Women Safety with GPS, GSM and Detection of Heart Attack, FITS and Sunstroke

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Abstract:

Keeping in mind,the present situation of the metropolitan cities and big cities, women safety and security has become one of the most important forthwith requirements in our country. The device we developed will meet the requirement of a simple and a cost-effective safety gadget that helps the victims during sudden and unforeseen dangers from strangers.We all know that a heart attack can kill a life in 3 attempts but now a days it can be dangerous in first attempt also. If checking our health regularly on daily basis, then we can identify so many diseases by detecting them before itself. Many people at a certain age lose their lives due to heart attack which is not easy to detect. To overcome that and to help our society from heart attack, the system we developed will help in decreasing the death rate by real time heart rate monitoring and early detection of heart attack. Sunstroke and Seizures are also the life-threatening conditions in which the victims need urgent medication.Sunstroke, also known as Heat Stroke, which occurs due to continuous exposure to high temperatures. Seizures, commonly known as Fits, is a sudden and uncontrolled disturbance in brain. A Seizure that lasts longer than 5 minutes is a medical emergency.Many people lose their lives due to Sunstroke and Seizures if not given a proper medication when affected by them. This system also helps in detecting the sunstroke and seizures in a person with the help of sensors. The Sensors we used are interfaced to a micro controller (ATmega328p)and then connected to a GPS-GSMmodule (SIM808) which help in identifying the affected person's condition and his location through a message to a nearby hospital.The main advantage of this system is that this device is compact and easy to carry. The use of sophisticated components makes the device more reliable.

Keywords: Heart-rate monitoring and detection,micro controller (ATmega328p),GSM-GPS module (SIM808), Sunstroke, Seizures.

1. Introduction

In today's world, Women safety and security has become a very big concern in a country like India where women are playing an outstanding role in each and every field. According to the recent surveys on women, it was stated that four out of ten women in the society are facing serious troubles in the form of Harassment. Many people in the developed countries still fear to step outside alone due to the increasing number of cases in violence against women. India is a peace-loving country and one of the safest destinations for tourists across the world.

However, a few incidents in recent past brings to attention that there is a need for women safety and security. To help women, many attempts have been made but still a safer and secure system is needed that can ensure safety during public transport or when traveling alone especially in night. Women are not so physically strong when compared with men. So, an extra helping handy device would be a boon for them. The best way to reduce the probability of becoming a victim in violence (rape, sexual assault, Domestic violence) is to defend themselves from hazardous situations with the help of a handy women security devices.

The device we developed not only helps in defending themselves but also helps in bringing assistance as fast as possible by giving current location through SMS to family and police. This can be

achieved with the help of a flex sensor which was fit in a hand glove. When the girl is in danger from a certain group of people, she then tries to punch the man. The flex sensor's threshold resistance value is programmed in the micro controller and when the sensor is bent while tightening the fist,the copper wire mesh provided on the glove delivers a mild shock to the opponent and hence it avoids the next violence attempt. The necessary circuitry for the shock is simple and easy to carry. When the sensor is continuously bent for a certain time, the GPS-GSM module in the system sends her location through a message to her parents and nearby police station. So much care was taken about the shock that it just delivers a mild shock and doesn't harm the life of the opponent.The resistance values in the flex sensor varies largely in normal usage of the glove and heavy tightening of the fist. Hence there will be no harm to the people around her.

In addition to this, there was also a heartbeat monitoring system equipped inside the glove. Heart attack is a common one which affects almost 60% of the total population. Recent surveys states that, more than 2 million people in India suffer from a heart attack each year. Around half of the heart attack deaths occur within one hour of the heart attack. Hence, the heart attack affected person need to be given proper medication as early as possible. This system is designed in such a way to sort out this situation. The heart rate is monitored with the help of a pulse oximeter sensor. GSR (Galvanic Skin Response) electrodes were also placed which gives the intensity of emotion state. The confirmation of heart attack is done with the combined values of heart rate and GSR electrode data. The pulse oximeter sensor and GSR electrodes are interfaced to micro controller. When heart attack is confirmed, the location of the person is sent using GPS-GSM module to nearby Hospital/Ambulance and family members so that the necessary medical help will be available within no time.

Apart from the heart attack, there are also many life-threatening conditions which takes away the lives of individuals if not treated early. Sunstroke and Seizures are major among them. The body temperature of a sunstroke affected person is completely different from a normal person's temperature. It will be either high or low depending on the hydration levels. In order to monitor the body temperature constantly, a Temperature sensor is equipped and interfaced with the micro controller. The sunstroke condition is confirmed with the combined values of body temperature and GSR electrode data. When sunstroke is confirmed, the location is shared to nearby hospital with the help of GPS-GSM module which is interfaced to the micro controller. We can also detect the seizures condition by monitoring the shakes from the hand of the victim with the help of a Vibratory sensor which was kept in the glove. Thus, the whole system helps not only in safeguarding the women but also will be useful for elderly citizens in health monitoring. The micro controller used for the above applications is Arduino Nano (ATmega328p).

2. Related works

Recent works on Women Protection, Health Monitoring and Detection are presented below.

