaneously transmits accurate and real-time location data, enabling swift response and assistance.

As an optional security measure, the device incorporates a shock generator circuit:

* **Shock Activation:** Upon user discretion, activates a shock generator circuit designed to deter potential threats and provide an added layer of self-defense.

The device is meticulously crafted for ease of use and accessibility:

* **Portability:** Compact and lightweight, ensuring ease of carriage for users in various settings.
* **Intuitive Operation:** Simple and user-friendly interface facilitating quick and straightforward activation of distress signals or the shock mechanism if required.

Complementing the device's functionalities is a web-based platform:

* **Location Data Management:** Records and displays transmitted location data securely for authorized access.
* **Visualization:** Presents the location information in a user-friendly interface, aiding in swift response and user reassurance.

The device ensures seamless integration and connectivity:

* **Communication Module:** Utilizes reliable communication protocols for signal transmission.
* **Power and Battery Management:** Optimized for extended usage, ensuring reliability during critical situations.

The functions encapsulated within the "Woman Safety Device" collectively aim to offer a comprehensive safety solution, empowering users with swift distress signaling, optional self-defense capabilities, and robust data management for enhanced security.

* 1. **USER CHARACTERISTICS**

The "Woman Safety Device" is made for women who want to feel safer in uncertain situations. It's for different kinds of women, from young adults to older ones, living in cities or towns. People who care a lot about their safety and like using technology will find it helpful. It's for those who want a small and easy-to-use tool that they can carry with them every day. This device is meant to quickly send a signal for help when needed, making them feel more secure and confident. Understanding what women need and like helps make sure the device is just right for them.

* 1. **CONSTRAINTS**

Technical Limitations:

* **Size and Portability:** The device's size constraints to ensure it remains portable and convenient for users to carry at all times.
* **Power Consumption:** Limitations on power usage to ensure extended battery life for reliable functionality.
* **Technical Compatibility:** Compatibility constraints with communication protocols and mobile networks for distress signal transmission.

Regulatory and Compliance Factors:

* **Legal Framework:** Adherence to regional or international laws regarding safety device standards, data privacy, and telecommunications regulations.
* **Safety Regulations:** Compliance with safety standards and regulations concerning the shock generator functionality.

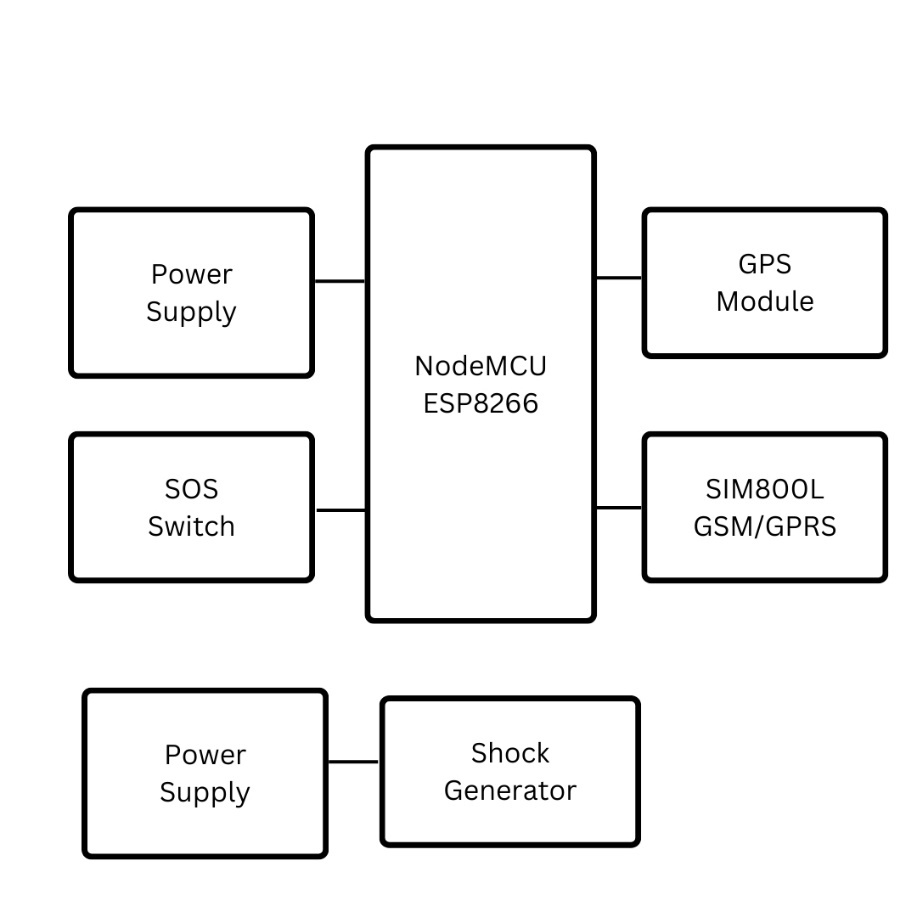
Resource and Production Limitations:

* **Cost Constraints:** Keeping production costs within a reasonable budget for mass production and affordability.
* **Material Accessibility:** Availability of necessary components or materials required for manufacturing the device.
* **Production Scalability:** Ensuring the device's design allows for easy scalability during mass production.

User Acceptance and Usability:

* **User Preferences:** Aligning device functionalities with user expectations and preferences.
* **Ease of Use:** Ensuring the device remains simple and intuitive for users to operate effectively during emergencies.
  1. **METHODOLOGY AND BLOCK DIAGRAM**

The figure 2.1 shows the The development of the "Woman Safety Device" involved a systematic approach beginning with comprehensive research to understand user needs and available technologies. This phase encompassed surveys, interviews, and technology assessments. Subsequently, the design and development phase focused on prototyping, integration testing, and iterative refinement based on user feedback and technical feasibility. Rigorous testing and validation followed, including user trials, functionality assessments, and compliance checks to ensure adherence to safety standards and regulations. Implementation involved finalizing designs for production and strategizing the launch, distribution, and post-deployment monitoring for continuous improvements. Throughout, effective project management strategies were employed, including structured timelines, resource allocation, and risk mitigation measures, to ensure the project progressed efficiently from conceptualization to implementation. The typical block diagram for the 'Woman Safety Device' is presented in Figure 2.1. This diagram offers a comprehensive overview of the device's architecture, illustrating the interaction between key components. The block diagram delineates the sequence starting from the SOS button initiation, passing through the microcontroller unit, GPS module, and SMS transmission module.



