

# Design and Implementation of Safety and Health Monitoring System for Women

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**Abstract**— Women security is a major concern and has become mandatory now-a-days. IT companies are looking forward to security solutions for women working at night shifts. This paper proposes a model that can be used to deal with the security issues of working women by tracking location, providing self-defense and alerting people. This proposed system also consists of a health monitoring system to monitor the heart rate and temperature of a person.

**Keywords**— women, security, tracking, self-defense, health-monitoring

## I. INTRODUCTION

In the current global scenario, prime question in every woman's mind is only about her security and safety, considering the ever-rising increase of issues on women harassment. The thought haunting every woman is when they will move freely on the streets even in odd hours without worrying about their security. The best way to reduce probability of becoming a victim of violent crime is to recognize, defence and look up resources to help out of hazardous situations. If a woman is travelling alone during night and someone is following her, then the proposed system will provide assistance by providing current location to her associates and nearby police station through SMS.

Generally in a button press women safety system, a switch is used to alert people, if she feels to be in trouble. But in a similar scenario, if a woman is hit on the head from behind, she may never get the chance to press panic button and no one will get to know that she is in trouble. A GPS based women's safety system that has dual feature is designed. In this proposed system, the device responds to pressing of panic button or position of the woman as detected by the accelerometer or abnormal heart beat detected by the pulse sensor. Whenever the device detects the above cases, the system sends the current location to the authorized associates number, police station and emergency contacts through SMS and also sounds a buzzer continuously till a reset button is pressed. The buzzer sound alerts nearby people to realize the situation. This prototype model also has a self-defence mechanism taser, which gives a minute electrical shock to the attacker and help the victim save herself from any dangerous situation. This device will prove to be very useful

in saving lives as well as preventing atrocities against women. In addition to safety of women, it can be used to measure heart rate and temperature.

## II. RELATED WORK

The research work presented by Piyush Kumar Verma [1] describes a device, when it is switched on; it activates the pulse sensor which keeps track of normal pulse rate. If the pulse sensor detects abnormal pulse rate, calls the ambulance to the current location and turns on the buzzer to alert the people around. It also sends the location and pulse reading to the family members and police through GSM module.

Glenson Toney, discussed in detail [2], the device can either be turned on manually, when a person senses a threat or turned automatically either by flex sensors or fall detectors. Whenever the victim is not in a position to turn on the device manually, he can twist his wrist to on the device using flex sensor or can fall down to activate the device using a fall detector. Once the device is turned on, it turns on the wireless camera which would be attached in the body of device, starts live streaming the video to a remote location continuously to the control room at an interval of 30 seconds.

Author Sharifa Rania Mahmud [3], describes a device which is intended to be made into two parts. If a woman is subjected to attack then a switch has to be pressed by her, manually, which in turn will trigger the microcontroller to activate the on-body shock circuit and simultaneously capture the image/video and audio of the attacker and transmit it via an RF module to another section where it will be stored.

Author Madhura Mahajan [4], discussed about the safety device can also have an emergency button when pressed once, it sends instant location with a distress message to the police pre-set numbers, twice it sends both the distress message with instant location and records the audio of the incident and when long pressed, it activates call to the police and sends message of instant location to the police. The hidden camera detector works with the help of RF signal interface. When the RF signal is interrupted, camera can be detected. It lights up when it receives a strong frequency. If mobile is lost its location can be tracked and sent to the pre-set number.

Author D. G. Monisha, describes women empowerment application will provide information about domestic violence prevention laws, health tips for women and urgent call for women seeking help from street violence in a single system [5]. The application also maintains a forum, which creates a group where women can talk with other domestic abuse victims anonymously.

**III. METHODOLOGY**

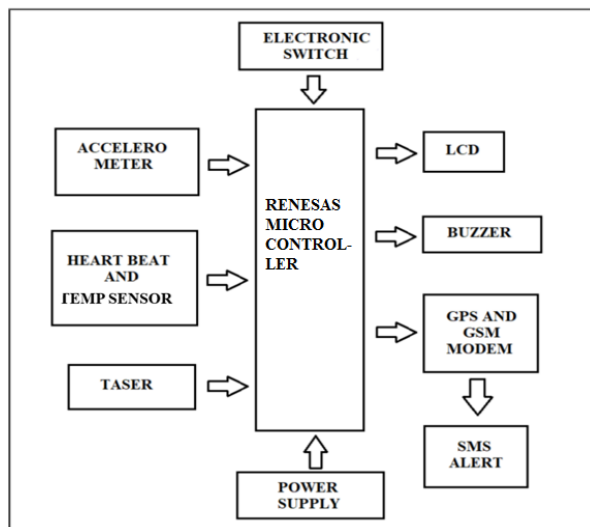


Figure 1: Block Diagram

The proposed system is divided into three parts: health monitoring, women safety and self defence.

**A. Health Monitoring**

The LM35 Temperature sensor is interfaced with Renesas Microcontroller to detect temperature in centigrade of human body. It shows the state of wellbeing of an individual. When the temperature rises above 40 °C, it sounds a buzzer to alert the person. The pulse sensor is designed to give digital output of heart beat when the finger is placed on it. It works on the principle of light modulation by blood flow through finger at each pulse. The device monitors the pulse rate of the person and alerts when the pulse rate is high or low.

**B. Women Safety**

Accelerometers are electromechanical devices that sense either static or dynamic forces of acceleration. The static forces include gravity, while dynamic forces can include vibrations and movements. ADXL335 measures the acceleration in 3 axes. This is used for fall detection. When a woman is scared or frightened the pulse rate increases and the device detects it and alerts by sending text SMS and location. The panic switch in the proposed system is used to send the current location and an alert SMS, when the person senses danger.

**C. Self Defence**

In this work, a taser is used as self defence device. Taser is an electroshock device. It has two small dart like electrodes, which is connected to main unit by conductive wires as shown in figure 2. It delivers an electric pulse which is of high voltage and few milliamps. It uses high voltage for the pulse to reach the target (20 feet away) and few milliamps to keep it away from doing any lasting damage. This electric pulse gives intense muscle pain and complete loss of muscle control, which makes the attacker unconscious.



Figure 2: taser

The flow of the proposed system is shown in the figure 3

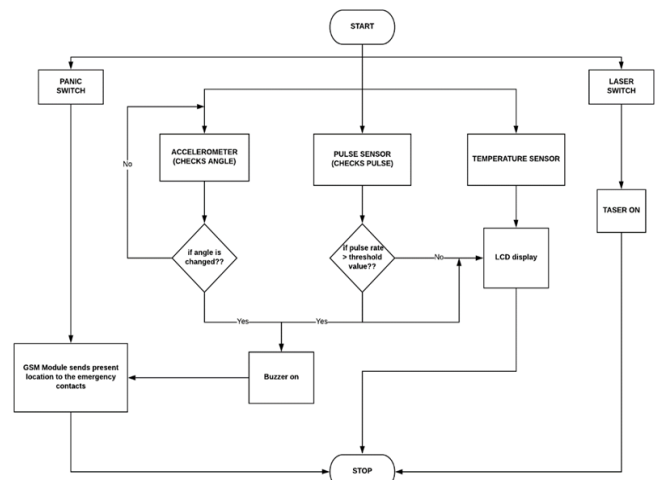


Figure 3: Flowchart

The main purpose of our project is to provide security to the women from dangerous situations. This device consists of a key or button which can be pressed by the women when she feels insecure. As the switch is pressed by the women, the pulse sensor and accelerometer will become active and starts sensing the pulse value and position of the victim and sends this value to the microcontroller. If the reading is abnormal then it takes the current latitude and longitude value of the victim with the help of GPS module. If the pulse readings are normal then it just displays the pulse value on the LCD. The microcontroller switch ON the buzzer present in the device, so that nearby people notice the critical condition and come to rescue. Microcontroller also sends the SMS of current location to the registered mobile number of the family member and police with the help of GSM module. The GSM sends the current location and other data at every 10 Sec so that if victim is changing its current location continuously then that can be easily traced by police. GSM module also calls the family member and police station. The temperature sensor becomes active and starts sensing the body temperature of the person and display on the LCD. When the woman presses the second switch, then the self-defence device taser becomes active and sends electrical signals to make the attacker unconscious.

#### IV. RESULTS AND DISCUSSION

Implementation and result of the proposed system for different cases of the device operation is discussed below.

##### CASE 1:

Panic switch is available in the women safety system. When a woman is travelling alone in remote area and senses any danger, then panic button can be used.

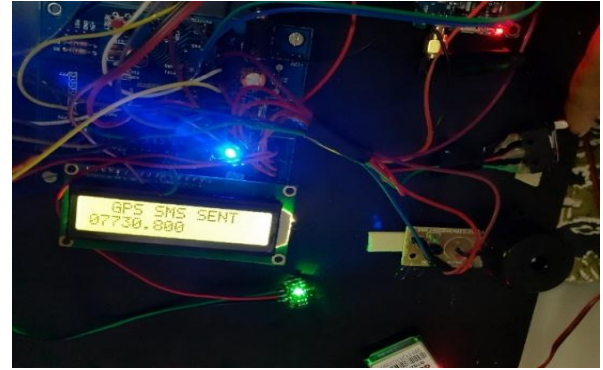
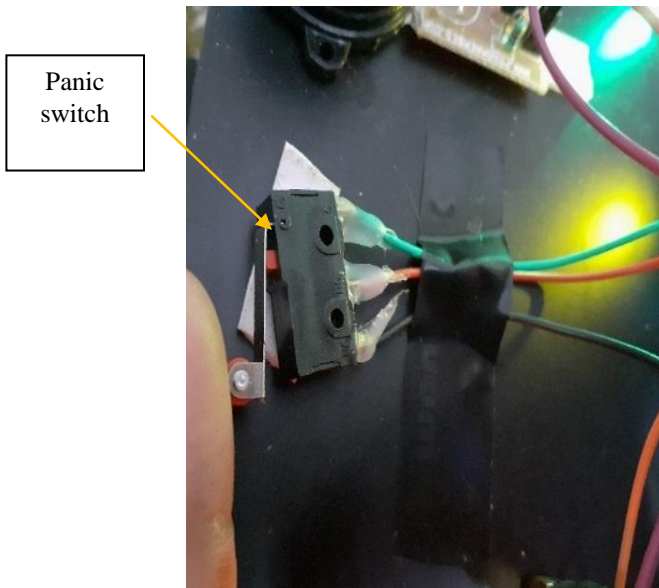


Figure 4: Sending location when panic switch is pressed

Panic switch is shown in figure 4, which can be switched on manually by sensing danger. On pressing this switch, the GPS gets activated and it fetches the present latitude and longitude of the person and sends that location to the associated contacts through GSM. The longitude and latitude of location is displayed on LCD second line.

##### CASE 2:

When a person is attacked either from backside or frontside there are chances of the person falling on ground, there will be no time to press the panic button. Therefore, in this system an accelerometer detects the fall angle and alerts the people around by a loud buzzer. It also sends an alert text SMS and location to the associated contacts. The ADXL335 accelerometer is a complete 3-axis acceleration measurement sensor. Normally all the axis of ADXL335 accelerometer will have the readings in the range of 160-170.

Due to left tilt of the accelerometer the x-axis value is changed and displays **ACCIDENT DETECT** message on LCD

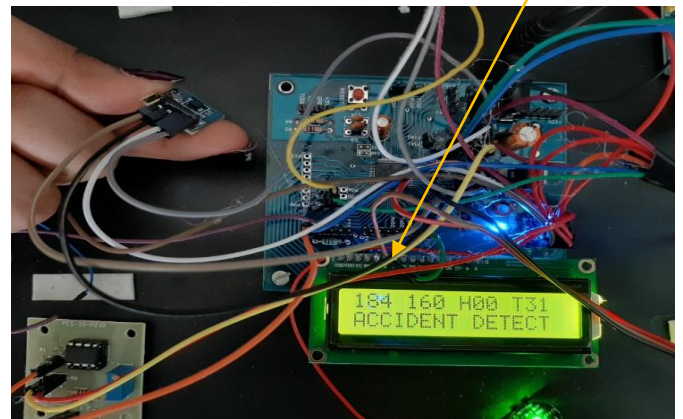


Figure 5: Fall Detection When the X-axis exceeds the given range

In the figure 5, in the first row of LCD, the first 3 digits display the X-axis value of accelerometer. The value acquired from X-axis gives the fall in left/right direction. The next 3 digits in the first row of LCD, display the value of accelerometer Y-axis. The value acquired from Y-axis gives the fall in forward/backward direction. Normally all the axis will have the readings in the range of 160-170. When either of the axis exceeds 175 then the fall is detected and the "ACCIDENT DETECT" message will be displayed on the second row of the LCD.

In the figure 6, in the first row of LCD, first 3 digits display the value of accelerometer X-axis. The value acquired from X-axis gives the fall in left/right direction. Normally all the axis will have the readings in the range of 160-170. When the reading of the axis goes below 145 then the fall is detected and the "ACCIDENT DETECT" message will be displayed on the second row of the LCD.

Due to right tilt of the accelerometer the x-axis value is changed and displays **ACCIDENT DETECT** message on LCD



Figure 6: Fall Detection When the X-axis is lesser than the given range

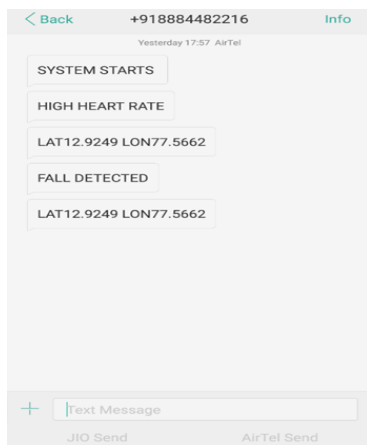


Figure 7: Message along with Location sent on Fall Detection

The figure 7 shows that when the fall is detected by the accelerometer. GSM and GPS are initialized and the messages were received by the mobile phone. The system will send an SMS through GSM as accident detected to the associate contacts along with the present location fetched by the GPS.