Dr.P.V.Ramaraju, et al. [1], proposed the framework of emergency response which is important in the rehash of repulsive lead for women. It is an unimportant exertion unit that can store exhaustive system data in the particular area and provide smart warning if there ought to build up a horrendous lead event against ladies. It's a flexible protective system. It's going to be essential in risk management that the structure benefits by providing women a secure environment in general people and interfaces with them to work until late at night. Anyone will be expelled before making any terrible lead against the ladies and it helps to decrease the shocking explicit rate against the ladiesThe outcomes contains the made model of ladies security band and adaptable application appeared in front line cell and sometime watches out for the message that is sent by band to pleasing through Short Message Service (SMS)which joins the data, development and longitudes. Ajitha U, et al. [2], discussed the design uses low cost-effective ZigBee heart rate monitoring and alert system. The system can be used in hospitals and for patients who are under continuous monitoring. The heart attack detection by monitoring the heart rate, helps to inform a person if he is about to have heart attack. The system uses transmitting and receiving parts of which the transmitter is with the patient

and the receiver is with doctor or nurse. The system uses smart sensor which converts the heart beat into pulses. When the controller detects heart failure or heart attack, it sends signals to cell phone contained with the doctor. Dr.P.V.Ramaraju, et al. [3], proposed a method which includes indicating and alerting systems while driving using Arduino micro controller.This project consists of ultrasonic sensor which gives the information of adjacent vehicles distance and a camera which shows adjacent vehicles so this helps the driver to estimate the adjacent vehicles position. The system deals with the detection system which helps the drivers in their works respectively. Raghvendra Tiwari, et al. [4], stated in his paper thatHeart and blood vessel disease is our nation's No. 1 killer. About half of the deaths from heart and blood vessel disease are from coronary heart disease, which includes heart attack. About 325,000 people a year die of coronary attack before they get to a hospital or in the emergency room. But many of those deaths can be prevented by acting fast. Some heart attacks are sudden and intense. But most start slowly, with mild pain or discomfort. The proposed system will help old age people to track their heart rate and in case of any heart anomalies it will notify to emergency contact. It can also be used by the users who have just under gone to heart surgery. Aboobacker Sidheeque, et al. [5], explained thatsensors could be connected to heart rate, blood pressure, ultrasound, or any number of devices that could automatically relay the information it collects to healthcare professionals. It makes equipment more effective by allowing real time monitoring of patient health.The system alerts for lower heartbeats. Whenever the user logs on for monitoring, the system also displays the live heart rate of the patient. Thus, concerned ones may monitor heart rate as well get an alert of heart attack to the patient immediately from anywhere and the person can be saved on time. KainatZeba, et al. [6],proposed that there are devices that accurately measure the heart rate using optical technology with the infrared LED standard and a photo-sensor by using index finger for measurement of the heart rate. A microcontroller which is programmed in order to acquire the signal via its built-in analog to the digital converter, ADC and to use the readings to measure the cardiovascular rate. B. Sathyasri, et al. [7], explainedthe sensors that measures various parameterslike a glucometer, air flow and patient position that are transmitted via microcontroller by a gateway to a cloud storage platform. The data collected in the cloud platform is accessible for further handling, for the investigation of some correlations among measured parameters and health state of the patients. This work had proposed that GPS will track the current location and send it via SMS to the registered emergency contact numbers, it also record audio and video, it also has additional process like making call to the user after receiving the notification.Pantelopoulos A, et al. [8], stated an approach in identifying technical weaknesses in the current state of the art wearable biosensor solutions, a variety of system implementations are compared. The multi-parameters design of physiological sensing systems is illustrated, providing reliable measurements of vital signs and incorporating support for decision-making in real time to identify symptoms or context awareness. A number of significant characteristics, which best describe the roles and characteristics of the systems were chosen to draw up an in-depth study to determine the maturity of leading achievements in wearable health monitoring systems.

G. Nagaraju et al. [9], suggested that MRI images are magnetic resonance images which can be acquired on computer when a patient is scanned by MRI machine. We can acquire MRI images of the part of the body which is under test or desired. Besides these, bio sensors have better scope in the future which gives accurate results and are very relatable to body scans. DongareUma, et al. [10], proposed the system which is about 'An android application for women safety based on voice recognition'. One in which, voice keywords are set for activation of the system. System recognizes the voice of the user. After system gets activate, it uses a GPS or Wi-Fi to track the location information of the user and send that location information. Simultaneously, an emergency signal is sent to people who are selected by the mobile user as a message via SMS. Piyush Kumar Verma, et al. [11], discussedthat the pulse sensor checks the pulse of victim and in abnormal health situation the device also sends current GPS location to ambulance at every 10 sec in form of SMS. MasafumiKuzuya, et

al. [12], stated that older adults are both more susceptible physiologically and environmentally and according to Japanese data, about 30% of men and 50% of women who are hospitalized because of heat stroke are aged 65 years and over. The heat stroke in older adults has also been reported to become more serious. In the environment, heat attacks in older adults are distinguished by the fact that, unlike young people, many patients experience this disorder in their homes rather than outside. Relative to young people, as older adults have a lower volume of body fluid, a reduced skin sensitivity, lower sweat levels and a lower thirst sensitivity,they are susceptable to heat stroke. RashaTalal Hammed, et al. [13],explainedabout the advances in Internet innovation that have made possible techniques for the conveyance of healthcare. Networking infrastructure and common access can encourage sharing of patient data and clinical information; make the Internet a perfect tool for remote patient observing applications. In this paper, we portray an experimental model designed for monitoring and checking the health condition of the patients based on sensors. The framework depends on e-health sensor shield associated with a cloud platform which gathers the data from the sensors.