*Figure 2.1 Block Diagram of Project*

* 1. **EQUIPMENT AND APPARATUS REQUIRED**
* **Computers:** Utilized as workstations for design software, programming, and prototyping simulations. These are essential for coding, simulations, and designing the device's functionalities.
* **ESP8266:** Acts as the central processing unit (CPU) in the device. Incorporates a WiFi module responsible for transmitting location details to the dedicated webpage, enabling real-time tracking.
* **GPS Module:** Utilized for accurately locating the person in distress. It enables the device to acquire precise location data crucial for distress signaling.
* **GSM Module:** Facilitates the transmission of location details via SMS. This module ensures that distress signals, along with location information, are efficiently relayed to predefined contacts or authorities.
* **Circuit Module for Shock Generation:** Comprising essential components such as a transistor, step-up transformer, and feedback binding. This circuit is responsible for generating a shock if activated, enhancing the device's self-defense capabilities.
  1. **ASSUMPTIONS AND DEPENDENCIES**

The "Woman Safety Device" project is founded on several assumptions and dependencies crucial to its success. We assume that users will readily embrace and find the device user-friendly and valuable for their safety needs. Moreover, the assumed reliability of key components like GPS modules and communication systems is pivotal. Regulatory compliance with existing safety standards and regulations forms another fundamental assumption. Anticipating a positive market response and demand among the target user base are additional assumptions. However, the project's progress relies on various factors, including the availability and compatibility of essential technical components, adherence to regulatory standards, access to manufacturing resources, and the timely acquisition of user feedback during trials for iterative improvements. These dependencies significantly influence the project's trajectory and its ability to achieve its intended objectives.

* 1. **SPECIFIC REQUIREMENTS**

Functional Requirements:

* **Distress Signaling:** The device should have a dedicated button for triggering distress signals, initiating SMS transmission with accurate location data to predefined contacts or authorities.
* **Shock Generator:** Optional functionality allowing users to activate a shock generator circuit for self-defense purposes.
* **Location Tracking:** Integration of GPS technology for precise and real-time location tracking.

Usability and Interface:

* **User-Friendly Design:** Intuitive interface and simple operation for ease of use during emergencies.
* **Portability:** Compact and lightweight design for convenient carriage.

Security and Compliance:

* **Data Privacy:** Ensuring secure transmission and storage of user location data adhering to relevant privacy regulations.
* **Safety Standards:** Compliance with safety regulations regarding the shock generator functionality.

Performance and Reliability:

* **Battery Life:** Long-lasting battery performance to ensure reliability during critical situations.
* **Signal Transmission:** Reliable and swift distress signal transmission in various environmental conditions.

Communication and Connectivity:

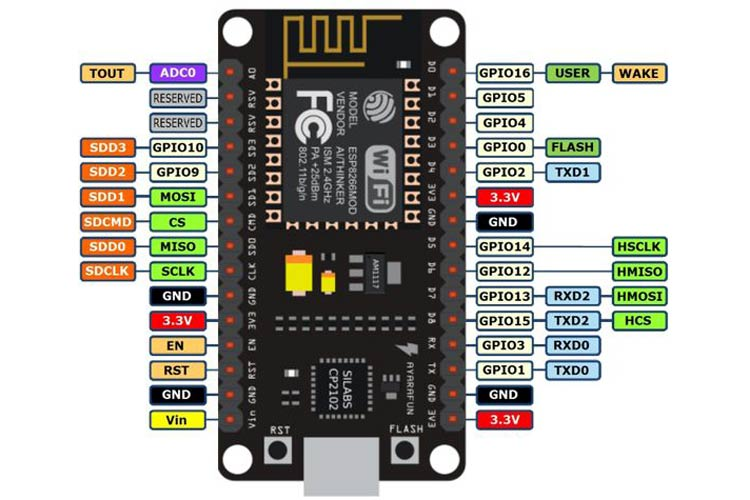
* **SMS Functionality:** Seamless and efficient SMS transmission capability to predefined contacts or authorities.
* **Compatibility:** Compatibility with standard mobile networks for signal transmission.

1. **DEVELOPMENT AND IMPLEMENTATION**
   1. **INTRODUCTION TO TOOLS**
      1. **ESP8266 NodeMCU**

The ESP8266 is a highly popular and versatile Wi-Fi module used in Internet of Things (IoT) applications. It integrates a microcontroller unit (MCU) and a Wi-Fi radio, providing a cost-effective solution for adding wireless connectivity to embedded systems. The ESP8266 module is based on the ESP8266EX system-on-a-chip (SoC) produced by Espressif Systems. It operates in the 2.4 GHz frequency range and supports various Wi-Fi standards, including 802.11 b/g/n. This microprocessor operates at 80MHz to 160 MHz adjustable clock frequency and supports RTOS. NodeMCU has 128 KB RAM and 4MB of Flash memory to store data and programs. NodeMCU ESP8266 can be powered using a Micro USB jack and VIN pin as External Supply Pin. It supports UART, SPI, and I2C interface. The module can be programmed using various development platforms, including the Arduino IDE, PlatformIO, and the Espressif IoT Development Framework (ESP-IDF). This flexibility allows developers to choose their preferred programming language and environment. Figure 3.1 shows ESP8266 board. The detailed technical specifications of the components can be found in the respective datasheets. For instance, for the ESP8266 module, please refer to datasheet [6] for more comprehensive technical details.

It's Specifications & Features are as follows:

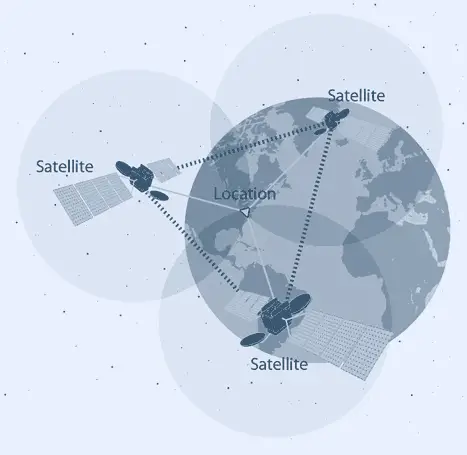
* Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106
* Operating Voltage: 3.3V
* Input Voltage: 7-12V
* Digital I/O Pins (DIO): 16
* Analog Input Pins (ADC): 1
* Flash Memory: 4 MB
* SRAM: 64 KB
* Clock Speed: 80 MHz
* PCB Antenna
* Small Sized module that can fit inside your IoT projects.



*Figure 3.1 ESP8266 NodeMCU and its pinout*

* + 1. **NEO-6M GPS Module**

GPS is a system of 30+ navigation satellites orbiting the earth. We can know where they are in space as they constantly transmit information regarding their position and current time to Earth in the through of radio signals. A GPS receiver listens to these signals. Once the receiver calculates its distance from at least three GPS satellites, it can be figured out where you are. This process is known as Trilateration. Figure 3.2 shows the trilateration process.

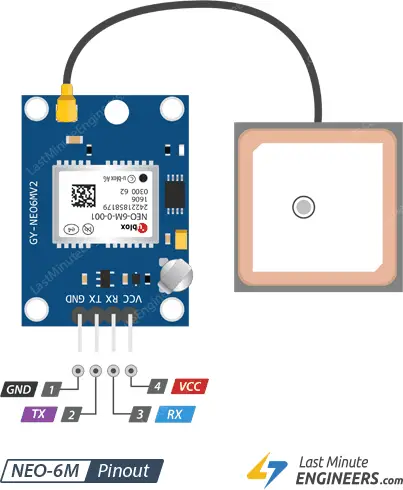


*Figure 3.2 Trilateration*

At the heart of the module is a GPS chip from U-blox – NEO-6M. The chip is smaller than a postage stamp, but despite this, it has a surprisingly large number of functionalities into its tiny frame. It can track up to 22 GPS satellites over 50 channels and achieve the level of tracking sensitivity i.e. -161 dB, while consuming power of only 45 mA current.