**CASE 3:**

Pulse sensor monitors the health of a women, is suffers from a major heart arrest or her pulse rate decreases, this device detects it and alerts the people around by loud buzzer so that she is attended immediately. It also sends text SMS and present location to the associated contacts as shown in the figure 9.

Heart Rate indicated as **H72** on the LCD



Figure 8: High Heart Rate

In the figure 8, In the first line of the LCD, the bits in the 10 and 11 position displays the heart rate (number of beats per minute). If a person senses danger, it's natural that the heart rate or pulse rate increases suddenly from normal pulse rate. So, when a woman is attacked her heart rate increases. This high heart rate is detected by pulse sensor in this device which alerts people around by a loud buzzer sound. It also sends text SMS and present location of the person to the associated contacts. For the purpose of demonstration 72 beats/minute is set as the threshold value above which it is considered as high heart rate.

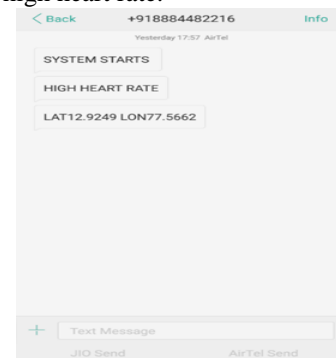


Figure 9: Message along with Location sent on High Heart Rate

The figure 9, shows messages, when the heart rate of a person goes high. The GSM gets initialized and it will send an SMS as “**HIGH HEART RATE**” to the associate contacts along with the present location.

#### CASE 4:

The temperature sensor LM35 is used as health monitoring system in the proposed system. Here the sensor is used to detect human body temperature.

Temperature displayed as  
**T43** (in °C) on LCD



Figure 10: High Temperature

In the figure 10, The digits in 14 and 15 position of the first row of LCD display temperature in centigrade. This shows the state of well-being of the woman. The normal human body temperature range is typically 97.7–99.5 Fahrenheit (°F). On converting temperature from Fahrenheit to Celsius, the normal body temperature ranges from 36.1°C to 37.2°C. When the temperature rises above the normal body temperature, it alerts the woman by displaying on the LCD.

#### CASE 5:

In this project, taser is used as a self-defence device. When a woman is in danger and there is nobody to help then she can help herself by using this self-defence taser. It delivers an electric pulse which is of high voltage and few milliamps. It uses high voltage for the pulse to reach the target (20 feet away) and few milliamps to keep it away from doing any lasting damage. This electric pulse gives intense muscle pain and complete loss of muscle control, which makes the attacker unconscious for few minutes.

For the purpose of demonstration, since use of taser is illegal, it is replaced by a 5V laser device in the proposed system.

Laser Beam

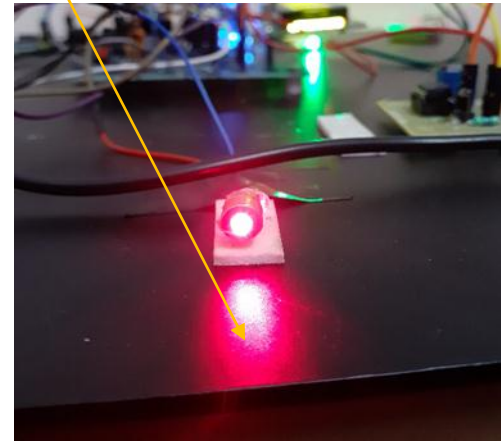


Figure 11: Laser ON condition when laser switch is pressed

The figure 11, represents the laser replaced as a taser for self-defense. In this system, the laser is turned on when the laser switch is on and gets turned off as the switch is off.

## V. CONCLUSION AND FUTURE SCOPE

### CONCLUSION

According to the survey 53% of the working women are not feeling safe. Primary goal of this project is to ensure woman safety, secured, healthy and independent. The proposed design will deal with critical issues faced by women during night and provide security with advanced technology. While the society may or may not change its mind set but this device will help to feel women independent.

The main aim of the project was women security which was achieved through the location coordinates provided by GPS and the further communication of these coordinates through GSM to the associated contacts. The health monitoring and self-defense purposes are also achieved. Self-defense is provided to the women using Taser and temperature and pulse sensor monitors the health of woman.

The major advantage of the system is its simplicity in design and it requires no regular maintenance. Since it is quite economical it would be easy to afford thereby improving security which is the main motive of this project.

### FUTURE SCOPE

The proposed design ensures complete women safety can be used in public transport. With further research and innovation this project is used as a small wearable device like watch, pendent etc. so that it is easily portable to anywhere and everywhere. It can also have a camera and audio recorder to record the incidents as a proof of crime against the attacker.

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