

Design of Low-Cost Women Safety System Using GPS and GSM

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Abstract— In 2019, India recorded an overall 4,05,861 cases of crime against women, it was a rise of 7% from 2018. In 2019 total of 32,033 cases of rape were lodged, which was 7.3% of all crimes against women[18]. Data shows that the crime rate registered per lakh women population increased from 58.8 in 2018 to 62.4 in 2019[18][20]. There are many problems like sexual harassment, domestic violence, eve-teasing that are being faced by women. Sometimes victims don't have proof to prove to mishappen[20]. We proposed a device which will send an SMS to the registered mobile numbers when a button is pressed or when the women fall and save voice recording of that situation as proof. There are two separate parts in our proposed model, first is a transmitter which will be on the wrist and the other is a receiver part which includes Arduino UNO interfaced with SIM900A GSM module, NEO6M GPS module[15], RF TRANSMITTER AND RECEIVER module, BUZZER, MPU6050(accelerometer), ISD1820(voice recorder) Which will be fit on her jacket. When either a button is pressed from transmitter or MPU6050(accelerometer) detects any fall, second part got activated and an emergency message will be sent with the current latitude and longitude, the buzzer will make a loud sound to get the attention of nearby people for quick help and ISD1820(voice recorder) start recording voice as a proof.

Keywords—ARDUINO UNO, SIM900A GSM, NEO6M GPS, RF TRANSMITTER AND RECEIVER, BUZZER, MPU6050, ISD1820

I. INTRODUCTION

In India, people worship Lakshmi, Sati, Durga and on the other side there is an increasing number of violence against women. In 2020, 2,914 complaints of 'crimes committed against women' were received by national commission for women[18]. The crime includes domestic violence, rape, abduction, dowry deaths etc[19]. In the year 2015, 2016, 2017, 2018 and 2019, 2,328, 1,359 and 1,637, 2,575 and 10,531 cases were reported respectively. Sometimes matter is not reported to the police as victims don't have the proof to prove to mishappen[6]. There are many mobile phones Loaded with many security applications for women and if anything goes

wrong, mobile phone will send emergency alerts with current location to chosen people[20]. There are many special devices in the market for the women safety but that are not able to solve problems as they are primarily new, most of them have not reached many rural areas yet and the high cost of the devices[5][19]. Most of the applications in smartphones do not work without the Internet or mobile network connection[16]. The women have to open her phone then open the app and then press a button, it takes a lot of time to do something and also most of the times the culprit go for the phone first and throw that away[19][20]. There is a need to develop devices like safety bands, earrings, keyrings etc that can be carried around easily, works faster and which will allow women to send emergency messages with their exact location in times of dangerous situations easily[5]. Our proposed model is a safety system for women in dangerous situations. In this paper, we have discussed some existing systems and our model, which is the advanced versions of some previously proposed models.

II. EXISTING SYSTEMS

In the paper by Sriranjini R in “GPS and GSM Based Self Defense System for Women Safety” in 2017[1] microcontroller used is PIC16877A. an SMS alert with location is sent to some pre-defined emergency numbers when a button is pressed using GPS and GSM and the speech circuit (ISD1820PY) on activation of the device. another defined button is pressed, to capture the voice[1]. Whereas in 2019, the paper by C. Priya in “One Touch Alarm for Women's Safety Using Arduino” ARM controller is used[2] and the SMS with the location will be sent when the capacitive sensor is activated, this paper[2] is an advanced version of previous paper[1] as a buzzer and tear gas is used which can be useful for quick help by nearby people and self-defence[9].

Pallavi Raj in “A SMART BAND FOR WOMEN SAFETY” in 2018 gave a design that the device will be activated when the pulse rate increased is more than that of the normal pulse rate[4]. The pulse sensor is used to detect pulse rate. An alert message along with the location will be sent to

the nearest police station and her family. A mobile application is used for location tracking and search for the nearest police station[10]. In 2019, the paper by B. Sathyasri in “Design and Implementation of Women Safety System Based On IoT Technology”[7], an emergency message along with the location will be sent to the registered mobile numbers When woman triggered the device. IoT module and neuro simulator is used to track the location continuously and to produce non-lethal electric shock and the buzzer to make a loud sound in emergencies[14]. this paper[7] is not efficient in the part of activation as the previous paper[4] as it has button which has to be pressed to activate the device but this paper[7] has neuro simulator and a buzzer which are more useful for self-defence and to alert nearby people for a quick response.

III. PROPOSED MODEL

A. BLOCK DIAGRAM

Connection of different devices used in the proposed model is shown in the block diagram in fig 3.0.

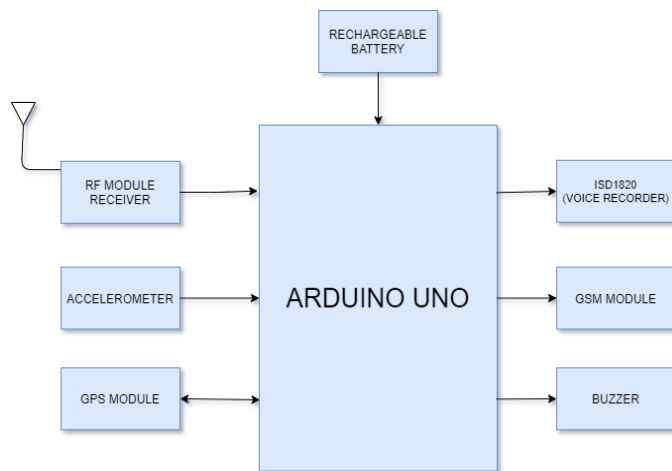
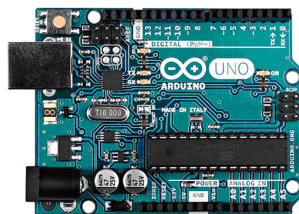


Fig 3.0 Block Diagram

- **RECHARGEABLE BATTERY**

Batteries are used to power transmitter and receiver devices separately. Batteries are rechargeable which will make the project very cost-efficient.

- **ARDUINO UNO**



3.1 Arduino UNO

Arduino Uno shown in fig 3.1 is an open-source electronics platform based on AVR microcontroller Atmega328. Arduino IDE (Integrated Development Environment) software is used to program Arduino UNO. C and C++ are Programming languages used in IDE.

- **RF TRANSMITTER AND RECEIVER MODULE**



Fig 3.2 RF transmitter and Receiver

For wireless transmission of data, the RF module shown in fig 3.2 is used. It is a combination of RF Transmitter and RF Receiver. The RF transmitter receives data and transmits it through its antenna whereas the RF receiver receives the transmitted data. This module has a range upto 100 Mtr (under perfect conditions).

- **ACCELEROMETER (MPU6050)**



Fig 3.3 MPU6050

MPU6050 shown in fig 3.3 is a Micro Electro-mechanical system (MEMS). It consists of three-axis accelerometer and a three-axis gyroscope. We have used this module to detect fall in our project.

- **GPS MODULE (UBLOX NEO-6M)**

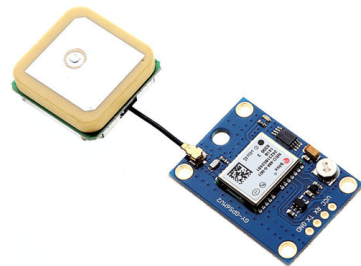


Fig 3.4 UBLOX NEO-6M GPS

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The NEO-6M GPS module shown in fig 3.4 is a GPS receiver with a built-in ceramic antenna. With the signal and power indicators, we can monitor the current status of the module. It is used to provide current location which includes latitude and longitude[15].

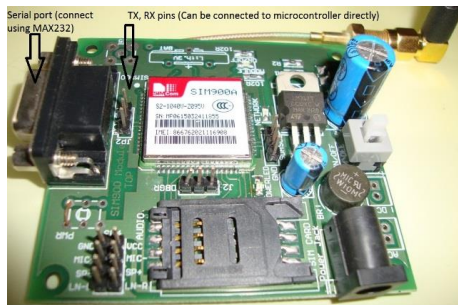
- VOICE RECORDER (ISD1820)



Fig 3.5 ISD1820

Voice Record Module shown in fig 3.5 is based on ISD1820, it is a multiple-message record/playback device. The capability of this module is for recording upto 8 to 20 seconds. In our project, we connect isd1820 with the Arduino Uno which will give a “HIGH” command to REC pin to record and it will record the voice And In need, we can get our output by pressing PLAYE button.