Unlike other GPS modules, it can perform 5 location updates in a second with 2.5m horizontal position accuracy. Additionally, the Time-To-First-Fix (TTFF) of the U-blox 6 positioning engine is less than one second [8].

Power Save Mode (PSM) is one of the chip's best features. This enables the selective on/off switching of specific receiver components, hence reducing system power usage. This significantly lowers the module's power consumption to just 11mA, making it appropriate for applications that require low power, including GPS wristwatches. The required data pins of the NEO-6M GPS chip are broken out to a 0.1″ pitch headers. It contains the pins needed for communication with the microcontroller over the UART. With a default baud rate of 9600, the module offers baud rates ranging from 4800bps to 230400bps. Figure 3.3 shows NEO-6M GPS. Figure 3.1 shows ESP8266 board. The detailed technical specifications of the components can be found in the respective datasheets. For instance, for the NEO-6M GPS module, please refer to datasheet [8] for more comprehensive technical details.



*Figure 3.3 NEO-6M GPS Module*

It's Specifications & Features are as follows:

* Receiver Type: 50 channels, GPS L1(1575.42Mhz)
* Horizontal Position Accuracy: 2.5m
* Navigation Update Rate: 1HZ (5Hz maximum)
* Capture Time Cool start: 27s
* Hot start: 1s
* Navigation Sensitivity: -161dBm
* Communication Protocol: NMEA, UBX Binary, RTCM
* Serial Baud Rate: 4800-230400 (default 9600)
* Operating Temperature: -40°C ~ 85°C
* Operating Voltage: 2.7V ~ 3.6V
* Operating Current: 45mA
* TXD/RXD Impedance: 510Ω
  + 1. **SIM800L GSM GPRS Module**

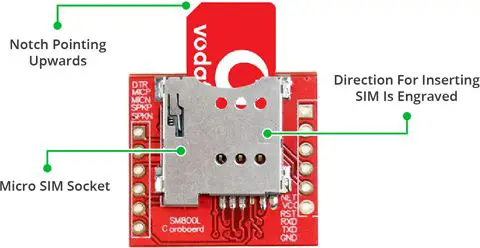
The SIM800L GSM GPRS module is a miniature GSM modem that can be used in almost every variety of IoT projects. This module can used to do almost everything a normal cell phone can do, such as sending and receiving SMS messages, making phone calls and using tele services, connecting to the Internet via GPRS and using data service, and much more. The module will function practically anywhere in the world because it supports quad-band GSM/GPRS networks, which is the best in module. The operating voltage of this module ranges from 3.4V to 4.4V, making it an ideal to use directly with LiPo battery supply. These features makes it an excellent choice for embedding in projects with limited power and limited space. The SIM800L GSM module has all of the pins needed for data communication separated out into headers with a pitch of 0.1′′, including the pins needed to communicate with the microcontroller via UART. The module has automated baud rate detection feature and supports baud rates ranging from 1200 bps to 115200 bps. To establish a network connection, an external antenna is necessary for the module. As a result, the module typically comes with a solderable helical antenna. If you would like to keep the antenna away from the board, there is a U.FL connector on the board as well. There’s a SIM socket on the back! Any 2G Micro SIM card inserted will work perfectly [4]. The proper way to insert the SIM card is typically engraved on the surface of the SIM socket over the module. Figure 3.1 shows SIM800L GSM/GPRS Module. The detailed technical specifications of the components can be found in the respective datasheets. For instance, for the SIM800L module, please refer to datasheet [7] for more comprehensive technical details.

It's Specifications & Features are as follows:

* Supports Quad-spectrum-band: GSM850, EGSM900, DCS1800 and PCS1900
* Using 2G SIM, it can connect to any global GSM network
* Can be connected with an external electret microphone & 8Ω speaker to make and receive voice calls
* Send and receive SMS messages
* Send and receive GPRS data using TCP/IP, HTTP, etc
* Scan and receive FM radio broadcasts
* Transmit Power: Class 4 (2W) for GSM850, Class 1 (1W) for DCS1800
* Serial-based AT Command Set
* FL connectors for cell antennae
* Accepts Micro SIM Card