Bhagya Lakshmi.J.M ,et al.[14],defined the heart rate or pulse rate, as a sign basic of medicine, and it is directly to a humans cardio health.The proposed model gives a computer – based heart rate monitor system using an Arduino software board and Pulse sensor, pulse detecting sensor that uses the principle by the Arduino, then it transfers the data to the computer through a serial monitor. Sharief FBabiker,et al.[15],proposed that heartbeat rate is one of the very important parameters of the cardiovascular system. The heart rate of a healthy adult at rest is around 72 bpm. Athletes normally have lower heart rates than less active people. Babies have a much higher heart rate at around 120 bpm, while older children have heart rates at around 90 bpm. The heart rate rises gradually during exercises and returns slowly to the rest value after exercise. The rate at which the pulse returns to normal is an indication of the fitness of the person. Lower than normal heart rates are usually an indication of a condition known as bradycardia, while higher than normal heart rates are known as tachycardia.G. Nagaraju et al. [16], explained in this paper that Detecting text is an essential prerequisite in natural pictures. This text detection algorithm uses edge-Enhanced Maximally Stable Extreme Regions as candidates for the basic letter.This text detection algorithm uses edge-enhanced maximally stable extreme regions as basic letter candidates This can be demonstrated by using ARDUINO kit to implement the hardware framework for text extraction. Arduino projects can be stand-alone, or they can work on your device with software running. The Arduino programming language is the implementation of Wiring, a related physical computing platform based on the programming environment Processing multimedia.G.Nagaraju et al. [17], defined that the blood smear images from a microscope provide important information for diagnosing and predicting diseases in a hematological analysis.Blood test play an important role in diagnosing of many diseases such as Anemia, cancer and coronary heart disease.The segmentation and the classification of the white blood cells should be done accurately and if it is not done accurately then further analysis may not have effective results. This may also lead to wrong medication to the patient. To avoid this type of problems a different type of segmentation and classification technique is used for the accurate identification of white blood cells which is a fast process and error free.

3. The Proposed Methodology

3.1 Project Theme:

The main aim of the project is that it can be used not only for women protection but also for continuous health monitoring and detection simultaneously. The sensors we used, are interfaced to

Arduino Nano Microcontroller and coded them accordingly. The whole system is handy and the sensors are made to fit inside the glove so that there will be no stress or pressure in carrying it.

3.2 Major Components:

3.2.1 Battery:

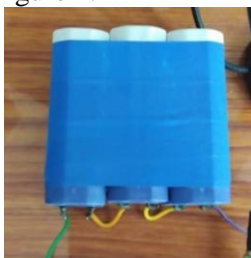Three batteries each of 4 volts,1.5 amperes are connected in series to power the circuit as shown in the figure 1.

Figure 1. Batteries

3.2.2 Voltage regulator (7805, 7812):

It is a three-pin IC that acts as a voltage regulator as shown in the figures 2,3. Unregulated DC current is converted into controlled DC current.Voltage sources in a circuit may have fluctuations which result in no fixed voltage outputs being given. The output voltage is maintained at a constant value by an IC voltage regulator. 7805 IC and7812IC are members of the 78xx series of fixed linear tension regulators used to control these fluctuations. These are common integrated circuit (IC) voltage regulators. The xx in 78xx shows the voltage it provides for output. 7805 IC offers a controlled power supply of + 5 volts with provisions for addition of a heat sink.

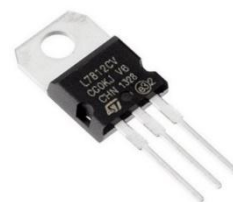**Figure 2. Voltage Regulator 7805**

Figure 3. Voltage Regulator 7812

3.2.3 Arduino Nano (ATmega328p):

The Arduino Nano USB Microcontroller is a ready-to-use breadboard version of the Arduino Mini 05 microcontroller kit with built in USB as shown in the figure 4. Together with most Arduino boards the Nano has more analog input pins and an onboard + 5V AREF jumper. The device achieves throughput approaching 1 MIPS per MHz. In our project we used Arduino nano as a microcontroller for interfacing all the sensors we used and code them accordingly.

Figure 4. Arduino Nano (ATmega328p)

3.2.4 LCD Display (16×2):

An LCD which is shown in the figure 5, is an electronic display module which produces a visible image using liquid crystal. The 16×2 display is a very simple module that is widely used in circuitry. The 16×2 translates 16 characters per line into 2 such lines on the display. Each character is displayed in a matrix of 5×7 pixels in this LCD. A variable resistor is used to control the contrast of display.
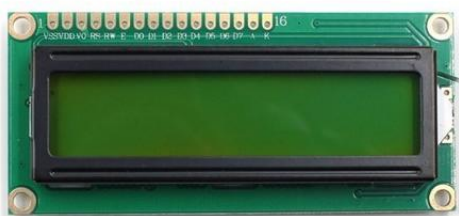
Figure 5. LCD Display 16*2

3.2.5 Relay:

Relays are used where an independent low-power signal is needed to control a circuit, or where multiple circuits have to be controlled by one signal. Relays were initially used as signal repeaters in long distance telegraph circuits: they refresh the signal that comes in from one circuit by transmitting it on another circuit. In this project we used 12v relay as shown in the figure 6, to control the static current produced.