- GSM MODULE (SIM 900A)



GSM Module SIM900A

Fig 3.6 SIM 900A

SIM900A shown in fig 3.6 delivers GSM/GPRS 900MHz performance for Data, Fax, SMS and voice in a small form factor and with low power consumption. This module is used to send SMS to the registered numbers.

- BUZZER



Fig 3.7 Buzzer

The device shown in fig 3.7 makes a buzzer noise and is used for alerting.

B. FLOW CHART

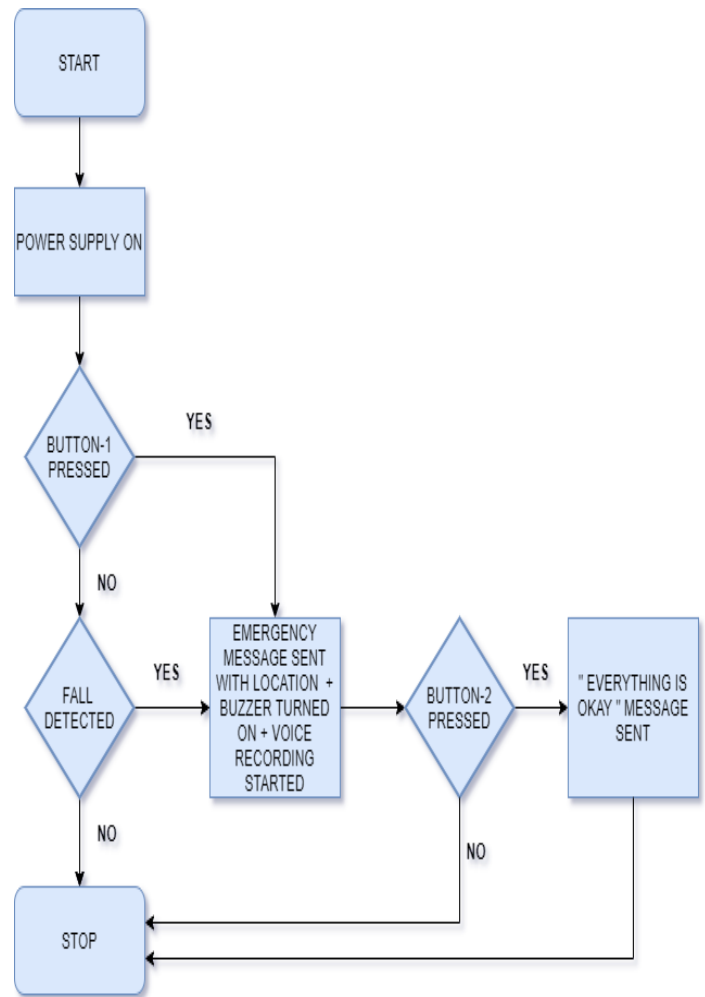


Fig 3.8 Flow Chart

STEP 1: Start

STEP 2: Switch ON the power supply.

STEP 3: If button-1 is pressed then an emergency message with the location will be sent to the registered mobile numbers, buzzer will make a loud sound and ISD1820 will start recording voice.

STEP 4: If button-1 is not pressed and somehow MPU6050 accelerometer detect fall then also emergency message with the location will be sent to the registered mobile numbers, buzzer will make a loud sound and ISD1820 will start recording voice.

STEP 5: After sending the emergency message if button-2 is pressed then the message “everything is okay” will be sent to the registered mobile numbers.

