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A Novel Approach to Provide Protection for Women by using Smart Security Device

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Abstract— In today's world women are less secure and have many issues regarding their security purpose. They have to undergo among various difficult situations and have to prove themselves every time in all critical conditions. So, for their security and safety purpose government has provided security through rules and regulation to the society. Although there are many existing systems for security purpose need of advanced smart security system is increased. In order to overcome such problems smart security system for women is implemented.

This paper describes about safe and secured electronic system for women which comprises of an Arduino controller and sensors such as temperature LM35, flex sensor, MEMS accelerometer, pulse rate sensor, sound sensor. A buzzer, LCD, GSM and GPS are used in this project. When the women is in threat, the device senses the body parameters like heartbeat rate, change in temperature, the movement of victim by flex sensor, MEMS accelerometer and the voice of the victim is sensed by sound sensor. When the sensor crosses the threshold limit the device gets activated and traces the location of the victim using the GPS module. By using the GSM module the victim's location is sent to the registered contact number.

Keywords- Women safety, An Arduinocontrollers, Flex sensor, MEMS accelerometer, GPS module, GSM module.

I.INTRODUCTION

Safety is the most wanted power for everyone in today's world. Technology is the best way to achieve it. That's the reason to develop this project that can act as a rescue device and protect at the time of danger. The motivation behind this project is an attempt to focus on a security system that is designed merely to serve the purpose of providing security to women so that they never feel helpless while facing such social challenges. An advanced system can be built that can detect the location and health condition of person that will enable us to take action accordingly based on electronic gadgets like GPS receiver, GSM, pulse rate sensor, flex sensor, MEMS accelerometer, body temperature sensor. We can make use of number of sensors to precisely detect the real time situation of the women in critical abusive situations. The heartbeat of a person in such situations is normally higher which helps make decisions to detect the abnormal motion of the women while she is victimized.

II. EXISTING SYSTEMS

In Women and children based security system [1] victim has to press the emergency button, but in emergency conditions pressing the button is may not be possible. Using Smart Phone", the child cannot send its location by itself. The parent of that child has to send the message to the child's system to know their location.

In "Mobile Tracking Application for Locating Friends", a tracking application software must be installed in the mobile phone and the friends must be previously registered in the friends group of application [2]. To track their friends mobile phones are needed in both sides.

In an Intelligent System based on RFID and GPS Technologies for Women Safety[3] has some limitations in terms of cost, signal interferences and also the information access to invalid and unauthenticated users.

The main drawback of these applications and services is that the initial action has to be triggered by the victim [4] which often in situation like these doesn't happen. So the emphasis is to build a solution that works autonomously in situations encountered.

This paper presents new method to provide protection for women or children by ringing the buzzer and send the location to the nearby police station where the victim is present.

III. PROPOSED SYSTEM ARCHITECTURE

The architecture of proposed system as shown in Fig 1 consists of Arduino controller [5].as a main source and it receives input signals from the sensors, where thereby the sensors receives the input signals from a human who is in threat or in danger or in abnormal situations.

