



Intelligent Multipurpose Safety Wrist Band for Women using Arduino

*SONISHA SOMAN, *SREELAKSHMI G, *ASWANI ASOK, **SREEDHARAN EMBRANDHIRI

*Sree Narayana Guru Institute of Science and Technology, Manjaly, N. Paravur, Ernakulum

**Regional Centre IHRD , Thiruvananthapuram, India

Abstract - All over the world the women are facing much unethical physical abuse. According to latest data released by the National Crime Records Bureau (NCRB) in recent years violence against women has become a prominent topic of discussion in India. Another important problem nowadays many people are dying because of many health problems and which is due to they are not getting the timely and proper treatment. In order to overcome such situations, we propose a microcontroller based multipurpose intelligent system that keep user observing at all time. This system has the facility to detect the abnormalities like heart beat variation, sweat, shivering, temperature with help of different sensors and send location information as a message . if the user is in dangerous situation, her health parameters will vary. The system automatically identifies that situation and start communicate to the emergency phone numbers which is already stored in it. No human intervention is needed to operate the device. Despite of the attack, the system also alerts for the health problems.

Keywords – Women Safety, GSM, GPS, Arduino Uno, Heart beat sensor, Temperature sensor, Sweat sensor, Accelerometer, LCD display.

I. INTRODUCTION

In India the crimes against women are increasing day by day. In India, women continue to face social challenges and are often victims of physical harassments and violent crimes and, according to a global poll conducted by Thomson Reuters, India is the

“fourth most dangerous country” in the world for women. Also nowadays because of heart attacks many people’s were dying, the reason behind that they are not getting the timely and proper treatment[1].

There are some existing systems related to these problems, such systems surveyed and categorized into three ways.

First one is the systems designed as mobile apps for the android mobile phones. Some examples of such mobile applications are I Safe, Go Safe, I Follow, Abhaya and IPROB, SCIWARS. In these applications the system will send message and call alert under emergency conditions[2][3][4]. Second one is the systems designed as a device using Microcontroller. In such systems one of the device will be activated based on the values of sensors, another device is activated when the variations in pressure crosses over the threshold in unsafe situation. And the other system will be activated through the voice command. In each case the device will track the location through GPS module and send the emergency alert to the emergency contacts through GSM module[5][6].Third one is the system designed as an advanced artificial intelligence security systems. It is an automatic technique to predict the unsafe situations based on the female emotion such as fear, anger etc. So we propose a combined device applicable for both women and patients. The proposed device is a wrist band style. The main advantage of this device is, it doesn’t require any smartphone like any other systems[7][8].

II. PROPOSED SYSTEM

A safety wrist band is a new innovation in the field of technology which aims at individual safety. In the present scenario individual safety is of great consideration. Personal safety has become an issue of

importance for everyone but especially for women. The safety wrist band can assist the person automatically and manually. This is possible by the sensors namely stress sensor, heart rate sensor and accelerometer in the wrist band. In other way the person itself can make it manually. The continuous measured physiological parameters can be stored on the chip and which may further useful for the person[9].

The proposed system consists of an arduino tool, 16x2 LCD display, GSM module, GPS module, Switch button, Advanced sensors like Heart beat sensor, Temperature sensor, Sweat sensor, Accelerometer, LED, Buzzer, Driver circuit and a Power supply unit.

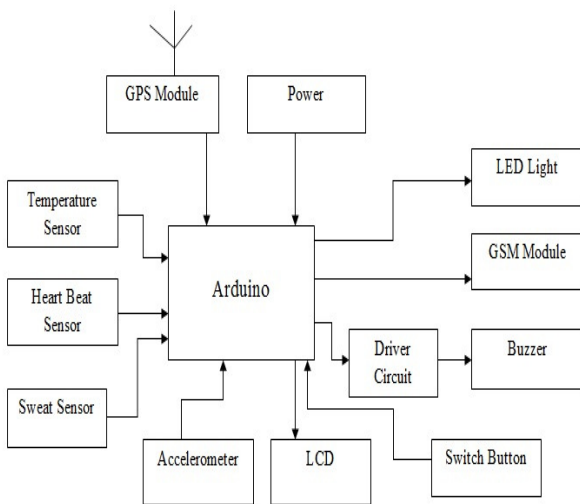


Fig. 1- Block Diagram of the proposed system

The proposed system is a wrist band style model. The proposed system will continuously monitor the person to check for uneasy situations. The advanced sensors such as temperature sensor, heart beat sensor, sweat sensor and an accelerometer sensor will continuously check the temperature, heart beat and sweat to check the emergency conditions. The system will also provide three switch buttons. Two switch buttons are used to give alert and the other one is used to cancel the alert. If any attack or emergency condition occurs the GPS module will track the location and send this location and emergency messages through GSM module to the emergency contacts that are predefined by the user. The device will also consist of a LCD display to display the message. A screaming buzzer and an LED light is also used to provide the alert at the time of emergency situations. We provide a power supply unit also for the device.

The working of each module is as follows:-

Arduino board: - In Arduino Uno Atmega328 microcontroller is used. It supports C and C++ languages. It has got 14 digital input-output pin, 6 analog inputs, 16 MHz crystal oscillator, ICSP header, power jack, USB connection and reset button[10].

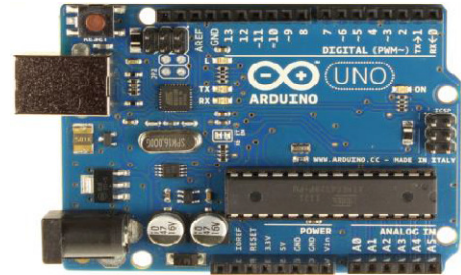


Fig. 2 - Arduino Uno

GSM Module: - It stands for global system for mobile communication, and is used for transmitting GSM mobile voice or messages. GSM is a multiple access technique which is used for communicational purposes. GSM module is powered by a power supply circuit. It is an interface between mobile and a computing machine. GSM modem is a dedicated device which supports USB as well as Bluetooth connection. Here we use SIM900 GSM module[11].



Fig. 3 - GSM Module

GPS Module: - GPS stand for Global Positioning System which consists of system of satellites that helps in the positioning of a place. It provides details such as latitude and longitude. The obtained data can be converted into a usable form with the help of microcontroller. The information of the location can get with the help of four satellites. In this system the GPS module is used to track the location at the time of emergency conditions[12][13].

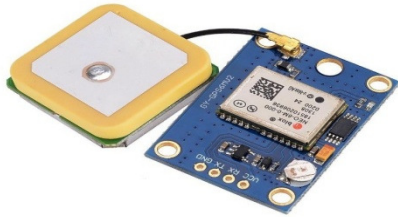


Fig. 4 - GPS Module

Heart Beat Sensor: - The heart related diseases are increasing day by day and hence heart rate is to be monitor to ensure the quality of health. Heart beat sensor is a sensor used to measure heart rate. Mainly it consists of an LED and a photo detector. The way in which it works is that an LED is placed to illuminate the finger on one side and a photo detector on other side. The photo detector measures the minute variations in the transmitted light from the finger. The variations in the photo detector signal are related to changes in blood volume inside the tissue[14].

The heart beat sensor is interfaced with the arduino. Arduino read the pulses from the sensor and calculate the heart rate and sends the data. If there occurs any variation from the normal rate, an alert is send automatically using GSM module.

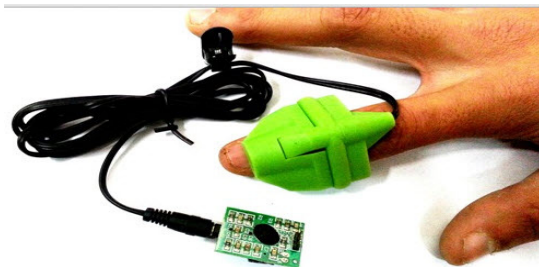


Fig. 5 - Heart Beat Sensor

Temperature sensor: - The temperature sensor is used to measure the body temperature variations. Its output voltage is linearly proportional to temperature which reads in centigrade instead of kelvin. This sensor does not require any external calibration. It has got low self-heating and low cost. The operating voltage varies from 4v to 3v. In our project LM35 is mainly used for measuring body temperature[15].

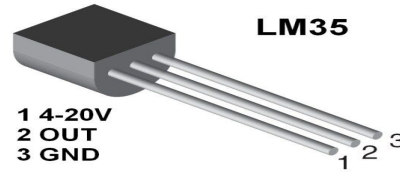


Fig. 6 - Temperature Sensor

Sweat Sensor: - It is a tool used for detection of sweat. The module consists of a metal plate that is placed on the skin and a comparator. The comparator will compare the sweat levels. Normally at uneasy situations people get nervous and produce excess sweat. At that time the sensor will give the compared output to the arduino board for further processing[16].

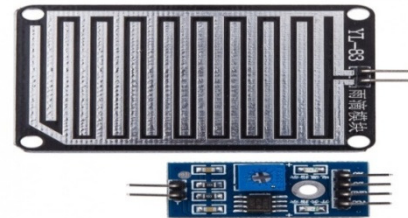


Fig. 7 - Sweat Sensor

Accelerometer sensor: - Here the Accelerometer is an instrument which is used for measuring the movement of the body. It is an analog device that reads in X, Y and Z directions. In our model we are using ADXL335 three axis analog accelerometer. It is also used in medical applications. This sensor has got high sensitivity because of its simplest structure and fast turn on time. The sensor value will directly give to the arduino using these 3 analog pins[17].

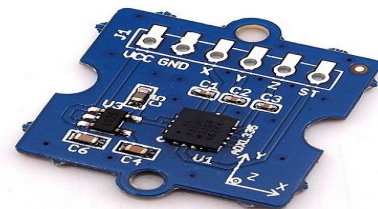


Fig. 8 - Accelerometer sensor

16x2 Alphanumeric LCD display: - A 16 x 2 alphanumeric LCD display is mainly used in many devices and circuits. It has 16 characters by two line display. It has two types of registers ie; command register and data register. Special commands can be inserted into LCD using command register and data is

inserted using data register to the LCD. It has got low cost and easily programmable[18].

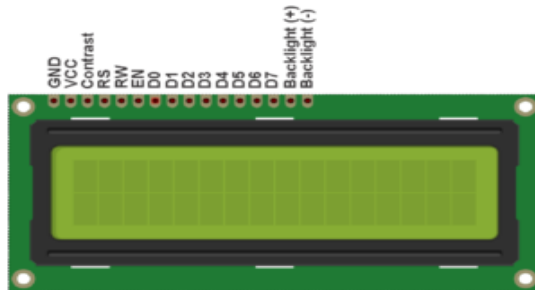


FIG. 9 - LCD display

Buzzer:- An electrical device that makes a buzzing noise and is used for signaling. In our project when any emergency conditions occurs the buzzer will continuously produces sound.



Fig. 10 – Buzzer

Driver Circuit: - The BC547 is used as driver circuit. It is an NPN bipolar junction transistor, is commonly used to amplify current. A small current at its base controls a larger current at collector and emitter terminals. It is mainly used for amplification and switching purposes.

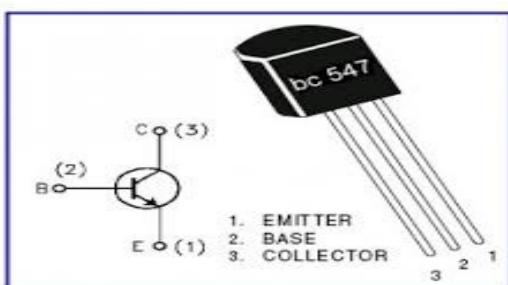


Fig. 11 - BC547

III Implementation of the system

The proposed system will continuously monitor the person to check for uneasy situations. The advanced sensors such as temperature sensor, heart beat sensor, sweat sensor and an accelerometer sensor will continuously check the temperature, heart beat and

sweat to check the emergency conditions. The system will also provide three switch buttons. Two switch buttons are used to give alert and the other one is used to cancel the alert. If any attack or emergency condition occurs the GPS module will track the location and send this location and emergency messages through GSM module to the emergency contacts that are predefined by the user[19][20]. The device will also consist of a LCD display to display the message. A screaming buzzer and an LED light is also used to provide the alert at the time of emergency situations. We provide a power supply unit also for the device. The circuit diagram of safety wrist band using wireless communication mainly consists of three sections like input section, processing unit and output section. The sensors output connected to the processing unit of the system, Arduino board. There are heart rate sensor, stress sensor and accelerometer[21].

The sensor is an object whose purpose is to detect events or changes in its environment, and then provide a corresponding output. A sensor is a type of transducer which provides various types of output as electrical or optical signals.

The sensor outputs are given to the input pins of the Arduino. All the sensors output are in the form of digital signal which comes to Arduino. The Arduino process the data from the input pins based on the program embedded on the board. Also there are another input from GPS module and button switches like cancel button and emergency button. In Arduino board there is a preset threshold value for heart rate sensor, stress sensor and accelerometer. If the sensor output exceeds the threshold value then the Arduino is ready to send the data to the output section after a delay. If there is an input from the cancel button during the delay period then Arduino stops sending the data. The Arduino could also send the data or text message without exceeding the threshold value. That is there is an emergency button, which when pressed, the Arduino will send the data to the output section. The output data from the Arduino contains the heart rate, stress, fall and location of the person. The output section consists of a 16 x 2 LCD display, GSM module and an alarm. The data can be displayed and also send to other mobile numbers via GSM module [22][23].

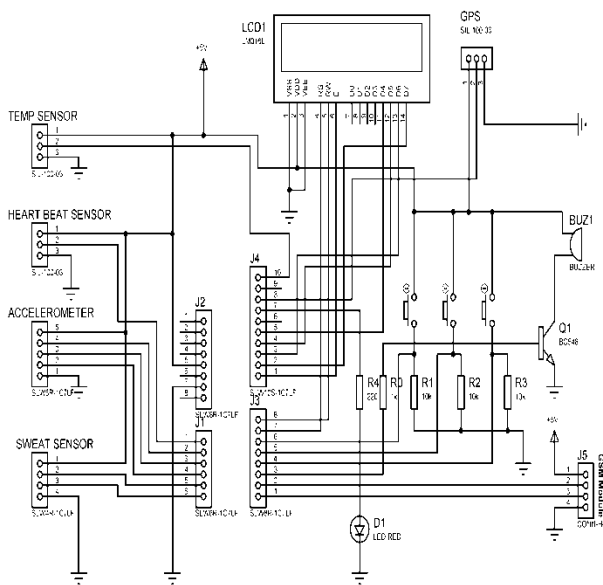


Fig 12. Circuit Diagram

- Step 8: If the sensor value doesn't exceed then repeat step 2 to 7
- Step 9: If the sensor output exceeds the preset threshold value then goes to step 10.
- Step 10: Activate the GSM module.
- Step 11: Check the cancel button input.
- Step 12: If the cancel button pressed then message transmission cancelled.
- Step 13: Repeat the step 2 to 11

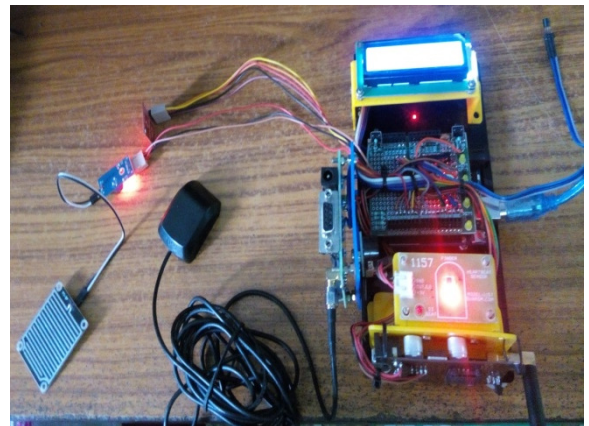


Fig 14: Hardware Assembly of the system

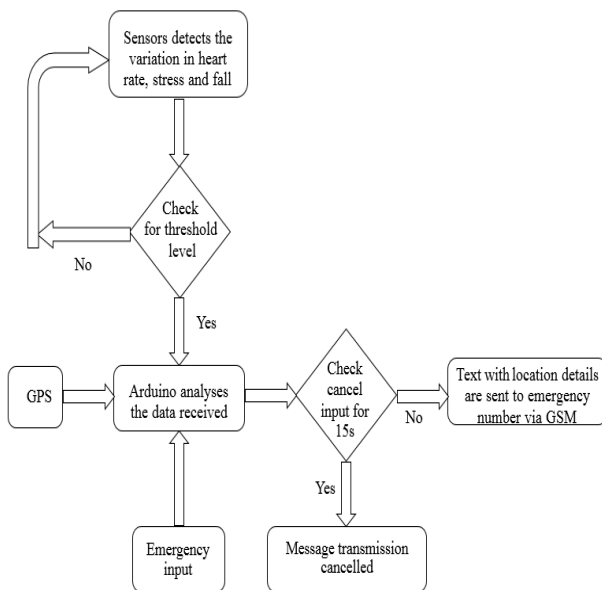


Fig 13 . Flow Chart

ALGORITHM

- Step 1: Start the program.
- Step 2: Get the sensors output.
- Step 3: Get the location details via GPS.
- Step 4: Display the parameters on the LCD display.
- Step 5: Check the output of emergency button.
- Step 6: If the emergency button pressed then directly goes to step 10.
- Step 7: Check the sensor output with preset threshold values for each sensor.

III. CONCLUSION

In the present scenario individual safety is of great consideration. Person safety has become a major issue of importance for everyone, especially for women. As the problems are found to be increasing day by day, the necessity for a safety device is unavoidable. In that sense the intelligent multipurpose safety wrist band is a new innovation in the field of technology which aims at individual safety, would be a boon for the society. The usage of such a device might considerably reduce the calamities. the system helps to supports the gender equality by providing safe environment to women in the society, and allows them to work till late nights. Anyone before doing any crime against the women will be deterred and it help reducing the crime rate against the women. The propose system provides the area zone modules to provides the child security and surveillance such as the child abuse and child missing crime rate in the society is high and protection measure is needed to provide them a safety. Women's security is a critical and social issue in today's world. The crime (molestations, robbery, sexual assault, rape, domestic violence) against the women can be now brought to an end with the help of real system implementation of propose model. This system can be used as patient



safety tracker, Kids location tracker, Protection against sudden cardiac disorders, Protection from unexpected assailant attack, Fall detection.

REFERENCES

- [1] Indira Sharma, "Violence against women: Where are the solutions?" *Indian J Psychiatry*. 2015 Apr-Jun; 57(2): 131–139. doi: 10.4103/0019-5545.158133
- [2] Ravi Sekhar Yarrabothu , Bramarambika Thota , "Abhaya: An Android App for the safety of women India Conference (INDICON), 2015 Annual IEEE
- [3] Dhruv Chand, Sunil Nayak et al , A mobile application for Women's Safety: WoSApp , TENCON 2015 - 2015 IEEE Region 10 Conference
- [4] Dongare Uma, Vyavahare Vishakha and Raut Ravina, "An Android Application for Women Safety Based on Voice Recognition", Department of Computer Sciences BSIOTR wagholi, Savitribai Phule Pune University India, ISSN 2320–088X International Journal of Computer Science and Mobile Computing (IJCSMC) online at www.ijcsmc.com, Vol.4 Issue.3, pg. 216-220, March- 2015.
- [5] J. Suganthi.; N. V. Umareddy; Nitin Awasthi Medical alert systems with Telehealth & telemedicine monitoring using GSM and GPS technology", IEEE Conference Coimbatore, 2012.
- [6] Jiewen Zheng, "Inst. Of Med. Equip. Acad. Of Mil. Med. Sci. Tianjin China; Guang Zhang; Taihu Wu Design of Automatic Fall Detector for Elderly Based on Triaxial Accelerometer", Bioinformatics and Biomedical Engineering 2009. ICBBE 2009. 3rd International Conference IEEE Beijing.
- [7] B. Chougula, "Smart girls security system," International Journal of Application or Innovation in Engineering & