A MINI PROJECT REPORT ON

Women's Safety Alert Device Using Arduino

BY

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UNDER THE GUIDANCE OF

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IN PARTIAL FULFILLMENT OF

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Certificate

This is to certify that the project entitled "Women's Safety Alert Device Using Arduino" submitted by

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is record of bonafide work carried out by them under my guidance, in partial fulfillment of requirement for the award of Third Year Engineering (Electronics & Telecommunication Engineering) of Savitribai Phule Pune University.

Date:

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Thanking You.

INDEX

Figure Table

Abstract

In this modern world, women security is still the biggest issue in every country. Still women are not allowed to move freely even in the streets without worrying about their security. Parents are worried about their security which has become the first barrier to send their daughters for job, tuition/coaching, party/outings, trips, etc. Day by day, women harassment has been increasing. Some women fear to go in dark because of the past records of women harassments, sexual assaults, eve teasing, etc.

We can't change the society totally but we can increase the security of girls by using modern technology. If women could seek for help with an SOS signal to their closed ones, such as parents, friends, relatives, neighbors, etc. it would bring courage and a ray of light/hope in a woman on such encounter. The proposed system for women consists of a alerting device which operates when push button is pressed. Here the security/alerting feature for the women is provided by the continuous monitoring of her location by the GPS Module. Once the button is pressed, a HELP message with Google Map location URL on registered contact numbers will be sent. Those contacts could just click on the URL received in their mobile's chat box, track her location and go out for help.

Chapter 2: Introduction and Literature Survey

2.1 Introduction

Women safety in India is a big problem, Safety of women matters a lot whether at home, outside the home or working place. Areas like streets, public spaces, public transport, etc. have been the territory of women hunters. Safety of women in India is a vast topic now-a-day. We cannot say that women are safe in India by seeing the last few year crimes against women especially in the national capital. Women generally are afraid to go alone outside. Despite of formation of various effective rules and regulations by the Indian government to handle and control the crimes against women, the number of crimes against women are increasing day by day. Rape is the most common crime against Women in India.

According to latest National Crime Records Bureau (NCRB) 2019 annual report, 32,260 rape cases are reported across only India. The number of reported rape cases has been steadily increasing over the past decade. Women in the society must be provided with devices with latest technology which provides her location using GPS technology to a central control room of police or send messages of her address to nearby locations. Public outrage after the brutal rape and murder of the 23-year-old student, “Nirbhaya” in Delhi on 16 December 2012 has focused greater attention on necessity for holistic measures for security and safety of women. It becomes evident when we look at various happenings taking place around the world, where the identity of woman has been misunderstood by a few individuals in the society and an 7attempt to harm a woman’s social status has been made and while it may be decades or centuries before the world becomes a safer place for us, there are several things we can and must do to protect ourselves.

2.2 Literature Survey

In this **Paper [1]**, the authors proposed a GPS based women's safety system that has dual security feature. The proposed system consists of a dual alert 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 neighbors.
The proposed system is complex and costlier.

In this **Paper [2],** the authors proposed a device that consists of a trigger, microcontroller (ATmega2560), GSM module (SIM900), GPS module (Neo-6M), IoT module (ESP-12E), Neuro Stimulator, Buzzer and Vibrating Sensor. In their project, when a woman senses danger she has to hold ON the trigger of the device. Once the device is activated, it tracks the current location using GPS (Global Positioning System) and sends emergency message using GSM (Global System for Mobile communication) to the registered mobile number and nearby police station. IoT module is used to track the location continuously and update into the webpage. Neuro Stimulator will produce non-lethal electric shock in emergency situations to detect the attacker, buzzer is used as an alarm to alert the nearby people so that they may understand that someone is in need and vibrating sensor will send the last location in case if the device gets defected.

In this **Paper [3],** the authors proposed a smart security wearable device for women based on Internet of Things. It is implemented in the form of a smart device and comprises of Arduino, Matlab based camera, buzzer and button to activate the services. A click of a button that will fetch her current location and also capture the image of the attacker via Matlab based camera. The location and the link of the GPS Values will be sent to predefined emergency contact numbers or police via smart phone of the victim.

In this **Paper [4]**, the authors proposed a device that consists of an ATmega328 microcontroller, GSM module, GPS modules. The system resembles a normal device which when activated, tracks the place of the women using GPS (Global Positioning System) and sends emergency messages and call using GSM (Global System for Mobile communication), to family member and the police control room.

Chapter 3: System Specification and Block Schematic

3.1 Hardware Requirement

- Regulated Power Supply
  - Arduino UNO
  - GSM Module [SIM900A]
  - Mobile
  - GPS Module [NEO-6M]
  - Push Button
  - Resistor [1k – 10k Ohm]
  - Breadboard
  - 12V Adapter
  - Jumper Wires (Male & Female, both)

- **Software**
  - Arduino IDE
  - Proteus for hardware simulation
  - Fritzing for Circuit design

3.2 Block Schematic

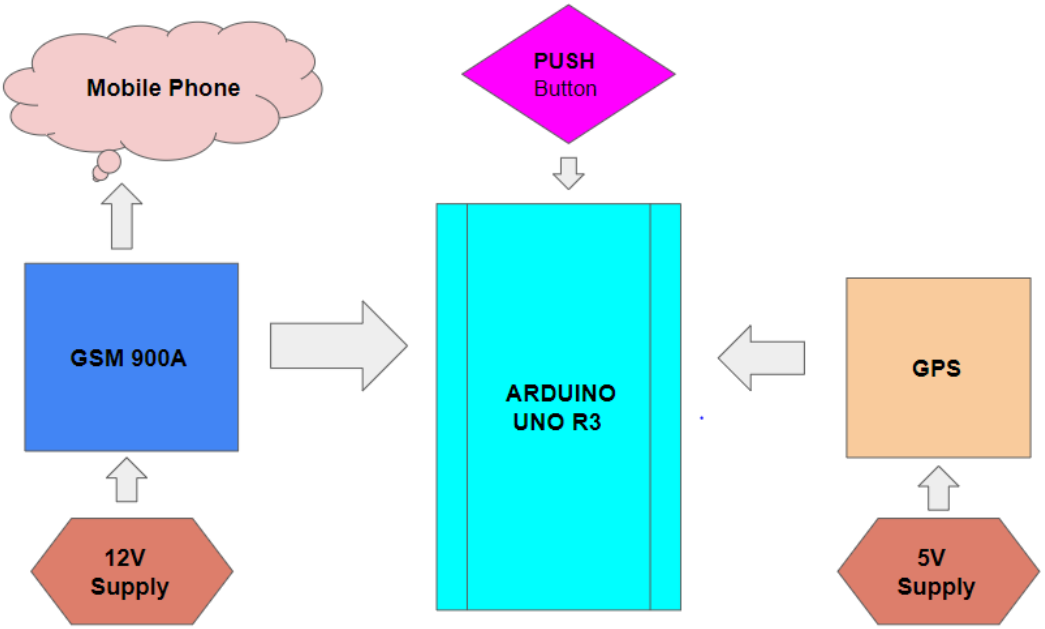


Figure 3.2.1 – Block Diagram

- Our Arduino is the main functioning part of the proposed system.
- GSM, GPS & Push Button are all connected with the Arduino.
  - GSM receives a 12V, 2A power supply (Adapter) that provides the message delivering feature with a help of 2G/3G/4G sim card inserted into it.
  - GPS receives a 5V power supply through Arduino 5V pin that provides the location monitoring feature and with it's help, location coordinates could be obtained and in the form of Google Map's location URL.
  - The whole system acts on a button press. Once the push button is pressed, location coordinates is recorded in the Arduino and finally a HELP message with those coordinates is sent to the registered mobile numbers.

Chapter 4: Hardware Design / Technical Details

4.1 Hardware Design

- **Power Supply Design**

The power range of Arduino UNO is from 3V to 5V. The transmitting burst will cause voltage drop and the power supply must be able to provide sufficient current up to 2A. For the DC car power input, a bypass capacitor of 100uF was used and placed as close as possible to Arduino UNO DC input pins. Since there is a high drop-out between inputand desired output, a DC-DC power supply will be preferable because of its better efficiency especially with the 2A peak current in burst mode of the module. During the power supply design, attention was paid to power losses. The voltage was never allowedto drop below 3.1V even when current consumption rises to 2A in the transmit burst sincethe module would shut down automatically. The PCB traces from the VBAT pins to the power supply should be wide enough to decrease Voltage drops in transmit burst. The bypass capacitor was placed close to the module as possible. The single 3.7V Li-ion cellbattery can be connected to Arduino UNO pins directly. A Li-ion 3.7V 1000mAhbatterywas chosen with a limited charge voltage of 4.2V. When battery is used, the total impedance between battery and pins should be less than 150m2, this was confirmed by useof a digital multimeter.