Figure 6. Relay 12 v DC

3.2.6 Step-up transformer:

The transformer we used is a step-up transformer in which the output (secondary) voltage is greater than the input (primary) voltage of it. The step-up transformer decreases the output current to keep the device input and output power equal. Consider a step-up transformer as shown in the figure 7. The

voltages are the E1 and E2, and the numbers of turns on the primary and secondary winding are T1 and T2.
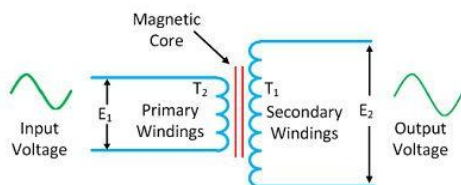
Figure 7. Stepup Transformer

3.2.7 Pulse Oximeter (MAX30100):

MAX30100 in figure 8, is an integrated sensor pulse oximeter and heart rate monitor. It is an optical sensor that derives its readings from transmitting two wavelengths of light from two LED's-one red and one infrared-then measuring the absorption of pulsing blood through a photodetector. This particular combination of LED colours is ideal for reading the data by the tip of one's finger. It is fully configurable via software registers, and the digital output data is stored within the device in a 16-deep FIFO. It has a digital I2C interface to communicate with a host microcontroller.
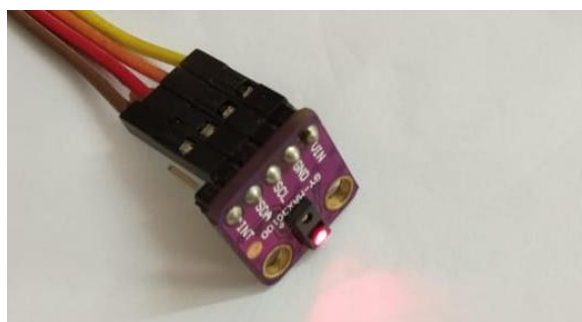
Figure 8. Pulse Oximeter (MAX30100)

3.2.8 GSR (Galvanic skin response)Electrodes:

GSR stands for galvanic skin response, is a skin electrical conductance measurement method. Strong emotion can make the sympathetic nervous system activate, resulting in more sweat being secreted by the sweat glands. Grove-GSR enables you to detect these strong emotions by simply connecting two electrodes on one hand to two fingers as shown in the figure 9. As GSR measurements operate by detecting changes in electrical (ionic) activity resulting from changes in the operation of the sweat gland, the electrodes must be sensitive to these changes and capable of transmitting the information to the recording instrument. Most of the GSR electrodes have an Ag / AgCl (silver-chloride) contact point with the skin. Ag / AgCl electrodes are used as they are inexpensive, durable, secure for human contact, and are of course capable of transmitting the ionic activity signal accurately.

Figure 9. GSR Electrodes

3.2.9 Vibratory sensor:

The vibratory sensorin the figure 10 is used for calculating vibrations may be either capacitive variable or piezo-resistive.Such sensors are versatile devices used to calculate different processes. This sensor is able to measure changes in the acceleration, stresses, temperature and force by adjusting electric load, using the piezoelectric effects.A sensor that operates on the basis of various other optical and mechanical concepts for the detection of observed vibrations is the working concept of the vibration sensor.These sensors usually range in sensitivity from 10 mV / g to 100 mV / g and lower and higher sensitivities are also available. Depending on the use, sensitivity of the sensor can be selected.

Figure 10. Vibratory Sensor

3.2.10 Temperature sensor:

DS18B20 as shown in the figure 11 is a Water Proof Temperature Sensor Probe is used in our project. The unique 1-Wire Interface requires a single digital pin to communicate with a microcontroller in two ways. Temperature sensor DS18B20 is fairly accurate and does not need any external components to operate. It can measure temperatures from-55 ° C to+ 125 ° C at a precision of ±0.5 ° C. The temperature sensor resolution is user-configurable to either 9, 10, 11 or 12 bits. Nonetheless, at

power-up the default resolution is 12-bit (i.e. precision 0.0625 ° C). With a 3V to 5.5V power supply the sensor can be powered and consumes just 1mA during active temperature conversions.

Figure 11. Temperature Sensor

3.2.11 Flex sensor:

This Flex Sensor as shown in the figure 12 is like no other variable resistor. The flex sensor's resistance increases as component bends body. The Nintendo Power Glove uses sensors like these. These can also be used as door sensors, robot whisker sensors or as a primary component in the development of stuffed animals for the sensitivity.A polymer ink is printed on one side of the sensor, with conductive particles embedded in it. The particles give the ink a resistance of about 30k Ohms, when the sensor is straight. The conductive particles shift farther apartwhen the sensor is bent away from the ink, increasing this resistance.The resistance returns to the original value, when the sensor straightens out again. You can determine how much of the sensor is being bent by measuring the resistance.

Figure 12. Flex Sensor

### 3.2.12 SIM808 GSM/GPRS/GPS Bluetooth Compatible Development Board with GPS Antenna:

SIM808as shown in the figure 13 is a GSM/GPRS/GPSBluetooth CompatibleDevelopment Board with GPS Antenna, that allows you to use your Arduino or Raspberry Pi with GSM communication and GPS features. You can send and receive SMS with this module; trace a location and even build on-card functions for your own cell phone. SIM808 module acts as GSM communicator and GPS receiver.