*Figure 3.4 Front side of SIM800L Module*

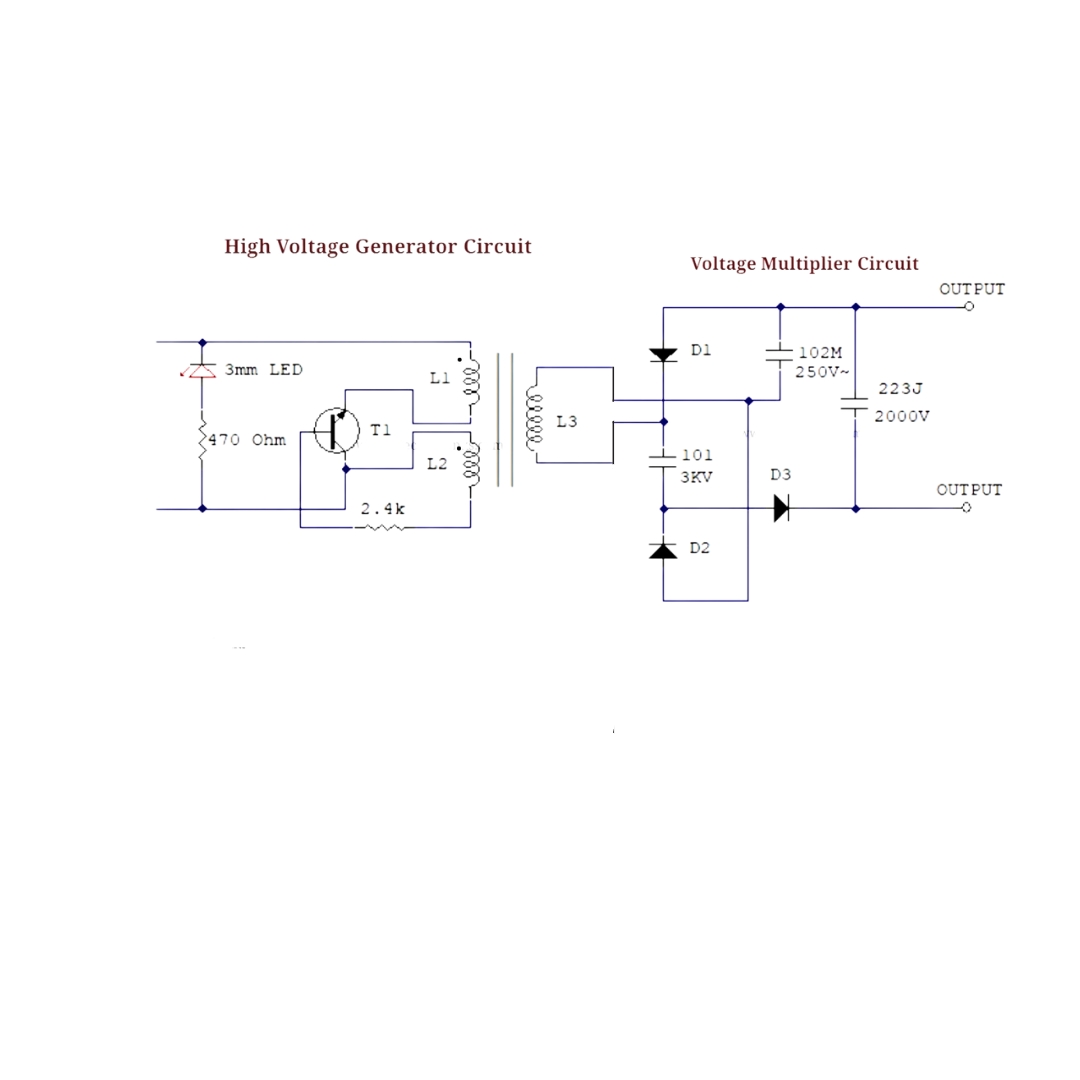


*Figure 3.5 Back side of SIM800L Module*

* + 1. **Shock generator circuit**

The shock generator circuit serves as an integral component within the "Woman Safety Device," designed to provide a self-defense mechanism when activated. This circuit employs a D882 transistor, a transformer, and a voltage multiplier circuit comprising diodes and capacitors to generate a high-voltage pulse for self-defense purposes. For circuit diagram of same is shown in figure 3.6. Its componential functional are as follows

* **D882 Transistor:** Functioning as a switch, the D882 transistor regulates the flow of current through the circuit based on input signals.
* **Transformer:** The transformer facilitates the elevation of the input voltage to a higher level for subsequent processing in the circuit.
* **Voltage Multiplier Circuit:** Comprised of diodes and capacitors, this circuit amplifies the voltage through rectification and energy storage stages.



*Figure 3.6 Shock generator circuit*

The D882 transistor operates as a control switch, managing the flow of current within the circuit upon activation. When triggered, the input voltage passes through the transformer, undergoing a step-up process to achieve an elevated voltage level. Subsequently, the voltage multiplier circuit further amplifies this voltage through a series of rectification and energy storage stages. This configuration results in a significant increase in voltage at the output, producing a high-voltage pulse. This output voltage is intended to serve as a deterrent or defense mechanism against potential threats, providing an added layer of security and self-defense capability to the "Woman Safety Device."

* + 1. **Arduino IDE software**

The Arduino IDE (Integrated Development Environment) is a software application used for programming and uploading code to Arduino and similar boards. It provides a user-friendly interface and a set of tools that simplify the development process for Arduino-based projects. The Arduino IDE is available for Windows, macOS, and Linux operating systems, making it accessible to a wide range of users. It provides a beginner-friendly environment while also offering advanced features for experienced developers. The Arduino IDE includes a code editor where you can write, edit, and organize your Arduino sketches (programs). It supports the Arduino programming language, which is based on C and C++. The code editor provides features like syntax highlighting, auto-completion, and code suggestions to assist in writing code. The Arduino IDE provides buttons to compile and upload your code to the connected Arduino board. The compilation process translates your code into machine-readable instructions, and the upload process sends the compiled code to the Arduino board, making it ready to execute. The Arduino IDE includes a serial monitor tool that enables communication between the Arduino board and your computer. It allows you to send and receive data between the Arduino and your computer, making it useful for debugging and monitoring the behaviour of your Arduino programs. It comes with a collection of example sketches that demonstrate various functionalities and features. These examples can serve as starting points for your own projects and provide valuable learning resources. Additionally, the Arduino website offers tutorials and guides to help you get started with Arduino development.

* 1. **ANY OTHER SUPPORTING TOOL USED**
     1. **ThingSpeak for Storing Location Data**

ThingSpeak is an IoT (Internet of Things) platform developed by MathWorks. It serves as a cloud-based platform that allows users to collect, analyze, and visualize data from various IoT devices. ThingSpeak served as a pivotal platform for the "Woman Safety Device," providing a secure and reliable means of storing and managing location data transmitted by the device. This cloud-based IoT platform offered seamless integration with the device, allowing for real-time data storage and visualization of transmitted location information. In the context of the "Woman Safety Device," ThingSpeak serves as a central platform for storing location data transmitted by the device. The GPS module, integrated with the ESP8266 MCU, sends the real-time location details to a ThingSpeak channel. This data can then be accessed and visualized through a dedicated webpage, enabling users to view the transmitted location information conveniently and securely.

The utilization of ThingSpeak ensures:

* **Data Security:** ThingSpeak's robust security protocols ensured the safe storage and access control of transmitted location data, maintaining user privacy.
* **Real-time Data Handling:** The platform's capability to handle and process real-time data transmission from the device facilitated immediate access to location information.
* **Visualization and Analysis:** ThingSpeak's graphical representation tools enabled the visualization of location data in a user-friendly interface, aiding in swift response and user reassurance.
* **Integration:** Allows integration with other IoT platforms and applications through APIs, facilitating data sharing and interoperability.
  + 1. **Webpage for Location Data Access**