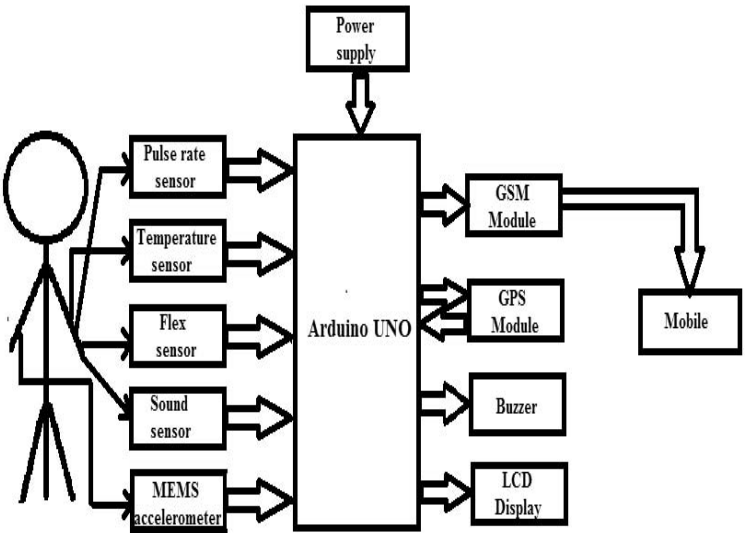

Fig: 1. Architecture of the Proposed System

The sensors described in the architecture are temperature LM35 sensor, MEMS accelerometer, heartbeat sensor, flex sensor, sound sensor. To display the body parameters[6] of the women(victim)in a dangerous situation an output is used in this project LCD 16*2display is used, also buzzer is used and GSM is used to send the alert message to the registered contact number where as GPS is used to track the location of that person(women).

IV WORKING PRINCIPLE

The principle behind this is to detect body parameter signals from the respective sensors which are in contact with the women who are in threat condition and hence after detecting signals, the sensor transmits the output electrical signals to the controller. The Arduino receives the signal from the sensor as an analog input signal and hence it generates the output parameters of each sensor and displays it on the LCD display.

The sensors used in the proposed system are flex sensor, temperature sensor, MEMS accelerometer, sound sensor, pulse rate sensor. Each sensor is used to detect signals [7] of human (women) who is in abnormal situations. If values of any sensor signal crosses the threshold limit indicating that the women is in threat and according to victim condition, when 4 sensors out of 5 sensors crosses the threshold limit the buzzer is activated.

Hence the GPS transmits the location to the Arduino and then the Arduino transmits the signal to the GSM. Finally the alert message "I am in danger" along with the latitudinal and longitudinal location is send to the registered contact number. Thus activation of sensor and buzzer traces the location of victim using GPS and with the help of GSM 800L used sends the message of location to the corresponding contacts with a 10secs delay.

V. HARDWARE DESCRIPTION

1. *Arduino:* The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

Sensors Interfacing To Arduino: The Arduino comprises of 28pins, where there 20 I/O pins. There are 14digital pins and 6analog pins. Here in this system all the respective sensors are connected to the analog pins of Arduino. The analog pins AO, A1, A2, A3, A4, A5 from Port B of Arduino are used for interfacing with the sensors. The digital pins (2, 3, 4, 5, 7,6,7,8) Port C of Arduino are used here to connect to the data lines of respective LCD display. The power supply of 5v is supplied to the Arduino through the USB cable. The output pin of Arduino i.e., 13th pin is connected to the buzzer to determine the output of the project. The main components of this project i.e. GSM and GPS are connected to Arduino. Hence in this proposed system the Arduino is completely used for implementation of the security system.

2. *Buzzer*: Now-a-days, it is more popular to use a ceramic-based piezo-electric sounder like a Sonalert which makes a high-pitched tone. Usually these were hooked up to driver" circuits which varied the pitch of the sound or pulsed the sound on and off.

3. GPS Module: Global positioning system (GPS) as shown below in Fig 2 is a navigation and precise positioning tool, which tracks the location in the form of longitude and latitude based on Earth by calculating the time difference for signals from various satellites to reach the receiver [8].

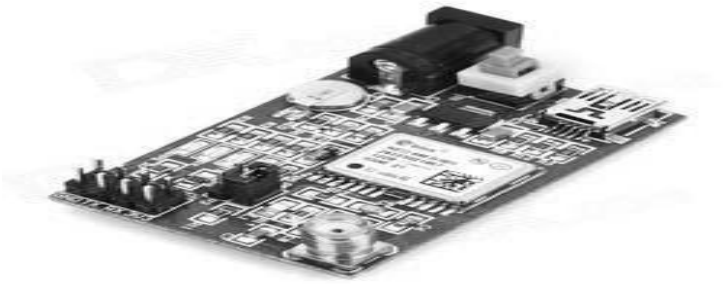

Fig 2. GPS Module

In six different orbits approximately 12500miles above the earth, 24 MEO (Medium-Earth Orbit) satellites revolve around the earth 24 hours and transmit location every second. It receives the data of location and transmits it to the Arduino. The Arduino thereby receives the signal from GPS and hence it performs further operations

4. *GSM Module:* Global System for Mobile communication (GSM) SIM card is inserted inside the mobile device to send and receive the messages using GPRS. The GSM SIM card number is registered with the system.GSM is used to send data from control unit to base unit .We can use GSM 800A which operates at frequency 900MHz. It has up link band of 890MHz to 915MHz and down link Band of 935MHz to 960 MHz GSM takes advantages of both FDMA & TDMA. In 25MHz BW, 124 carriers are generated with channel spacing of 200 KHz (FDMA). Each carrier is split into 8 time slots (TDMA) [9]. At any given instance of time 992 speech channels are made available in GSM 800L .

4. *Temperature Sensor:*

We can measure the body temperature using various temperature sensors. For instance, LM35 which has series of precision integrated circuit sensors whose output voltage is linearly proportional to the Celsius temperature. It operates linearly +/- 10.0mV/°C scale factor with 0.5°C accuracy. In emergency cases body temperature [10] varies drastically which can trigger module for rescue.

5. *Flex Sensor:* Resistive flex sensors as shown in Fig.3 can be used to measure bending or flexing with relatively little effort. Their lightness, compactness, robustness, measurement effectiveness and low power consumption make the sensors useful form ani-fold applications in diverse fields In relation to the human body, we consider the utilization of resistive flex sensors for the measurement of physical activity [11] and for the development of interaction/interfaced vices driven by human gestures.

Fig.3. Flex Sensor

6. *Mems Accelerometer:* An accelerometer shown in fig 4.8 is an electromechanical device that is used to measure acceleration and the force producing it. Many types of accelerometers are available in the market today .Due to its small size and robust sensing feature, they are further developed to obtain multi-axis sensing

One of the most commonly used MEMS accelerometer is the capacitive type. The capacitive MEMS accelerometer is famous for its high sensitivity and its accuracy at high temperatures. The device does not change values depending on the base materials used and depends only on the capacitive value that occurs due to the change in distance between the plates. If two plates are kept parallel to each other and are separated by a distance 'd', and if 'E' is the permittivity of the separating material, then capacitance produced can be written as

$C_0 = \epsilon_0 . \epsilon A/d = \epsilon A/d$

A change in the values of ϵ, A or d will help in finding the change in capacitance and thus helps in the working of the MEMS transducer. Accelerometer values mainly depend on the change of values of d or A.

7.Pulse Rate Sensor: The Pulse Sensor has shown in Fig 4 is a plug-and-play heart-rate sensor for Arduino. It can be used by students, artists, athletes, makers, and game & mobile developers who want to easily incorporate live heart-rate data into their projects [8].It essentially combines a simple optical heart rate sensor with amplification and noise cancellation circuitry making it fast and easy to get reliable pulse readings. Also, it sips power with just 4mA current draw at 5V so it's great for mobile applications.

Simply clip the Pulse Sensor to your earlobe or fingertip and plug it into your 3 or 5 Volt Arduino and you're ready to read heart rate.

8. Sound Sensor: The sound sensor module shown in Fig 5 provides an easy way to detect sound and is generally used for detecting sound intensity[12].