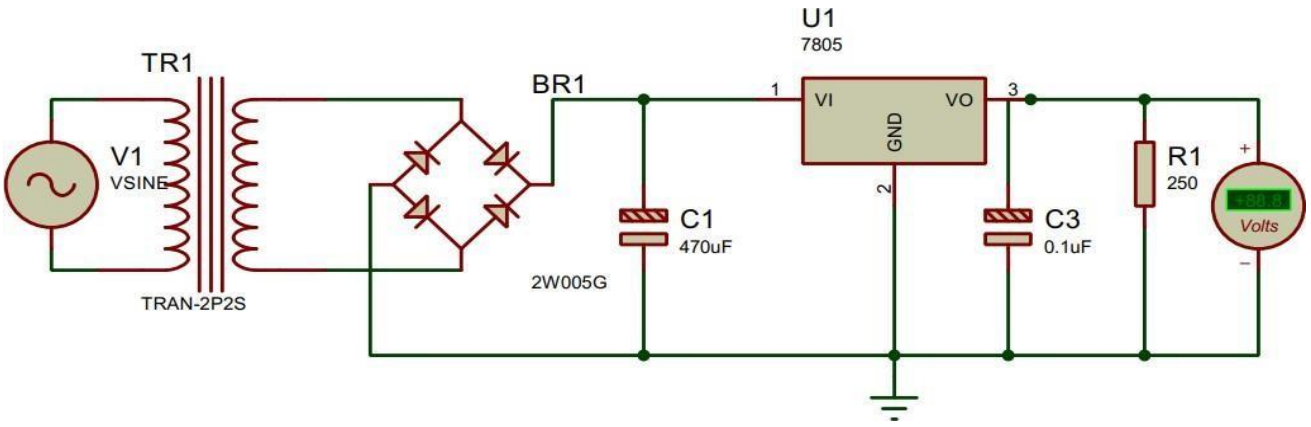


Figure 4.1.1. Power Supply Design

- **Power Supply Design Calculation**

As per datasheet

C2 = 0.33 microfarad (to avoid ripple after filtering)

C3= 0.1 microfarad (to avoid transient changes)

Ci is Filter Capacitor

Rectifier Vtg drop = 1.4V

Vreq =Vrec= 7V

(According to datasheet of 1805)

Vdrop = 1.4 V

Vsec =Vrec +Vdrop

=7+1*4

=8.4V (peak voltage)

Vsec (Rms)= Vsec/2

=6V Rms

LM7805 INPUT Voltage 7V-18V

Turns Ratio = Vp/Vs

= (230V)/(6v)

=36.66 = 37V

Transformer – 6Vrms And 1A Rating

diodes = IN4001

C 1, - Smoothing Capacitor Rating must be at least 10% more than Vsec

Rp = Ripple factor = 3v=0.03

V0ut = 5V

Rp = Vr (Pr) / Vout

Vr (pp) = peak to peak ripple voltage

Vr(pp) = Rp * Vout
= 0.03*5
= 0.15V
Vr (pp) = (1/ f*RL*C1) * Vrec
C1 = (1/ f*RL*Vrpp) * Vrec

C1=1/(120 * RL* 0.15)*7
RL=Load Resistance = Vout/Iout
= 5V/230mA
= 20 ohm

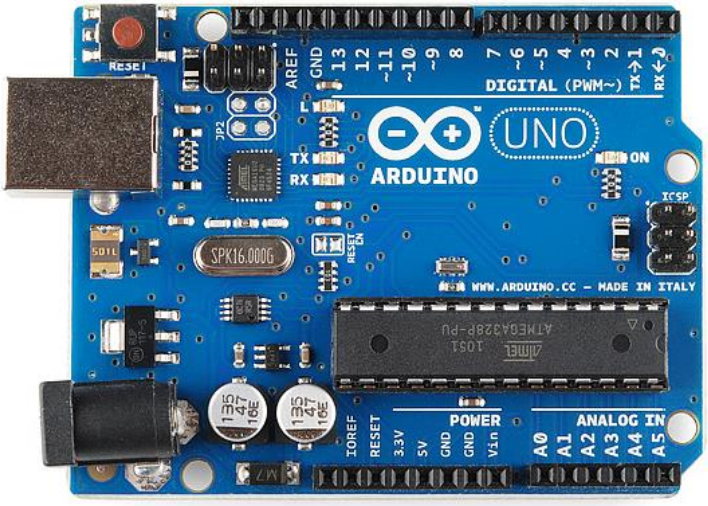
C1=1/(120 * 20* 0.15)*7
=397 microfarad
=470 microfaradTransformer 6Vrms & 1A

diode – IN4001 (full bridge rec).

C1 = 470 microfarad
C2 = 0.33 microfarad
C3 = 0.1 microfarad
Ic = 7805
Resistance = 20ohm

4.2 Technical details

1) Arduino Uno R3



Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code
To the physical board. The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware called a programmer) in order to load new code on to the board-you can
Simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package.

The Arduino Uno is a microcontroller board based on the ATmega328. It has 20 digital input/output pins (of which 6 can be used as PWM output sand can be used as a log inputs), a16MHz resonator, a USB connection, a power jack, an in-circuit system programming (ICSP) header, and a reset button. It contains
Everything needed to support the microcontroller: simply connect it to a computer (or appropriate wall power adapter) with a USB cable or power it with an AC-to-DC adapter or battery to get started.

- Microcontroller: ATmega328P
- Operating Voltage: 5V
- Input Voltage (recommended): 7-12V
- Input Voltage (limit): 6-20V
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- PWM Digital I/O Pins: 6
- Analog Input Pins: 6.
- DC Current per I/O Pin: 20 mA
- DC current for 3.3V Pin: 50 mA
- Flash Memory: 32 KB
- SRAM: 2 KB
- EEPROM: 1 KB
- LED_BUILTIN: 13
- Length: 68.6mm
- Width: 53.4mm
- Weight: 25g

2) GSM Module

GSM (or Global System for Mobile Communications) was developed in 1990. The first GSM operator has subscribers in 1991, the beginning of 1994 the network based on the standard, already had 1.3million subscribers, and the end of 1995.

The **SIM900A** is a readily available **GSM/GPRS module**, used in many mobile phones and PDA. The module can also be used for developing IOT (Internet of Things) and Embedded Applications. SIM900A is a dual-band GSM/GPRS engine that works on frequencies EGSM 900MHz and DCS 1800MHz. SIM900A features GPRS multi-slot class 10/ class 8 (optional) and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4.

- Dual-Band 900/ 1800 MHz
- GPRS multi-slot class 10/8
- GPRS mobile station class B
- Dimensions: 24x24x3mm
- Weight: 3.4g
- Control via AT commands
- SIM application toolkit
- Supply voltage: 12V, 2A
- Low power consumption: 1.0Ma (sleep mode)
- Operation temperature: - 40°C to + 85 °C

3) GPS Module

The NEO-6M GPS module is a well-performing complete GPS receiver with a built-in 25 x 25 x 4mm ceramic antenna, which provides a strong satellite search capability. With the power and signal indicators, you can monitor the status of the module. Thanks to the data backup battery, the module can save the data when the main power is shut down accidentally. Its 3mm mounting holes can ensure easy assembly on your aircraft, which thus can fly steadily at a fixed position, return to Home automatically, and automatic waypoint flying, etc. Or you can apply it on your smart robot car for automatic returning or heading to a certain destination, making it a real "smart" bot!

- Receiver Type: 50 Channels, GPS L1(1575.42Mhz)
- Horizontal Position Accuracy: 2.5m
- Navigation Sensitivity: -161dBm
- Communication Protocol: NMEA, UBX Binary, RTCM
- TXD/RXD Impedance: 510Ω
- Serial Baud Rate: 4800-230400 (default 9600)

4) Push Button

A **push-button** (also spelled **pushbutton**) or simply **button** is a simple switch mechanism to control some aspect of a machine or a process. Buttons are typically made out of hard material, usually plastic or metal. The surface is usually flat or shaped to accommodate the human finger or hand, so as to be easily depressed or pushed. Buttons are most often biased switches, although many un-biased buttons (due to their physical nature) still require a spring to return to their un-pushed state. Terms for the "pushing" of a button include **pressing**, **depressing**, **mashing**, **slapping**, **hitting**, and **punching**.

- Mode of Operation: Tactile feedback
- Power Rating: MAX 50mA 24V DC
- Insulation Resistance: 100Mohm at 100v
- Operating Force: 2.55±0.69 N
- Contact Resistance: MAX 100mOhm
- Operating Temperature Range: -20 to +70 ℃
- Storage Temperature Range: -20 to +70 ℃

5) Resistor

A **resistor** is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses. High-power resistors that can dissipate many watts of electrical power as heat may be used as part of motor controls, in power distribution systems, or as test loads for generators. Fixed resistors have resistances that only change slightly with temperature, time or operating voltage. Variable resistors can be used to adjust circuit elements (such as a volume control or a lamp dimmer), or as sensing devices for heat, light, humidity, force, or chemical activity.

Resistors are common elements of electrical networks and electronic circuits and are ubiquitous in electronic equipment. Practical resistors as discrete components can be composed of various compounds and forms. Resistors are also implemented within integrated circuits.

The electrical function of a resistor is specified by its resistance: common commercial resistors are manufactured over a range of more than nine orders of magnitude. The nominal value of the resistance falls within the manufacturing tolerance, indicated on the component