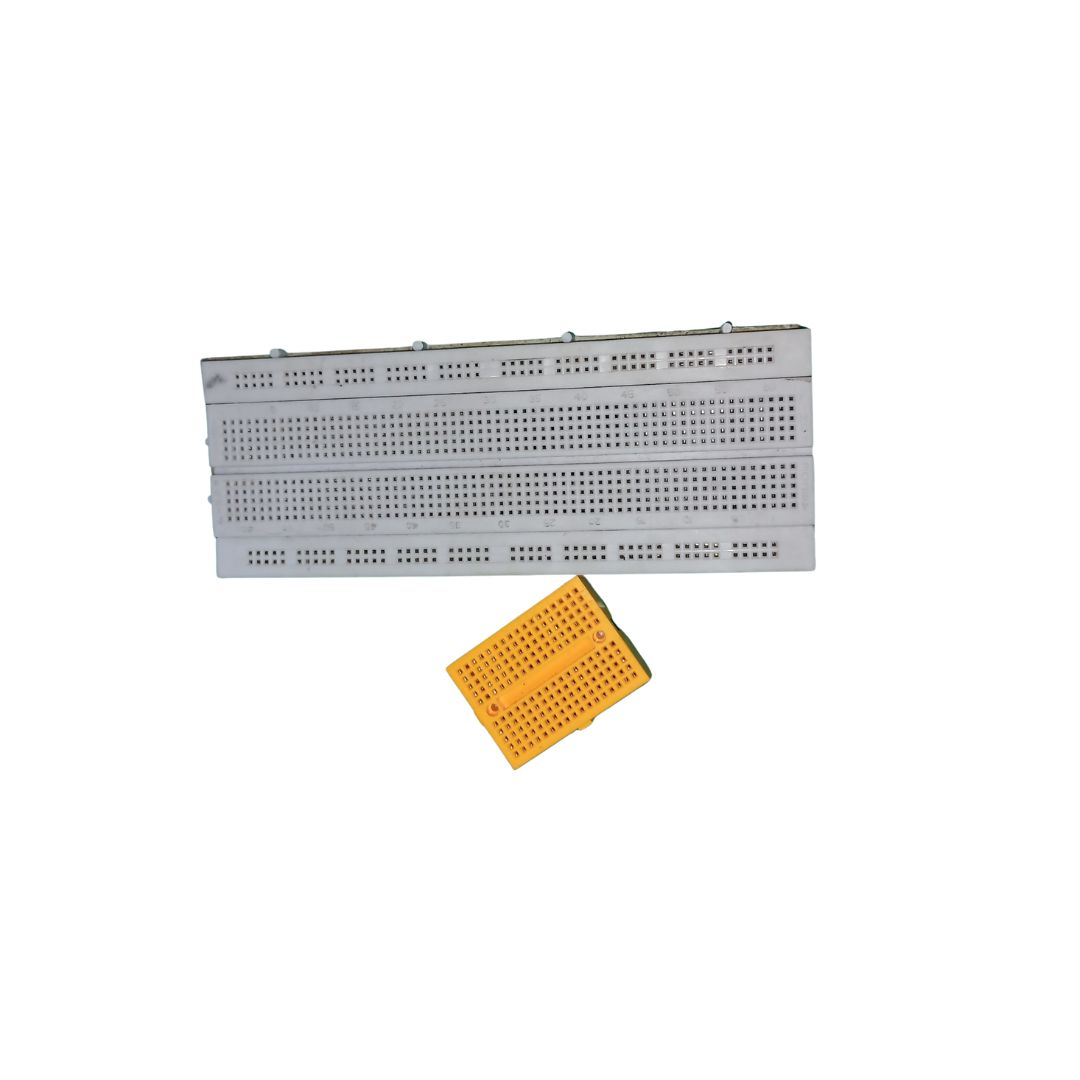
In addition to ThingSpeak, a dedicated webpage was developed to complement the device's functionality. This webpage served as an interface for authorized users to access and view transmitted location data securely. Key features of the webpage included:

* **Data Logging and Visualization:** The webpage facilitated the logging and visualization of location data received from ThingSpeak, presenting it in a user-friendly format.
* **Secure Access:** Implementing secure login credentials ensured that only authorized personnel could access the location data, maintaining data confidentiality.
* **User Interface:** The webpage's intuitive interface provided an easy-to-navigate platform for users to access the transmitted location information conveniently.

The integration of ThingSpeak for data storage and the development of a dedicated webpage further enhanced the functionality of the "Woman Safety Device," ensuring efficient data management and secure access to transmitted location data.

* + 1. **Breadboards**

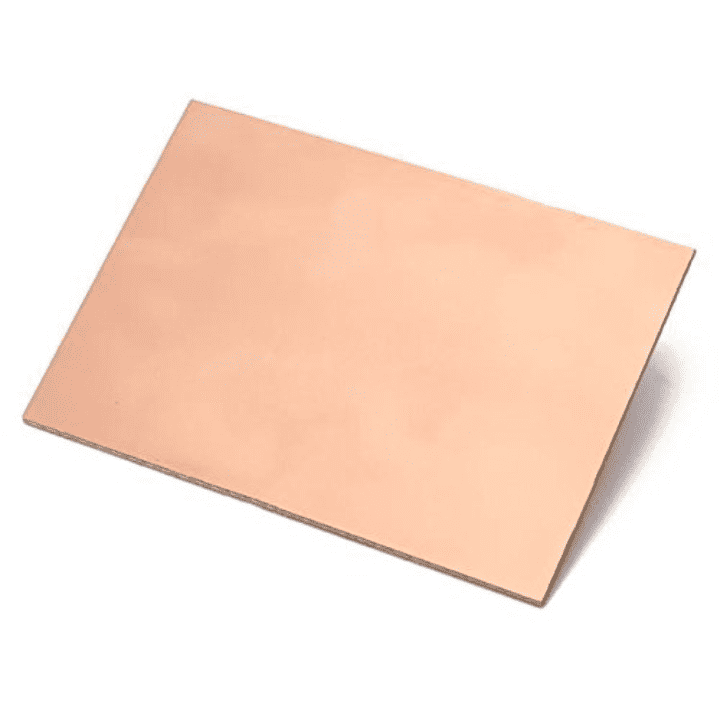
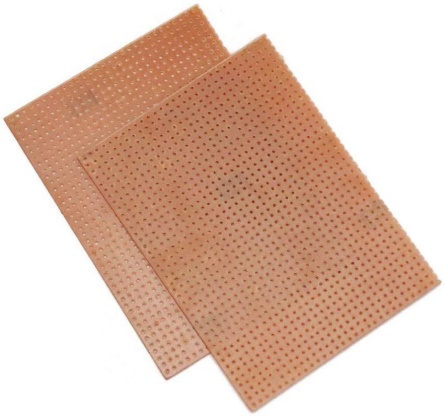
Breadboards are essential tools in electronics for prototyping and testing circuit designs without the need for soldering. They typically have rows and columns of tie points, providing a grid-like structure for placing components and creating connections across the board. Breadboards offer a platform to create temporary circuits by inserting electronic components into interconnected holes or sockets, known as tie points or nodes. Components are mounted onto the breadboard by simply plugging them into the interconnected holes, eliminating the need for soldering or permanent connections. Facilitates quick experimentation and iteration as components can be easily inserted, moved, or replaced, allowing for rapid design changes. In Figure 3.7, a typical breadboard is shown, a common tool in electronics prototyping, features a grid-like structure with interconnected holes for inserting and testing various electronic.



*Figure 3.7 Breadboard*

* + 1. **PCB Board**

A PCB (Printed Circuit Board) is a fundamental component in electronics used to mechanically support and electrically connect electronic components using conductive pathways or traces etched onto a non-conductive substrate. Holes or pads on the PCB allow components like resistors, capacitors, integrated circuits, and transistors to be soldered onto the board. A typical PCB is shown in figure 3.8.



*Figure 3.8 PCB Board*

In the context of the "Woman Safety Device," a PCB could be used as the foundation for assembling and interconnecting various electronic components (like the ESP8266, GPS module, GSM module, shock generator, etc.) into a compact and organized circuit. A well-designed PCB enhances reliability, reduces interference, and provides a more robust and professional-looking solution compared to point-to-point wiring or breadboard prototyping.