Fig.4. Pulse Rate Sensor

This module can be used for security, switch, and monitoring applications. Its accuracy can be easily adjusted for the convenience of usage. It uses a microphone which supplies the input to an amplifier, peak detector and buffer. When the sensor detects a sound, it processes an output signal voltage which is sent to a microcontroller then performs necessary processing

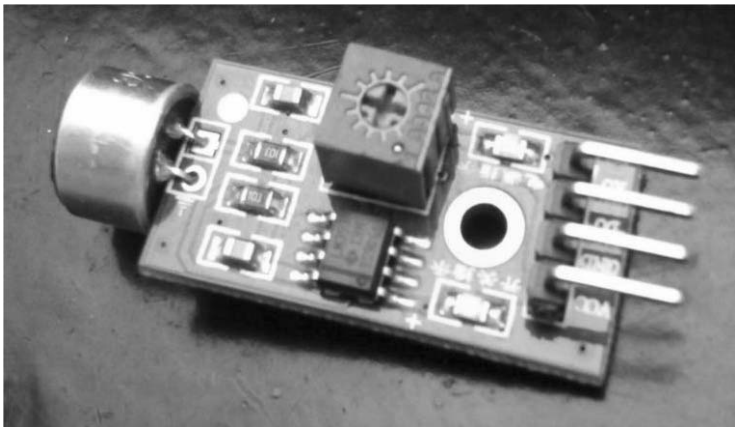

Fig.5. Sound Sensor

VI. ARDUINO SOFTWARE

Integrated Development Environment (Ide):

Here the Arduino IDE is used on computer (picture following) to create, open, and change sketches (Arduino calls programs as "sketches") .The Mega 2560 board can be programmed with the Arduino Software (IDE)[13]. The ATmega2560 on the Mega 2560 comes pre-programmed with a boot loader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol (reference, C header files). You can also bypass the boot loader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header using Arduino ISP . The ATmega16U2 (or 8U2 in the rev1 and rev2 boards) firmware source code is available in the Arduino repository.

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The Arduino Software (IDE) uses this capability to allow you to upload code by simply pressing the upload button in the Arduino environment. This means that the bootloader can have a shorter timeout, as the lowering of DTR can be well-coordinated with the start of the upload. This setup has other implications. When the Mega 2560 board is connected to either a computer running Mac OS X or Linux, it resets each time a connection is made to it from software (via USB).

VII. IMPLEMENTATION OF PROPOSED SYSTEM

In below Fig.6 shows flow chart of the implementation of the proposed system.

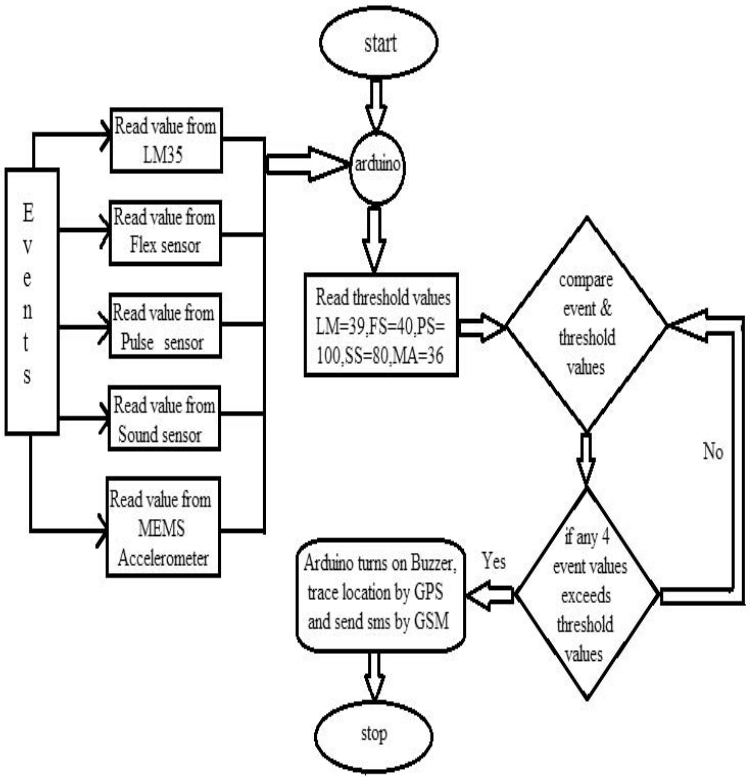

Fig 6. Flow Chart of Proposed System

a) Body Temperature Detection Of Victim

When a woman is in abnormal situation then the temperature of that person is sensed and this output from the sensor is fed to the A0 pin of the Arduino as analog input signal. Hence the sensors detects the abnormal condition of that women as change in temperature is detected and the respective voltage value is the output signal and hence the output temperature value of that women (whether it is low or high)is displayed on the respective LCD display as shown in below Fig 7.