- Resistance value
- Tolerance and
- Wattage rating

4.3 Circuit Diagram

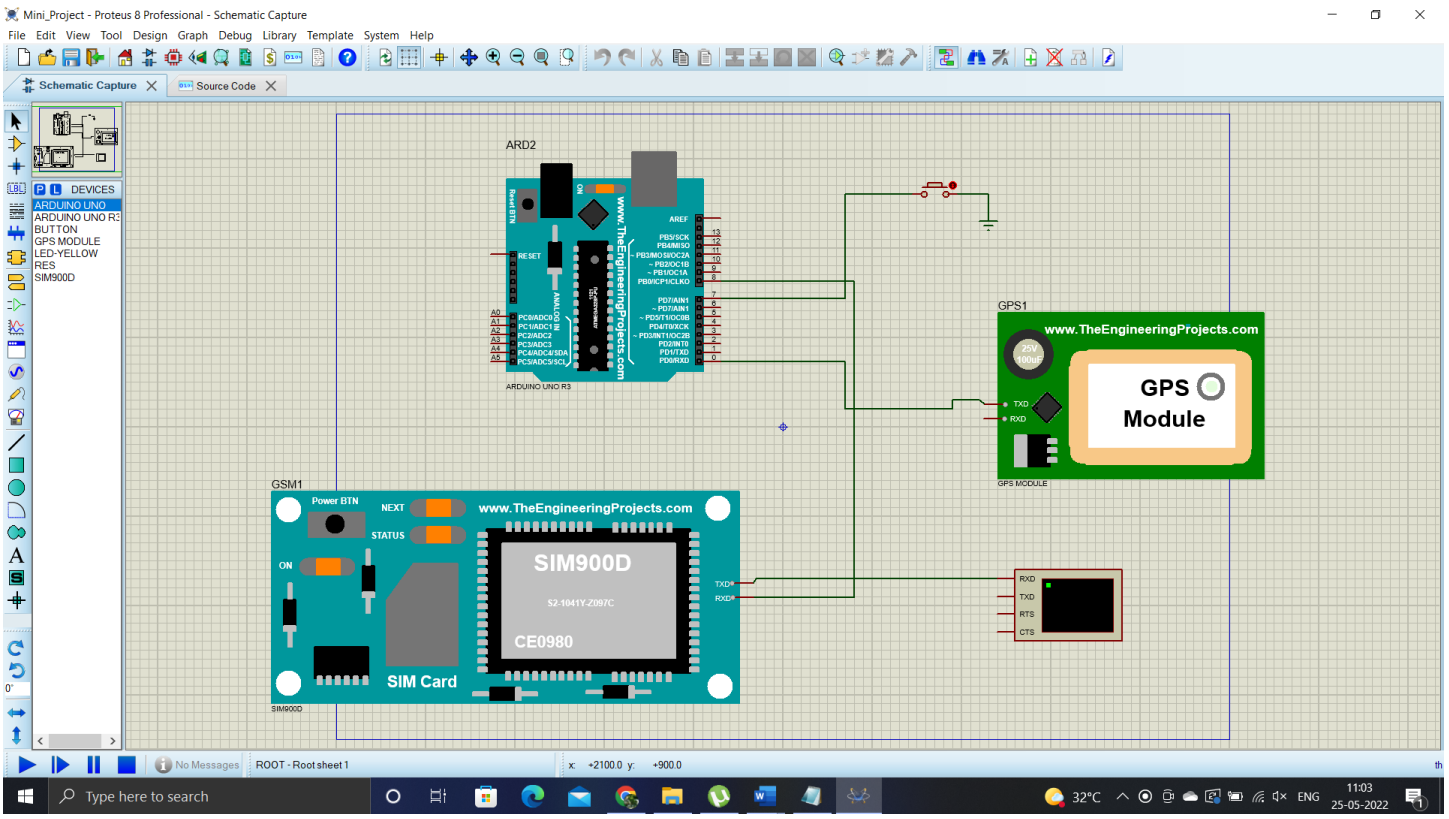


Figure 4.2.2 Circuit Diagram

Working:

Working of this project is very simple as all the work is done by the libraries (GPS & GSM). SIM900D(GSM) is message-based communication device. GPS Module is a location monitoring device.

Push Button is connected to Digital Pin 7 and on pressing the button the response is taken as HIGH. On receiving a HIGH state, the function for sending message as well as recording the location coordinates is called. GSM then SENDS a HELP message with location coordinates that is displayed on the virtual terminal.

Chapter 5: Software Design

5.1 Flow Chart

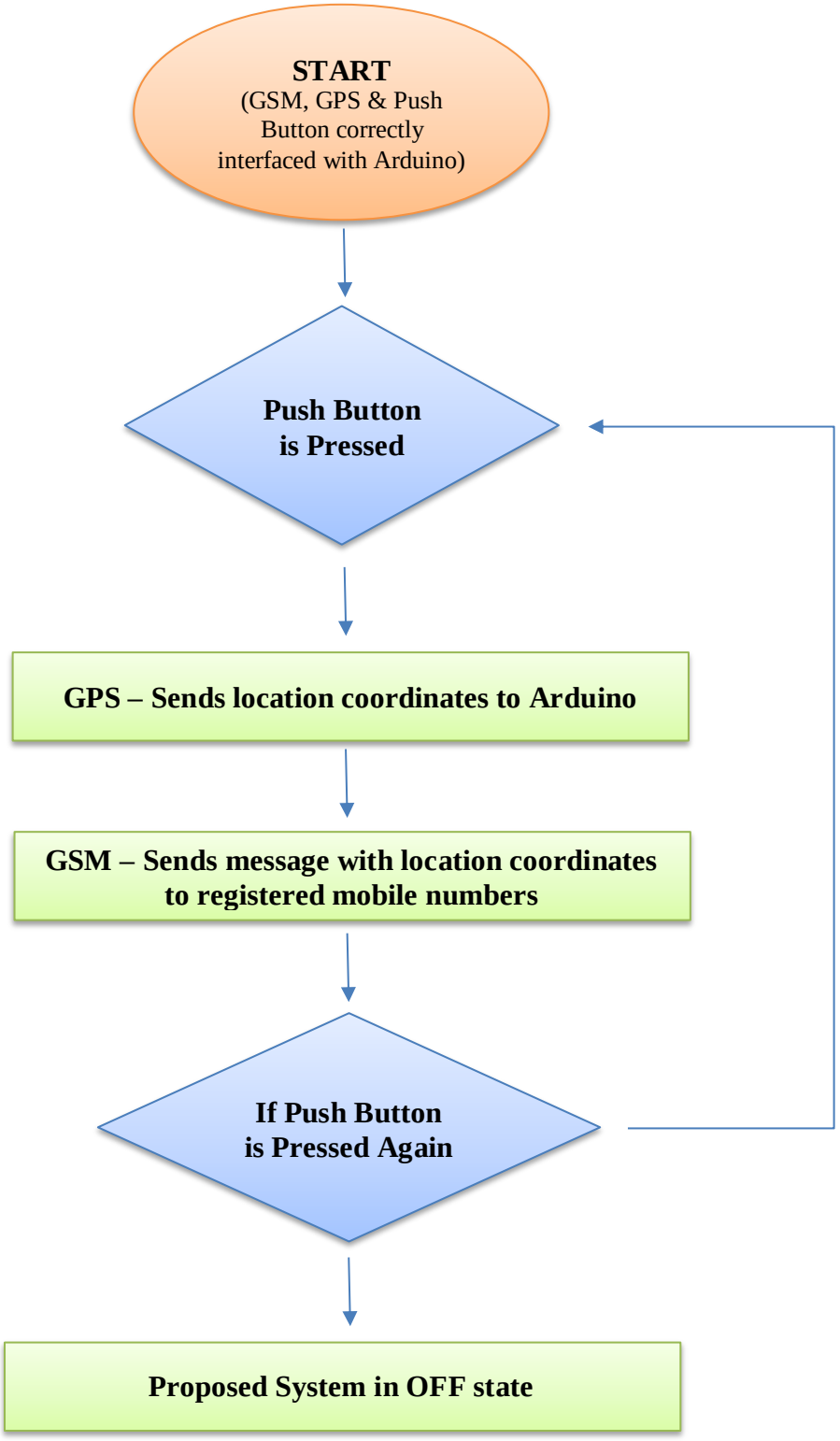


Figure 5.1.1 Flowchart

5.2 Source code

```
#include <SoftwareSerial.h>
#include <TinyGPS.h>
int state = 0;
const int pin = 9;
float gpslat, gpslon;
TinyGPS gps;
SoftwareSerial sgps(4, 5);
SoftwareSerial sgsm(2, 3);
void setup()
{
sgsm.begin(9600);
sgps.begin(9600);
}
void loop()
{
sgps.listen();
while (sgps.available())
{
int c = sgps.read();
if (gps.encode(c))
{
gps.f_get_position(&gpslat, &gpslon);
}
}
if (digitalRead(pin) == HIGH && state == 0) {
sgsm.listen();
sgsm.print("\r");
delay(1000);
sgsm.print("AT+CMGF=1\r");
delay(1000);
/*Replace XXXXXXXXXX to 10 digit mobile number &
ZZ to 2 digit country code*/
sgsm.print("AT+CMGS=\"+ZZXXXXXXXXXX\"\r");
delay(1000);
//The text of the message to be sent.
sgsm.print("Latitude :");
sgsm.println(gpslat, 6);
sgsm.print("Longitude:");
sgsm.println(gpslon, 6);
delay(1000);
sgsm.write(0x1A);
delay(1000);
state = 1;
}
if (digitalRead(pin) == LOW) {
state = 0;
}
delay(100);
}
```