* + 1. **Soldering iron and Solder**

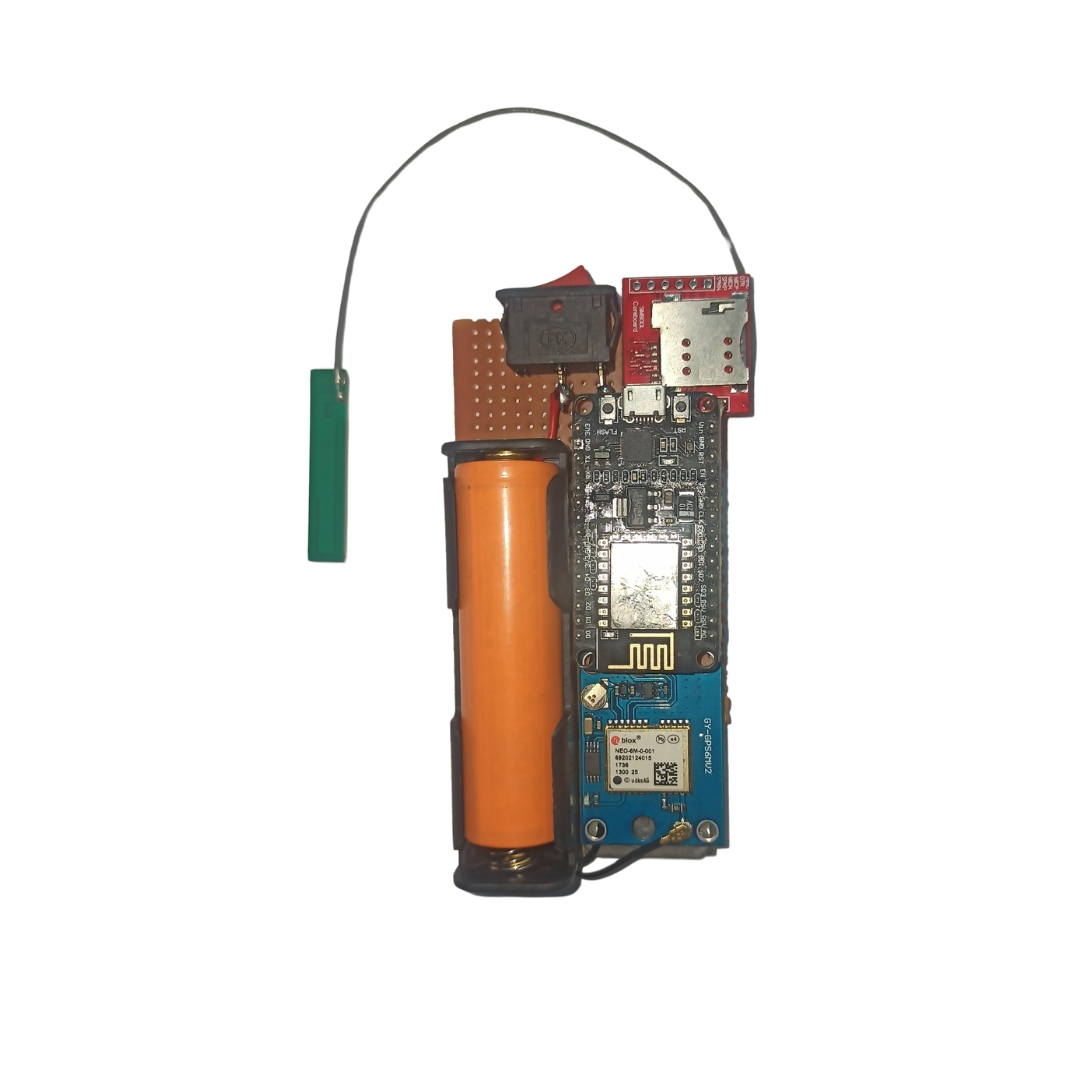
A soldering iron and solder are essential tools for assembling electronic components onto a PCB or creating electrical connections. A soldering iron is a handheld tool with a heated metal tip used to melt solder and create electrical connections by joining components. Different tip shapes and sizes of soldering iron accommodate various soldering tasks, providing versatility for different solder joint sizes and component types. Solder is a fusible metal alloy used to create a conductive bond between components. Common solder alloys include tin-lead (Sn-Pb) or lead-free compositions like tin-copper-silver (Sn-Cu-Ag). Solder is available in wire form for hand soldering or as solder paste for surface-mount component soldering. older melts at a relatively low temperature, allowing it to flow and create strong electrical connections without damaging sensitive components. Some solders come with a flux core, a chemical cleaning agent that helps in removing oxidation and facilitating the soldering process by improving wetting. Figure 3.9 shows soldering iron, solder and flux.



*Figure 3.9 Soldering iron & Solder*

* 1. **IMPLEMENTATION**

The initial phase of implementation involved creating a physical prototype of the "Woman Safety Device." Figure 3.10 showcases the compact design and prominent SOS button or panic button integrated into the device, enabling users to trigger distress signals swiftly.



*Figure 3.10 Women safety device prototype*

The shock generator circuit, depicted in Figure 3.11, incorporated a D882 transistor, a transformer, and a voltage multiplier circuit. This configuration facilitated the generation of high-voltage pulses for self-defense purposes.

A green circuit board with various components

Description automatically generated

*Figure 3.11 Shock Generator Prototype*

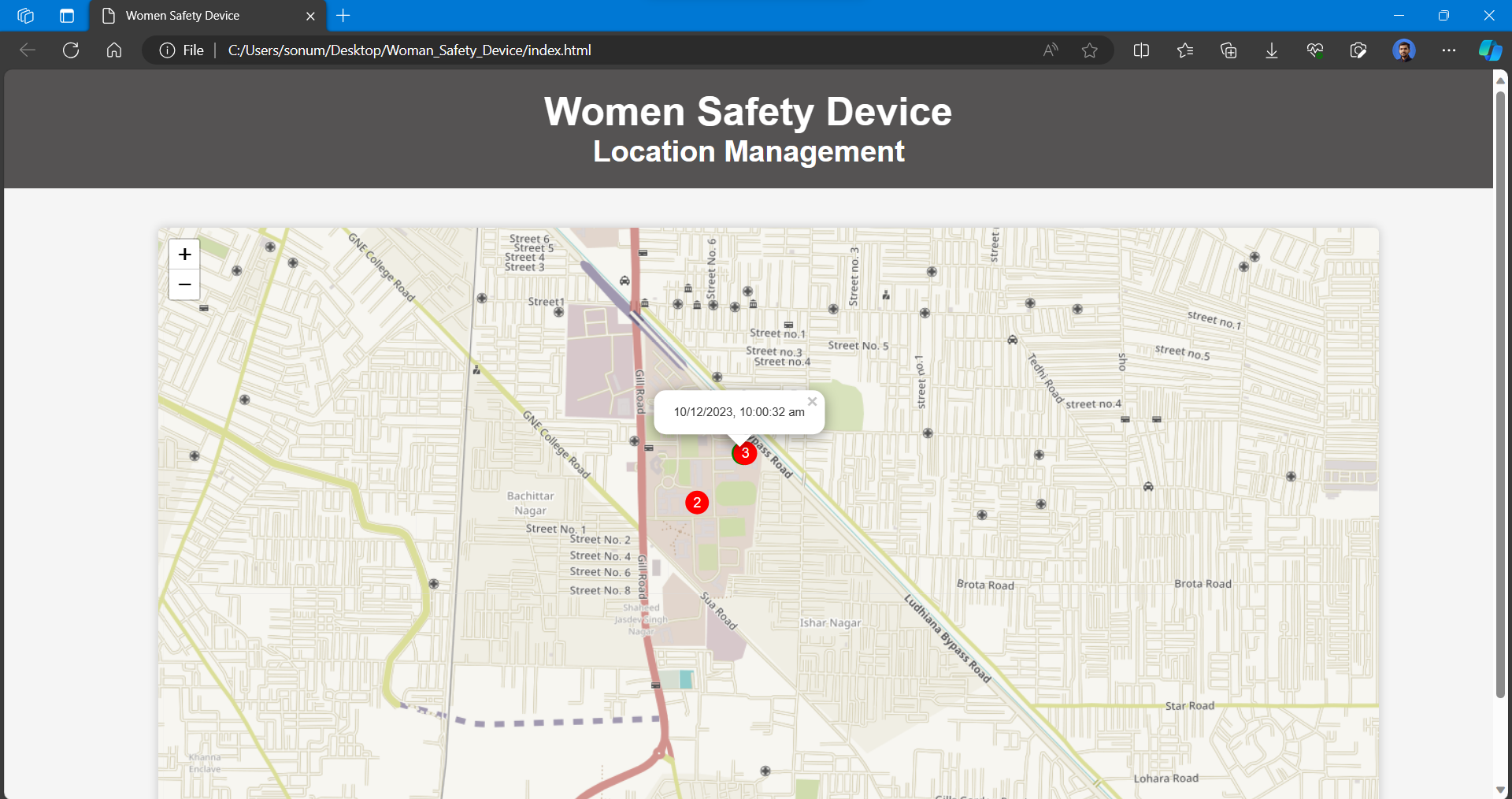
Figure 3.12 depicts the notification received by predefined contacts or authorities upon activation of the distress signal. This SMS contains crucial information, including the user's distress message and accurate location data, ensuring swift response and assistance.

A screenshot of a phone

Description automatically generated

*Figure 3.12 received SMS notification*

To complement ThingSpeak, a dedicated webpage interface (figure 3.13) is developed. This interface facilitated secure access to transmitted location data, ensuring users could view the information conveniently.



*Figure 3.13 Webpage Interface*

* 1. **TESTING AND VERIFICATION**

The primary focus during testing was the efficiency and reliability of distress signal transmission. A series of simulated distress scenarios were created to assess the device's response time and accuracy in transmitting distress signals to predefined contacts. Figure 3.4.1 displays the results of these tests, indicating the response times recorded in various simulated scenarios. Another crucial aspect was evaluating the accuracy of location tracking. By triggering distress signals in controlled environments, the accuracy of the location data transmitted to ThingSpeak was assessed. Testing of the shock generator circuit was conducted under controlled conditions to measure the voltage output and effectiveness of the self-defense mechanism. Voltage output produced by the shock generator circuit when activated, validating its functionality for self-defense purposes.

1. **CONCLUSION AND FUTURE SCOPE**
   1. **CONCLUSION**

The development and implementation of the "Woman Safety Device" stand as a testament to our commitment to enhancing personal safety measures for individuals in vulnerable situations. Throughout this project, our team diligently conceptualized, designed, and executed a multifunctional device aimed at providing immediate assistance and empowerment to users facing potential threats. The integration of distress signaling, precise location tracking, and an optional shock generator circuit has resulted in a comprehensive safety solution. Rigorous testing and validation phases have affirmed the reliability and effectiveness of the device, ensuring its readiness for real-world applications. This endeavor has been driven by a collective vision to leverage technology for the greater good, with a focus on empowering individuals to navigate their daily lives with a heightened sense of security.

As we conclude this phase of the project, we acknowledge the collaborative efforts and dedication of the team members, whose expertise and commitment have been instrumental in bringing this vision to fruition. The "Woman Safety Device" stands not just as a technological achievement but as a symbol of our commitment to creating a safer world for all. The future holds immense potential for further refinement, innovation, and the integration of advanced technologies to continually improve the device's capabilities and accessibility.

In essence, the "Woman Safety Device" is not merely a product but a testament to our dedication to leveraging technology for the betterment of society, ensuring that every individual feels empowered and secure in their daily lives.

* 1. **FUTURE SCOPE**

The "Woman Safety Device" lays the groundwork for ongoing advancements in personal security technology. Looking ahead, the scope for further development encompasses several key areas. Refinement of the device's user interface remains a priority, aiming for enhanced accessibility and user-friendliness. Exploring the integration of advanced technologies, such as AI-based threat detection and seamless connectivity with emergency services, stands as a promising avenue for swift and effective responses. Additionally, optimizing battery performance is crucial to ensure prolonged device reliability. Engaging communities through educational initiatives will play a pivotal role in raising awareness and fostering widespread adoption. The future holds immense potential for the "Woman Safety Device," poised to continually evolve as a reliable and empowering solution for ensuring personal safety in various settings.

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**APPENDIX**

**Code uploaded to ESP8266 using Arduino IDE:**

#include <SoftwareSerial.h>

#include <ESP8266WiFi.h>

#include <TinyGPS++.h>

#include <ThingSpeak.h>

// Define the pins for communication with the modules.

const int gpsRxPin = D1;

const int gpsTxPin = D2;

const int gsmRxPin = D6;

const int gsmTxPin = D5;

const int SOSpin = D8;

const char\* ssid = "windows";

const char\* password = "sonukaphone";

const char\* apiKey = "KFD1H0D3KEZ3W60J";

const unsigned long channelID = 2337349;

const String PHONE = "+917634859782";

float Latitude, Longitude;

String LatitudeString, LongitudeString;

int responseStatus = 0; // Global variable to hold the response status

unsigned long previousMillis = 0; // Store the last time data was sent

const unsigned long interval = 300000; // Interval in milliseconds (5 minute)

TinyGPSPlus gps;

WiFiClient client;

SoftwareSerial gpsSerial(gpsTxPin, gpsRxPin); // Create a SoftwareSerial object for GPS communication

SoftwareSerial gsmSerial(gsmTxPin, gsmRxPin); //// Create a SoftwareSerial object for GSM communication

void updateGsmSerial() {

delay(500);

while (Serial.available()) {

gsmSerial.write(Serial.read()); //Forward what Serial received to gsm Serial Port

}

delay(500);

while (gsmSerial.available()) {

Serial.write(gsmSerial.read()); //Forward what gsm Serial received to Serial Port

}

}

// Pass 0 or 1 for field3

void sendToThingSpeak(int field3Value) {

Serial.println("Sending data to ThingSpeak");

if(WiFi.status() != WL\_CONNECTED){

return;

}

// Set values to fields

ThingSpeak.setField(1, LatitudeString);