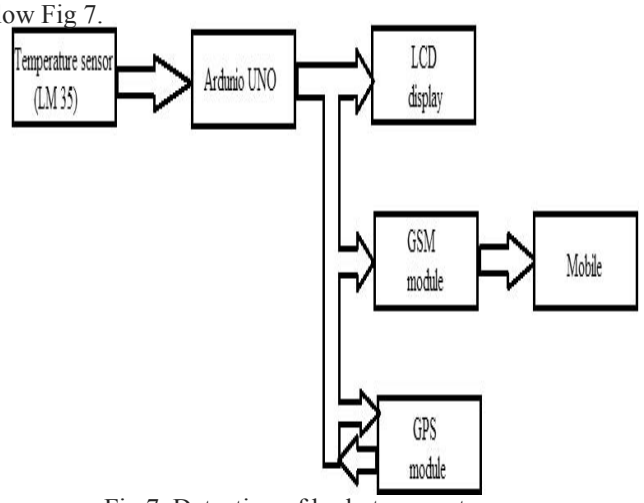

Fig.7. Detection of body temperature

b. Voice Detection Of Victim

The women is in any abnormal situation or dangerous condition then she can protect herself by shouting loudly or screaming for help and hence the sound sensor detects the signal and if the sound generated by the women proceeds the threshold value then the sensor feds the analog output to the Arduino as input signal.

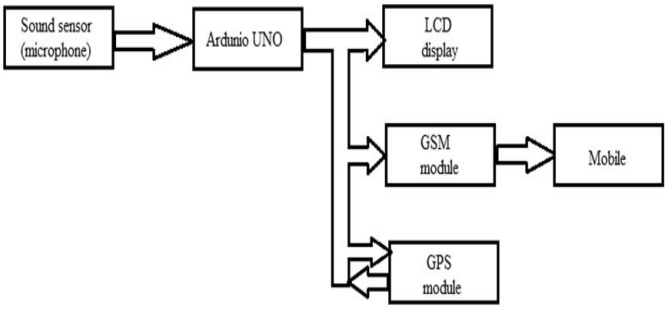

Fig.8. Detection of Voice

So considering the reference threshold (25-40decibles) value here in this project the maximum sound produced greater than this reference value activates the sensor and the sensor detects the analog signal and the sensor output is fed to the Arduino A3 pin as input and hence the Arduino generates output signal (as a digital value)which is displayed on the LCD display.

b. Flex Motion Detection Of Victim

The sensor is placed on the hand to detect the resistive change in that particular placement of the sensor as shown in below Fig 8 It depends on the change in resistance where the change in resistance is caused due to sudden bend of the body or hand or due to other reason. So, this allows the sensor to sense and detect the abnormal value and hence the output is detected in the display of LCD

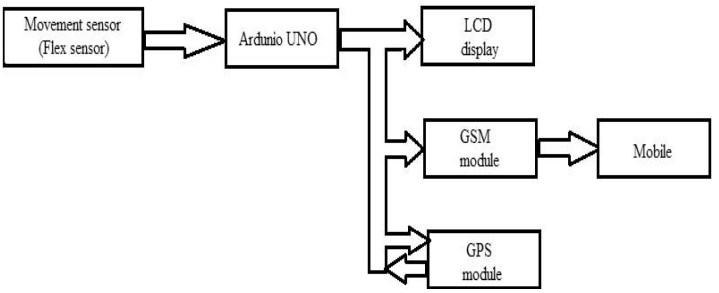

Fig.9. Detection of Movement

c. To Detect The Sudden Fall Of Victim

The MEMS accelerometer sensor is connected to the A4,A5 analog pins of the controller. The X coordinates of

MEMS is connected to the A5 pin whereas the Y coordinate is connected to the A4 pin of controller as shown in Fig.10 The MEMS accelerometer is used for fall detection purpose in many projects.