STEP 6: Stop

C. WORKING

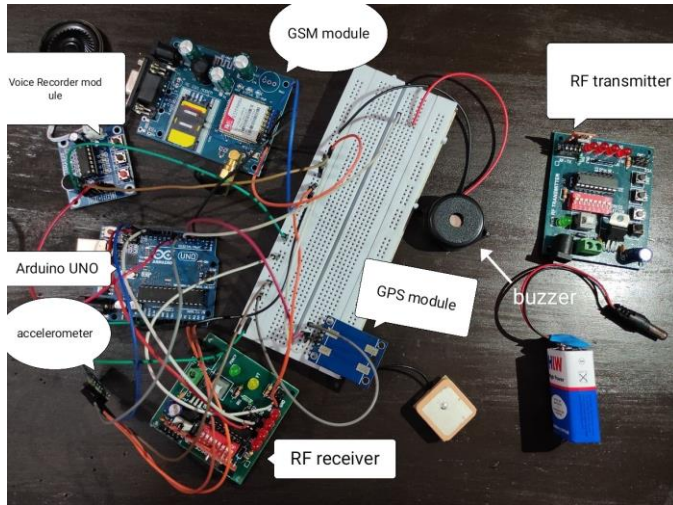


Fig 3.9 Circuit Diagram

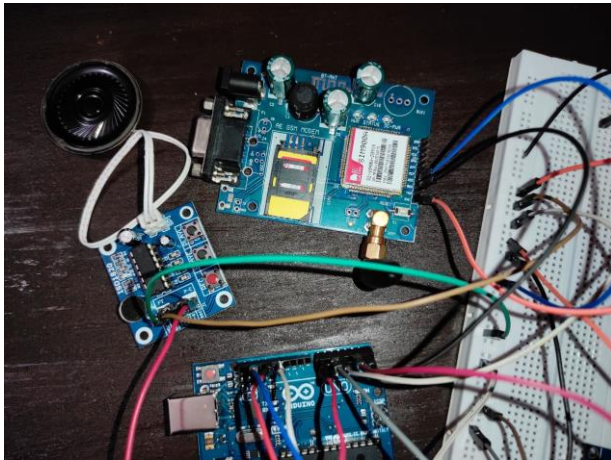


Fig 3.10 Arduino interfacing with GSM module and voice recorder module

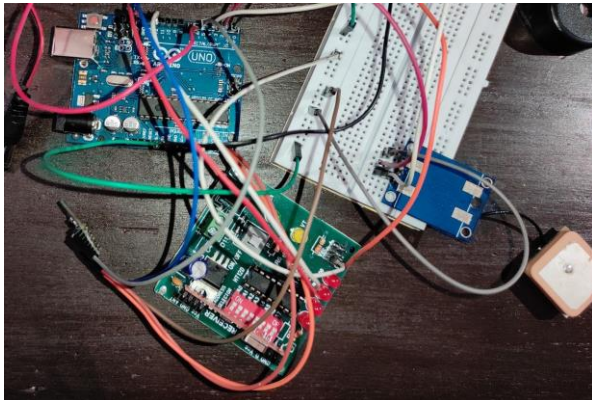


Fig 3.11 Arduino interfacing with GPS, RF receiver module and accelerometer

Fig 3.9 shows the circuit diagram of our proposed model. In our project, there are two separate devices transmitter and receiver (in fig 3.9 right device is a transmitter and the left

device is the receiver). Transmitter part has buttons which will be used in emergency and It will act as wrist band which can be easily accessible and receiver part contains Arduino Uno interfaced with GPS module, gsm module, mpu6050, isd1820 which can be easily fitted in a jacket. When a woman feels any danger she can press button-1. Once button-1 is pressed, the buzzer will make a loud sound to alert nearby people for quick help, the GPS will calculate the current latitude and longitude, GSM module will send SMS which contains the emergency message “I WANT HELP” with the current latitude and longitude values to the numbers registered in microcontroller and voice recorder(ISD1820) module will record voice up to 20 seconds which can be used as proof for a legal proceeding. sometimes attacker throws the victim on the ground to weaken them, In that case, if the women are unable to turn ON button-1, accelerometer(MPU6050) comes into play and it will detect the fall and activates the device which will send the emergency message with the current latitude and longitude to the registered mobile numbers, the buzzer will make a loud sound to alert nearby people and voice recording module(ISD1820) starts recording voice. Sometimes button-1 is pressed by mistake or somehow woman fall but is safe then ideally in both the cases the device will get activated and will send the message of emergency with current latitude and longitude, the buzzer will make a loud sound and voice recorder will start recording voice. But in our proposed model we have used one more button (button-2) which can be used when the device is activated by mistake and an emergency message is sent. In those cases after pressing button-2, message “everything is okay” will be sent to the registered mobile numbers, buzzer and voice recording will be stopped. Button-2 can manage the condition when button-1 or accelerometer gets activated by mistake which can stop the chaos that could be created by sending an emergency message by mistake.