Chapter 6: Test Setup and Testing Procedure

6.1 Simulation Test Setup:

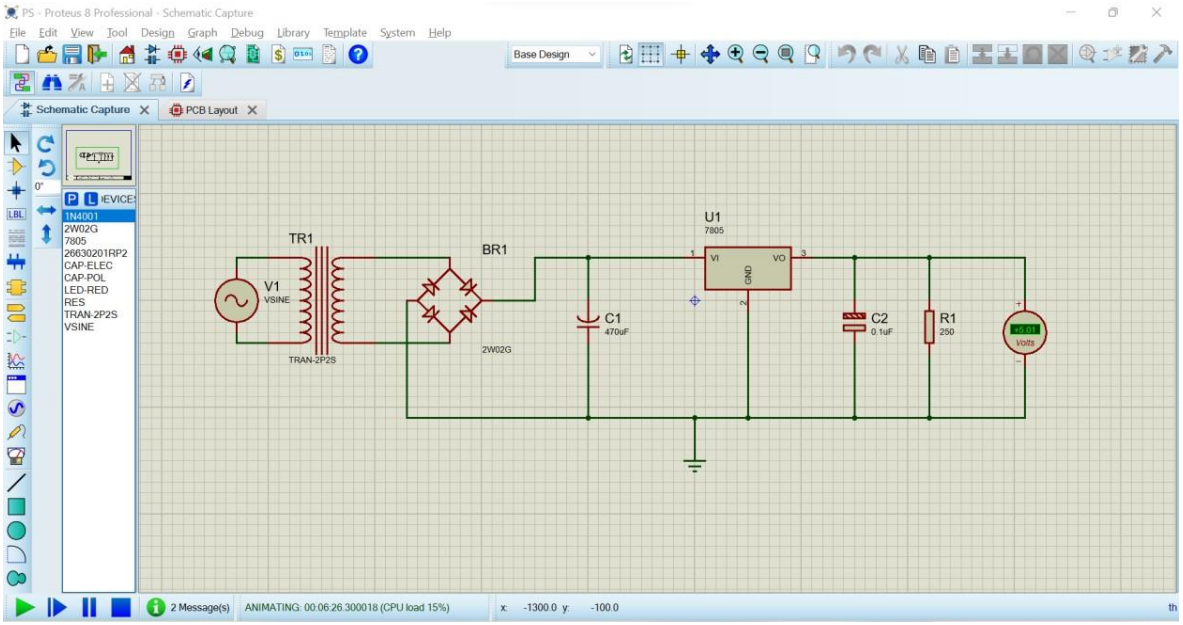


Figure 6.1.1: Simulation of Power Supply

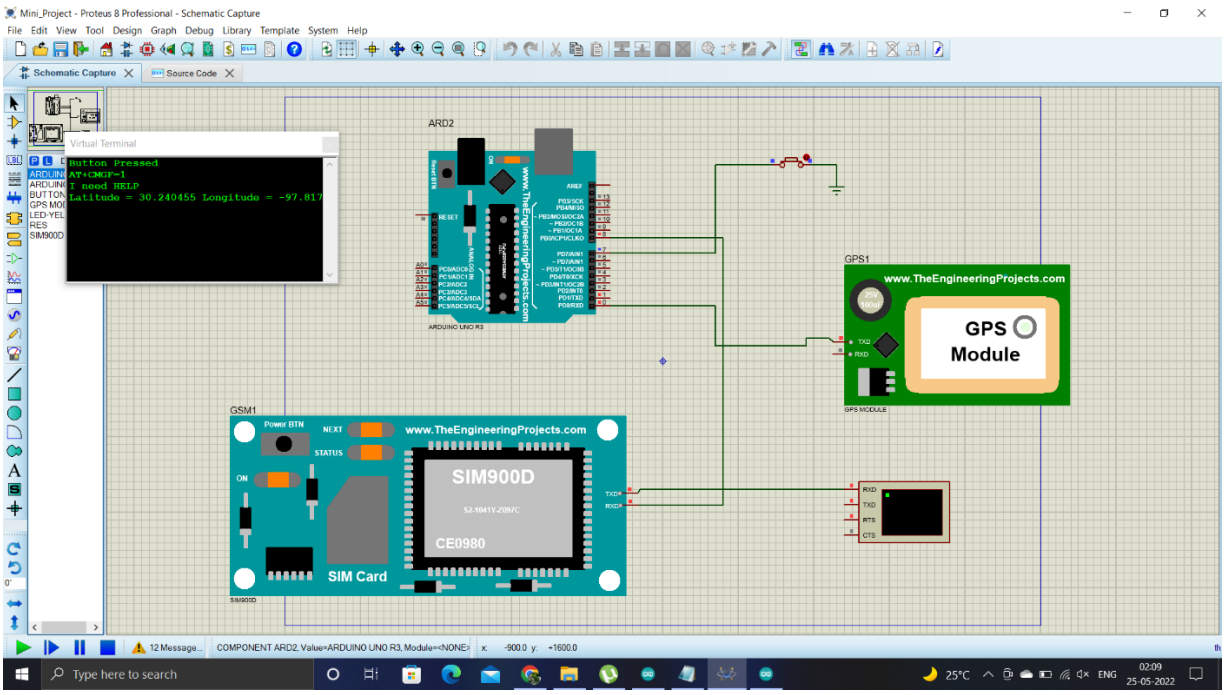


Figure 6.1.2: Simulation of Proposed System

- For test setup, make sure that connection is appropriate.
- Make sure that no short circuit problem could be occurred.
- Ensure that regulated power is been supplied.

6.2 Testing Procedures:

1] Software testing:

In software testing we used proteus software. As proteus is very user-friendly electronic circuit design software which can be used for circuit design, virtualsimulation and PCB layouts. We interfaced the GSM, GPS and Push Button with Arduino UNO R3, fed the hex program file of both GSM and GPS and our Arduino Code for the proposed system into the controller to observe the monitoring and control actions.According to the message and expected location coordinates set in the program we observed the related message on the virtual terminal that should have taken place in real time.

2] Hardware Testing:s

Power Supply:

In hardware testing we made and tested dotted PCB. While testing we checked the powersupply output, all the results were positive and we got 5V at the output. For testing purpose, we used LED to detect whetherthe control action is being performed correctly or not. The results that we achieved from PCB board testing were satisfactory and convincing.

Proposed System:

We interfaced the GSM, GPS and Push Button with Arduino UNO R3, and uploaded the hex program file of our Arduino Code with the help of Arduino.exe for the proposed system into the controller. Push button was pressed.According to the message and expected location coordinates set in the program we observed the related message on the registered mobile numbers as a text message.

Chapter 7: System Requirement

7.1 System Implementation Plan

Project is carried out in different phases. There are number of activity/tasksimplemented in step by step. The time and graphical chart are tabled below.

Activity/Task	Start date	End date
Collection of different topics & Topic finalization		
Literature survey		
Define scope		
Start implementing the project		

Table: Time Chart for Proposed Work

- **Planning**: - It's about designing the model and planning the simulation its take 40% oftime. Planning is essential for initiating our proposed work. It helps to get the details toplan the future estimates and implementation process. Data collection (literature survey) is one of the important processes through which we get the relevant information for our project work. It also helps to get the process of analysis and to make comparative analysis.
- **Implementation:** - It consumes 40% of the time.
- **Initialization:** making the initial settings like setting the protocols and creating the variables
- **Result Generation:** create and generates result and perform all operations like real system do.
- **Post processing:** The data collected from the Result generation is in the raw forgot, that data will be processed and results are generated from it.
- **Testing:** We need to test whether the simulation result we got is matching to the real world or not and validate it. It takes 20% of the time.

Chapter 8: Specifications

8.1 Advantages

- Low use of wiring since the system requires less components.
- Low cost, light in weight and robust. Message is received with 2-3 seconds.
- Location Coordinates is received in the form Google Map's URL so no other application would be needed for location to be detected. Nowadays, Google Map is a default application in all smart phones.
- N number of mobile numbers can be registered.
- Component Failure is very rare since, simple connections are done with separated power supplies.

8.2 Application

- It will be used for safety of
    a. Women's
    b. Physically challenged people
    c. Children
- It will be used for child tracking during school time.
- Automotives and transport vehicles
- Security, remote monitoring, transportation and logistics.
- Sending Locations for Police and Spy related activities/drills

Chapter 9: Conclusion and Future Scope

Conclusion:

This work attempts to keep women safe, it's a portable device so it can be easily carried to any places. This device continuously monitors the pulse rate of user wearing it, if the pulse rate is above the threshold, then the signal sends alert message to registered contact. Further an alert message will be sent to police station/Helpline. User don't have to press any button to give an alert message, this is an automatic process. Other than that, the device can also get triggered with the user's voice. An external trigger is also provided to activate the device manually.

Future work:

In Future, additional features can be added to the hardware like:

- Camera and sound recorder so that live updates of user can be observed and recorded for future aspects as well as to provide better safety measures in case of danger.
- And latest versions of hardware can be used to reduce the complexity and increase the performance as well as functionalities.
- A dedicated android/web application can also be interfaced with the proposed system for better updates.
- The proposed system may be turned automatic with the help of heartbeat sensor that would help in sending a message on drastic change in the heartbeat rate. Since, automatic may cause a false alarm therefore a cancellation button will help.

Bill Of Material/Component List

Component Name	Reference Number	Quantity	Price
Arduino UNO R3	ATmega328	01	850/-
GPS Module	Neo - 6M	01	400/-
GSM SIM900A Module	SIM900A	01	950/-
Push Button	-	01	8/-
Jumper Wires	-	20	60/-
Bread Board	-	1	180/-
Resistor	1K – 10K ohm	1	8/-
Adapter	12V, 2A	1	200/-
TOTAL	**-**	**-**	**2656/-**

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1) J. Sunil Kumar, D. Sreelakshmi, G. Sindhura Bhargavi, "**Women Safety System Using GSM & GPS Tracking**", Journal of Emerging Technologies and Innovative Research (JETIR) Volume-5 Issue-7, July 2018

2) B. Sathyasri, U. Jaishree Vidhya, G. V. K. Jothi Sree, T. Pratheeba, K. Ragapriya, "**Design and Implementation of Women Safety System Based on Iot Technology**", International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-7 Issue-6S3, April, 2019

3) Dudyala Sunitha, Ms. Udayini Chandana, "**Design And Implementation of Women Safety System Based on IoT Technologies**", Journal of Engineering Sciences (JES), Vol 10, Issue 9, Sept /2019

4) Ayesha Siddika, Md. Deluar Hussain, Md. Saddam Hossain, Md. Farhaduzzaman, "**Analysis, Design and Development of Arduino Based Women Safety Device Using IoT**", International Journal of Advancements in Research & Technology (IJOART), Volume 7, Issue 9, September-2018

Links:

1- https://www.theengineeringprojects.com/ : For installation of proteus modules

2- https://mechatrofice.com/arduino/send-gps-location-via-sms