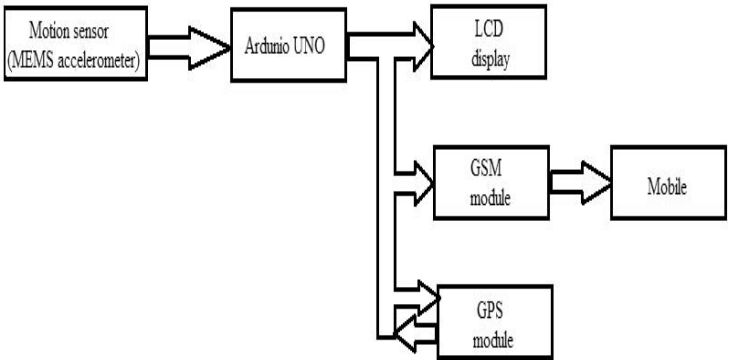

Fig.10. Detection of Sudden Fall of the Victim

In this device the MEMS is used to detect the sudden fall of that particular person and hence the X,Y coordinates determines that the value obtained after the sudden fall of that particular women/person. Hence it displays the output value on the LCD display.

d. Pulse Rate Detection Of Victim

Generally the heart rate of the human is 72beats/min. In this respective project the heart rate of a person if reaches or precedes the threshold (for >100beats /min.) then the sensor detect the analog signal and hence feds the output signal to the Arduino which is shown in below Fig 11.

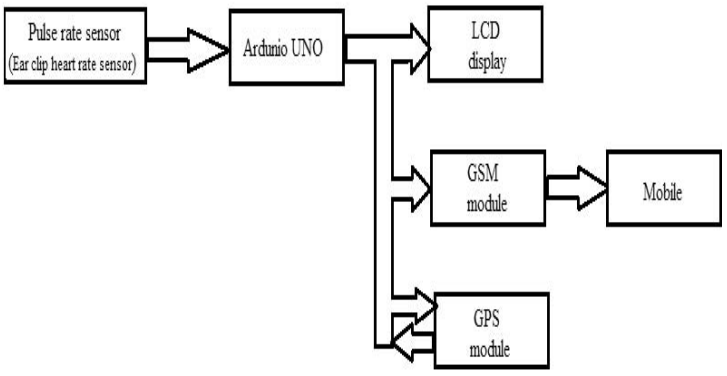

Fig.11. Detection of Pulse Rate of Victim

Generally if any woman is in dangerous situation then the heart rate either increases or decreases. So, the pulse rate sensor here detects the threshold vale and hence the sensor senses the heart rate .If the heart rate is more than threshold value i.e. normal beats of human (72beats/min) then it indicates the abnormal situation of the person and the Arduino here generates the output value (heart rate at that situation) and displays it on the LCD display.

e. Activation Of Buzzer

Here the buzzer only buzzes the sound if any 4 sensors are detected among the five sensors. Once all the four sensors (temp, flex, MEMS, sound) are detected the buzzer buzzes and hence the message alert “I am in danger” along with latitudinal and longitudinal values of that location is send to the respective contact through the GSM 800Lmodule and hence the latitudinal and longitudinal values and the message is received by the respective contact. In spite of abnormal cases if unexpectedly any of the four sensors among the five are detected and message is send, this might cause trouble for that person [14].

So to avoid this that particular person should press a switch to avoid sending messages within a span of 10 sec of time. So, in this way the alert and security is provided for that person in any situations.

VIII. EXPERIMENTAL RESULTS

The prototype of the women security system is shown in below Fig.12.The signals from temperature, flex, MEMS accelerometer, and sound, pulse rate sensors are detected successfully and send to Arduino. When four out of five above sensors crosses their threshold values the buzzer buzzes and the values are displayed on LCD as shown in Fig13.