Figure 13. SIM808 GPS-GSM Module

3.3 Block Diagram:

The alignment of components in the form of block diagram in our proposed work is shown in the figure 14.All the sensors are directly interfaced to the micro controller and coded them accordingly to their purpose and output is displayed on LCD Display.
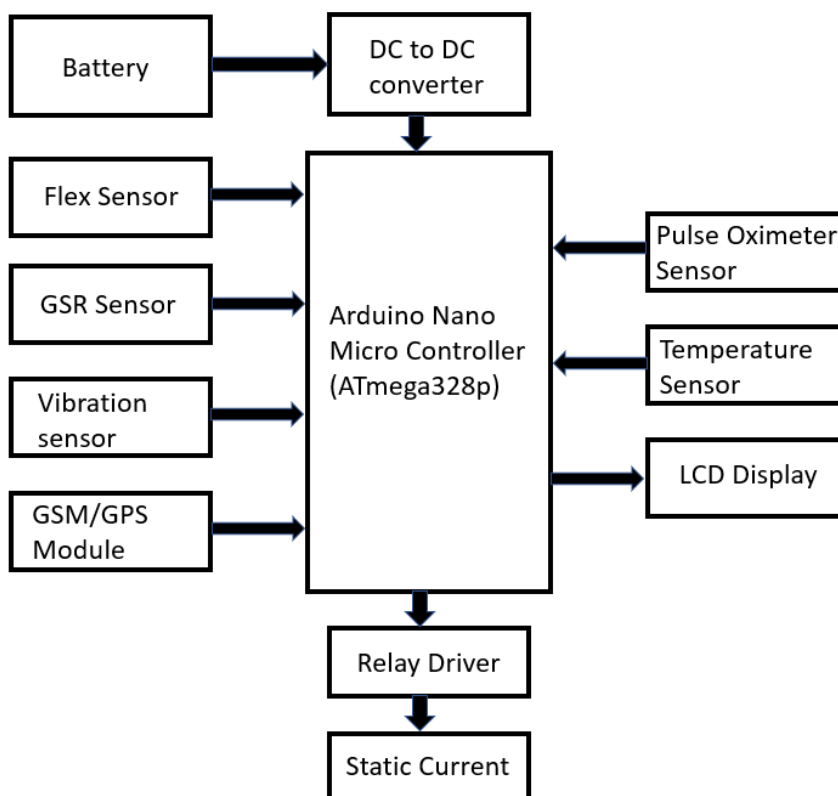
Figure 14. The Proposed work of women safety, monitoring and detection of heartattack, sunstroke and fits.

3.4 Explanation and Working:

Three batteries each of 4Volts, 1.5 Amps are connected in series to power the circuit. The circuit works over 5 volts and hence to regulate and vary the voltage, the voltage regulator 7805 (figure 2) is used. Another voltage regulator 7812(figure 3) is also used for GPS-GSM module. The main micro controller we used is Arduino Nano ATmega328p (figure 4). All the individual

components are directly interfaced to the micro controller and coded them accordingly to their purpose. The output readings like heart rate, flex resistance, body temperature, jerk number are displayed on the LCD display (figure 5) provided. To produce the static current, we used step up transformer (figure 7). A separate battery which is of 4 Volts is used for relay driver circuit as it requires more powerto generate static current. When the SPDT switch is turned ON, the circuit is powered up by the batteries and the 7805 Voltage regulator regulates the voltage to 5 volts which is given to Micro Controller and LCD display. The 7812 Voltage regulator provided voltage of around 12 volts to GPS-GSM module.The aim of this system is to provide safety and security to women and that can be achieved as follows.

The flex sensor is made to fit on one of the fingers. Whenever the fist in the glove is heavily tightened,the resistance produced by the sensor crosses the threshold resistance value and static current is produced on to the copper wires which are placed on the upper part of the glove. Whenever the opponent tries to harass her, she then holds the fist and punch the opponent so that the copper wires on the glove delivers a mild shock which is DC and is about 600 to 900 volts. This mild shock doesn't harm the opponent but avoids his next violent attempts on her. Certain care was taken about the flex resistance values such that the static current is produced only when the fist is heavily tightened. If he continues trying to harm her again for the second time, then a security alert in the form of message with the current location is sent to the phone numbers provided in the code. In this way, the victim safeguards herself from sudden dangers and harassments from strangers. The alongside concept of this system is also to monitor the health condition and that can be achieved as follows.

The pulse oximeter MAX30100 is made to fit to index finger inside the glove such that it constantly checks the heart rate of the person. The GSRElectrodes are also kept to two fingers inside the glove. These electrodes constantly check the intensity of stress condition of the person. When there is an abrupt change in the combined values of GSR electrode data and heart rate from the threshold values, the system confirms that is heart attack and informs the nearest Ambulance/Hospital and family members with the current location and alert message. In the same way, sunstroke can also be detected with the help of temperature sensor fitted in the glove and GSR electrodes. When the person is exposed to high temperature due to sun, he is prone to get affected by sunstroke. The system confirms that it is sunstroke with the combined values of temperature sensor and GSR electrode Data. An alert message with current location status of the victim is sent to family members and nearby hospital so that he can get immediate medical attention. One of the most life-threatening conditions is Seizures,commonly known as Fits. Although the main cause of a seizure is abnormal electrical activity in the brain, but the symptom we can identify when a person is affected by seizures is sudden uncontrollable jerking movements of arms and legs. These jerking movements can be identified by the vibration sensor which was kept in the glove. Whenever a person is affected by Seizures and is experiencing uncontrollable jerks in arms and legs, the vibratory sensor monitors the jerks and after crossing the threshold jerk number in a certain time, the system confirms it to be Fits/Seizures and it sends an alert message to family and Ambulance with current location information. In addition to this, a buzzer is also kept so that whenever the system confirms the above abnormalities heart attack, sunstroke and seizures, the buzzer makes a buzzling sound which alerts the people around.