ThingSpeak.setField(2, LongitudeString);

ThingSpeak.setField(3, field3Value);

// Write to ThingSpeak

responseStatus = ThingSpeak.writeFields(channelID, apiKey);

delay(100); // Send data to ThingSpeak(adjust as needed)

}

void setup() {

// put your setup code here, to run once:

LatitudeString = "30.858735", LongitudeString = "75.861335";

Serial.begin(9600);

Serial.println("Initializing project");

pinMode(SOSpin, INPUT);

pinMode(LED\_BUILTIN, OUTPUT);

digitalWrite(LED\_BUILTIN, LOW);

gpsSerial.begin(9600);

gsmSerial.begin(9600);

WiFi.begin(ssid, password);

delay(10000);

// Setting up SIM800L

gsmSerial.println("AT+CSMP=17,167,0,0"); //Once the handshake test is successful, it will back to OK

updateGsmSerial();

ThingSpeak.begin(client);

Serial.println("Entering loop");

}

void loop() {

// put your main code here, to run repeatedly:

int blackSwitch = digitalRead(SOSpin);

Serial.println(blackSwitch);

while (gpsSerial.available() > 0) {

if (gps.encode(gpsSerial.read())) {

if (gps.location.isValid()) {

Latitude = gps.location.lat();

LatitudeString = String(Latitude, 6);

Longitude = gps.location.lng();

LongitudeString = String(Longitude, 6);

}

delay(100);

}

}

if (blackSwitch == HIGH) {

String mapUrl = "Help! "+"http://maps.google.com/maps?&z=15&mrt=yp&t=k&q=" + LatitudeString + "+" + LongitudeString;

digitalWrite(LED\_BUILTIN, LOW);

gsmSerial.println("AT"); // checking connectivity

updateGsmSerial();

gsmSerial.println("AT+CMGF = 1");

updateGsmSerial();

// gsmSerial.println("AT+CMGDA=\"DEL ALL\""); //free storage for sms

// updateGsmSerial();

delay(10000);

gsmSerial.print("AT+CMGF=1\r");

delay(1000);

gsmSerial.print("AT+CMGS=\"" + PHONE + "\"\r");

delay(1000);

gsmSerial.print(mapUrl);

delay(100);

gsmSerial.write(0x1A); //ascii code for ctrl-26 i.e end of line

delay(1000);

updateGsmSerial();

delay(1000);

Serial.println("SMS Sent Successfully.");

sendToThingSpeak(1);

}

unsigned long currentMillis = millis();

if (currentMillis - previousMillis >= interval || responseStatus!=200) {

sendToThingSpeak(0);

previousMillis = currentMillis;

}

digitalWrite(LED\_BUILTIN, HIGH);

delay(1000);

}

**HTML Code for Webpage:**

<!DOCTYPE html>

<html lang="en">

<head>

<meta charset="UTF-8">

<meta name="viewport" content="width=device-width, initial-scale=1.0">

<link rel="stylesheet" href="style.css">

<link rel="stylesheet" href="https://unpkg.com/leaflet@1.7.1/dist/leaflet.css" />

<script src="https://unpkg.com/leaflet@1.7.1/dist/leaflet.js"></script>

<title>Women Safety Device</title>

</head>

<body>

<header>

<h1>Women Safety Device</h1>

<h2>Location Management</h2>

</header>

<div class="container">

<section>

<p>The project entitled "Woman Safety Device" integrates GPS tracking, GSM communication, and a shock generator for

self-defense, sending distress signals and location details during emergencies for enhanced personal

safety. This device utilizes ESP8266, GPS, GSM modules, and a dedicated webpage via ThingSpeak for data

transmission and visualization.</p>

</section>

<section id="map"></section>

</div>

<script src="script.js"></script>

</body>

</html>

**CSS Code for Webpage:**

body {

  font-family: Arial, sans-serif;

  background-color: #f5f5f5;

  margin: 0;

  padding: 0;

}

.container {

  max-width: 1200px;

  margin: 0 auto;

  padding: 20px;

}

section {

  margin: 20px 0;

  padding: 20px;

  background-color: #fff;

  border-radius: 5px;

  box-shadow: 0 0 10px rgba(0, 0, 0, 0.2);

  width: 100%;

}

p{

  text-align: justify;

  margin: 0;

}

header {

  background-color: #555353;

  color: #fff;

  padding: 20px 0;

  text-align: center;

}

h1{

  margin: 0;

}

h2 {

  margin: 0;

}

#map {

  height: 600px;

}

**JavaScript Code for Webpage:**

var map = L.map('map').setView([30.858734, 75.861631], 15); // Set initial view with zoom level

// Add a tile layer with satellite imagery (HOT imagery from OpenStreetMap)

L.tileLayer('https://{s}.tile.openstreetmap.fr/hot/{z}/{x}/{y}.png', {

    attribution: '© <a href="https://www.openstreetmap.org/">OpenStreetMap</a> contributors, Imagery © <a href="https://www.hotosm.org/">Humanitarian OpenStreetMap Team</a>',

    maxZoom: 19 // Adjust max zoom level if needed

}).addTo(map);

// Function to fetch and update markers

function fetchAndUpdateMarkers() {

    var channelID = '2337349';

    var url = 'https://api.thingspeak.com/channels/' + channelID + '/feeds.json?results=50';

    fetch(url)

        .then(response => response.json())

        .then(data => {

            // Clear existing markers

            map.eachLayer(layer => {

                if (layer instanceof L.Marker) {

                    map.removeLayer(layer);

                }

            });

            // Access the 'feeds' array from the response data

            var feeds = data.feeds;

            // Loop through the feeds and create colored and numbered markers based on field3 value

            feeds.forEach((feed, index) => {

                var latitude = parseFloat(feed.field1);

                var longitude = parseFloat(feed.field2);

                var field3 = parseFloat(feed.field3);

                var createdAt = new Date(feed.created\_at).toLocaleString(); // Convert timestamp to a readable format

                // Set marker color based on field3 value

                var markerColor = field3 === 1 ? 'red' : 'green';

                // Create a numbered and colored marker

                var marker = L.marker([latitude, longitude], {

                    icon: coloredNumberedIcon(index + 1, markerColor)

                }).addTo(map);

                // Bind popup with timestamp to marker

                marker.bindPopup(createdAt);

            });

        })

        .catch(error => {

            console.error('Error fetching JSON:', error);

        });

}

// Function to create colored and numbered icon

function coloredNumberedIcon(number, color) {

    return L.divIcon({

        className: 'colored-number-icon',

        html: '<div style="font-size: 14px; color: white; background-color: ' + color + '; border-radius: 50%; width: 24px; height: 24px; text-align: center; line-height: 24px;">' + number + '</div>'

    });

}

// Fetch and update markers initially

fetchAndUpdateMarkers();

// Refresh data every 30 seconds

setInterval(fetchAndUpdateMarkers, 30000);

  font-family: Arial, sans-serif;

  background-color: #f5f5f5;