IV. RESULT

The main purpose of the device is to provide security and safety to women in a dangerous situation. We tested our model in a real-time situation and here are some results. When button-1 is pressed then the emergency message with the current latitude and longitude will be sent to the registered mobile numbers as shown by the first message in fig 4.0 and fig 4.1 and the buzzer will make a loud sound and voice recorder will start recording voice. On copying and pasting the latitude and longitude on google maps we can get the location as shown in fig 4.2. When the accelerometer detects any fall it again sends the same emergency message with the current latitude and longitude to the registered mobile numbers as shown by the second message in fig 4.0 and fig 4.1 and the buzzer will make a loud sound and voice recorder will start recording voice. When by any mistake button-1 is pressed or accelerometer detects fall and in that situation the woman is safe. then an emergency message will be sent to the registered mobile numbers with buzzer making loud sound and voice recorder will start recording voice. But this will create a problem as the authority who is in charge of these cases will come in action despite nothing. In that case, the women can press button-2 to

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send message “everything is okay“ to registered mobile numbers as shown by the third message in fig 4.0 and fig 4.1 Button-2 act as a helper as it sends a safe message which can control the chaos that could be created due to an accidental emergency message.

Our model can be used for the safety of women, small children, elderly aged people, physically challenged people. This model can also manage the condition when the device got activated by mistake.

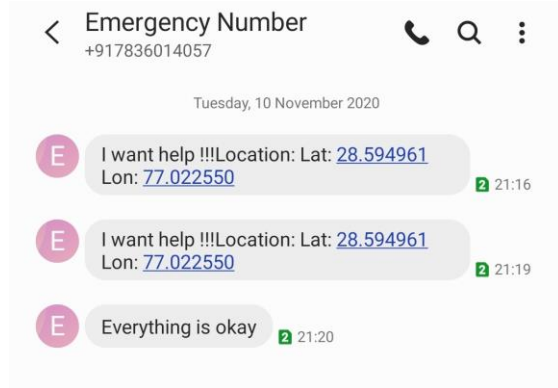


Fig 4.0 Result 1

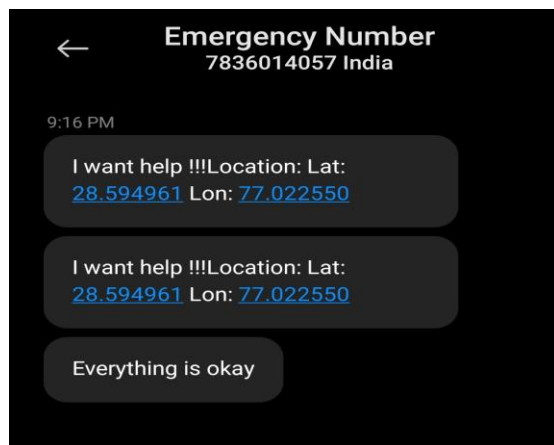


Fig 4.1 Result 2

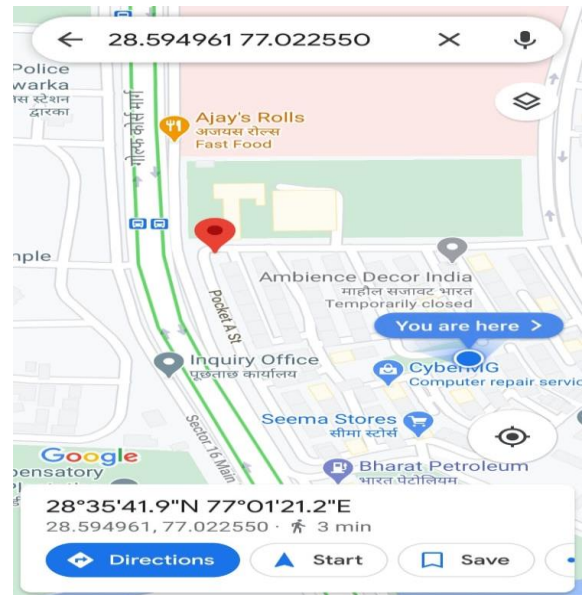


Fig 4.2 location

V. CONCLUSION AND FUTURE SCOPE

Our effort behind the project is to design a gadget which can be easily carried without notifying any other person. This project aims to protect women when she feels any danger and when her mobile phone is a way out of her reach. Our proposed model has an advantage to all above existing models. It is cost-efficient, fast and works without using the internet or any smartphone.

In future, the proposed device can be upgraded by adding camera module to save pictures and video recording as proof, pulse sensor which can be used to activate the device when health condition gets any worse, shock device which can be used for self-protection.

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