4. Results and Analysis:

 Figure 15 gives the hardware implementation of the proposed system. Figure 16,17 shows the serial plotter curves of flex sensor in normal state and fist tightened state. Figure 18 shows the serial plotter curves of pulse oximeter readings. Figure 19 shows the serial plotter curves of change in the Vibratory sensor curve from normal state to increasing jerks state. Figure 20,21,22 gives the curve of GSR Electrodes stress intensity level readings. Figure 23,24 shows the screenshots of received alert messages andgps link from victim's location.
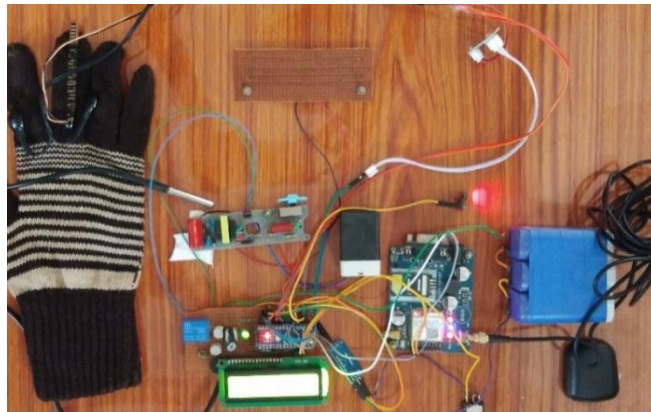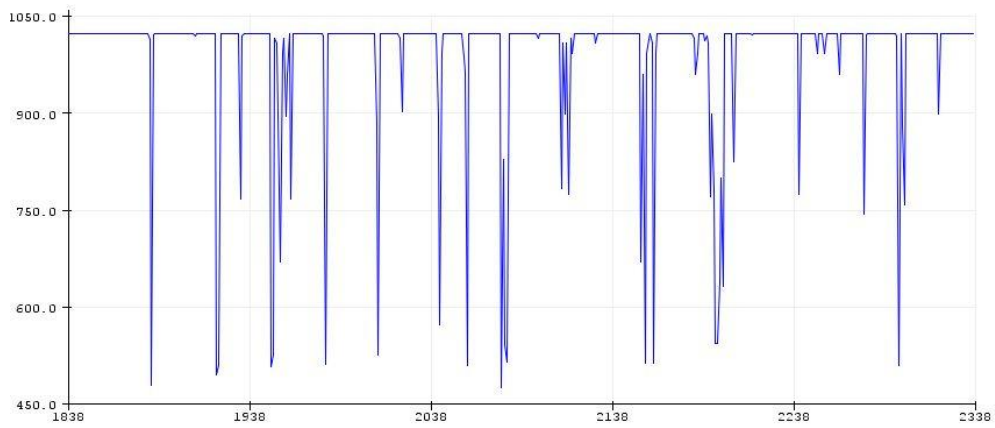

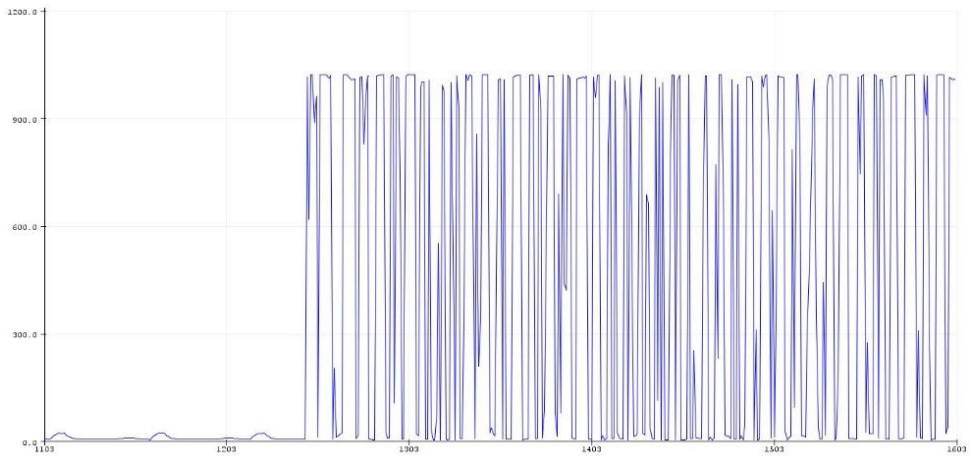**Figure 15. Hardware Implementation**
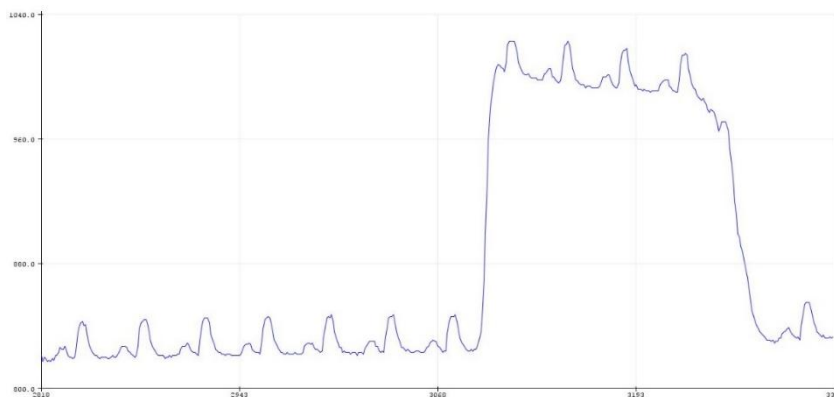
Figure 16. Change of Flex sensor curve from initial state to increased resistance state
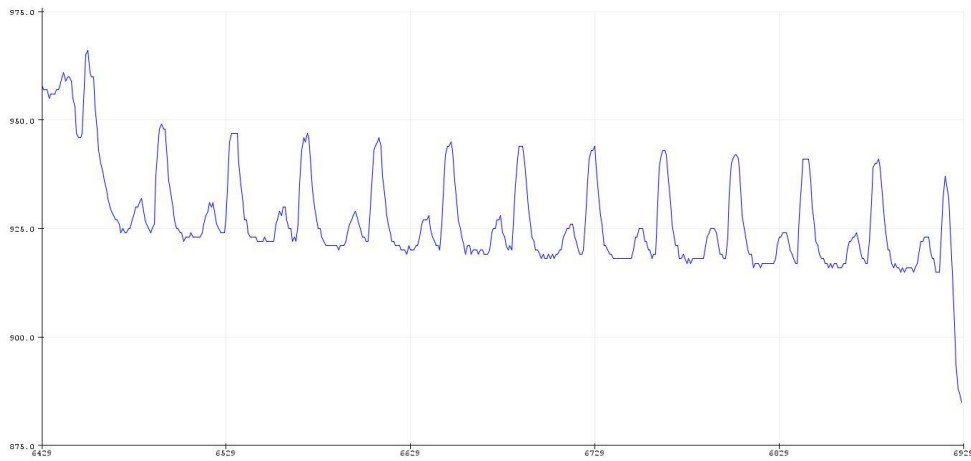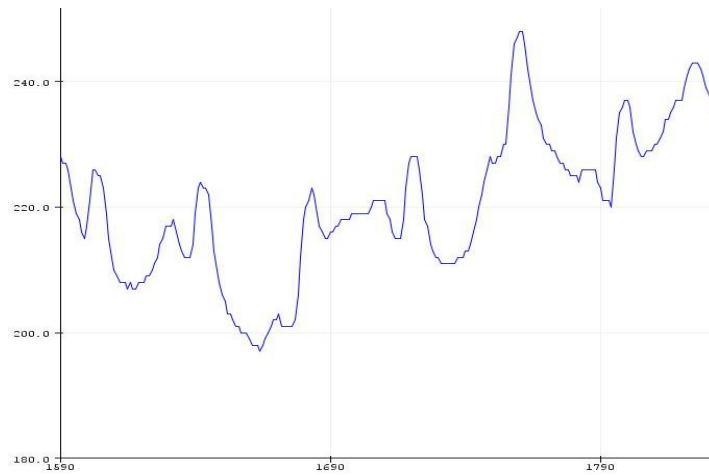
Figure 17. Flex sensor curve when shock mode activated (via serial plotter)
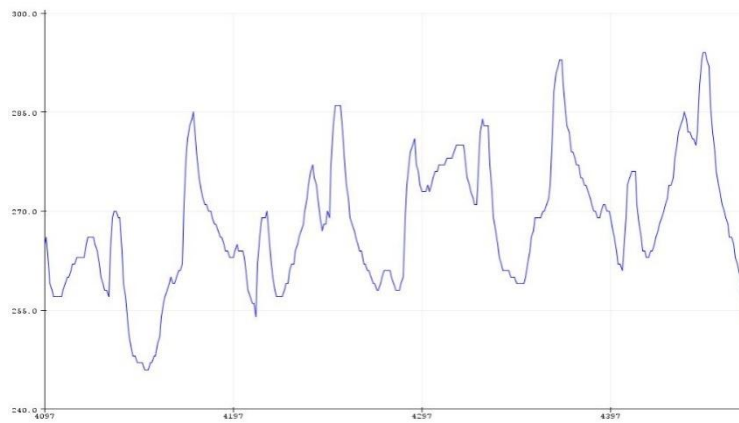

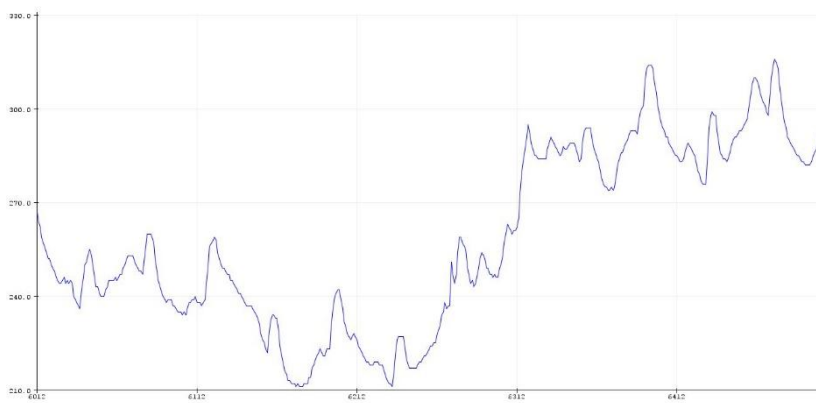**Figure 18. Pulse Oximeter curve (via serial plotter)**

Figure 19. Change in the Vibratory sensor curve from normal state to increasing jerks state (via serial plotter)

Figure 20. GSR Electrode curve in normal state

Figure 21. GSR Electrode curve in medium stress intensity state

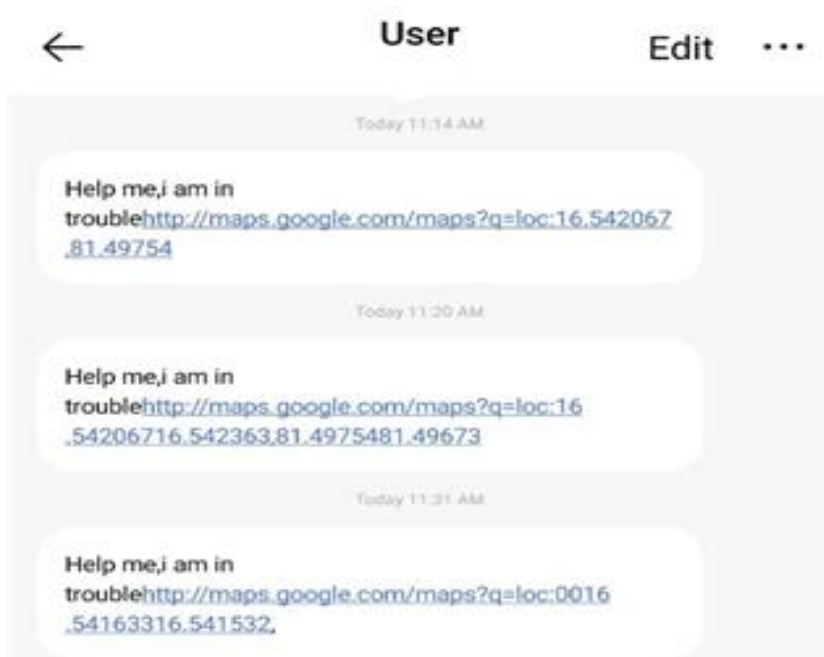**Figure 22. GSR Electrode curve in high stress intensity state**

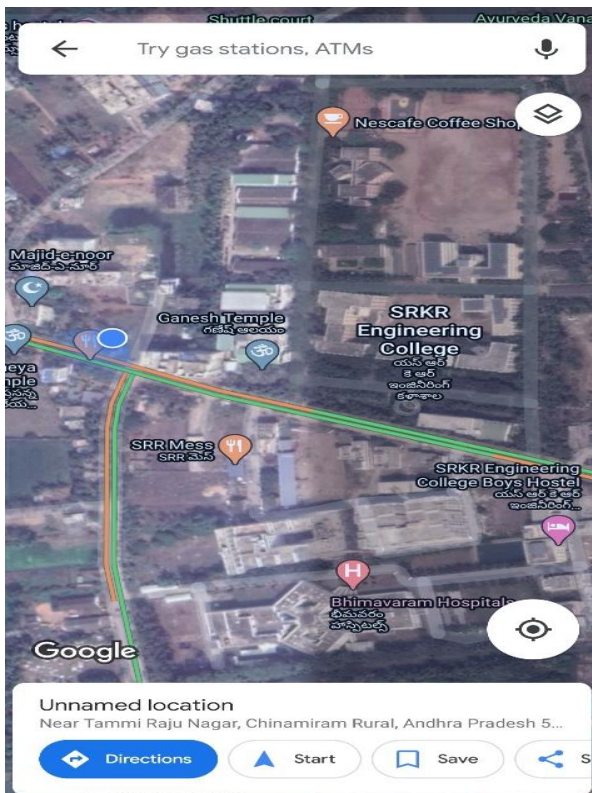**Figure 23. Screenshot of Alert message and GPS link via SMS**

Figure 24. Screenshot of victims's current location sent through SMS.

5. Conclusion:

In this devious world, proclaiming a large number of visceral beings where women safety became rather a dream, we are presenting a handy and conscience gadget which is capable of putting the demon away from our dear mothers and sisters. We incorporated a fist action based situation tracker, which will jolt out a burst off electricity through the obnoxious person reaching the victim. This feature can be invoked through stimulating tight wrist moment, which will actuate the sensor. We also packed some decent health monitoring sensors that will serve multipurpose uses. Thepulse oximeter, temperature sensor, vibrator sensor, GSR electrodes comes into the picture. They can be used to monitor the subject's emotional condition and also for real-time health monitoring of old people. The good thing is that this whole saviour device will not depend on your mobile phone, but it will communicate using the sim embedded into it. We hope and thrive further to improvise this cordial device to better serve the society.

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