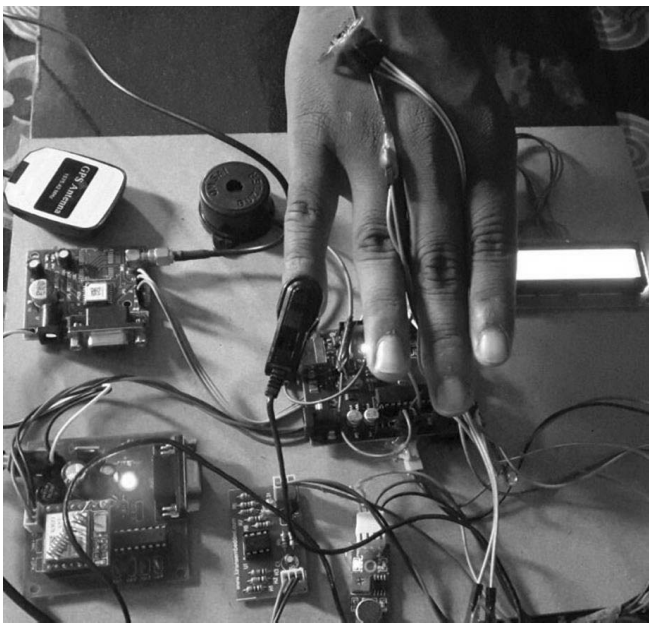

Fig.12. Prototype of security system

Fig 13. Threshold values of victim in LCD

After the Arduino gets four threshold crossed values it turns on GPS and traces the latitudinal and longitudinal values of woman and with the help of GSM 800L the Arduino send a message "I am in danger" to registered contact number as shown in below Fig 14.

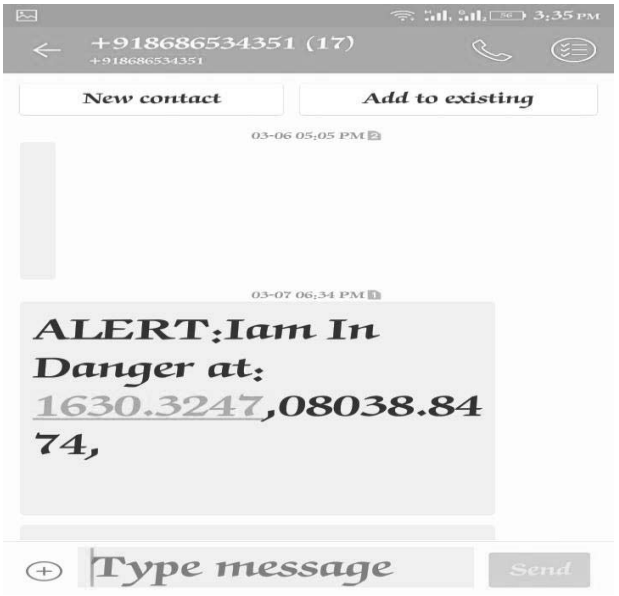

Fig 14. Alert message

IX. CONCLUSION AND FUTURESCOPE

This paper is all about the existing applications for women security and comes out with an innovative idea for security and protection for women and more research is possible with introducing smart technology where people and objects form a network. This will help to solve them technologically with compact equipment and ideas. Using screaming alarms and also alerting the emergency contacts by sending the messages with the location is helpful for women's security. This system can overcome the fear that scares every woman in the country about her safety and security.

Futurescope

For example as the school children safety are major concerns for parents as well as school management due to the recent incidents of child crimes like children missing, abuse etc. The modules used monitor the child safety when they are travelling in school buses. Once they reached the school the device gets deactivated by school authority and message send the parents that, "The child reaches the school safely". Hence, the advance technology makes the system more robust and reliable. As the new modules provide the functionality which enhance the safety and security.

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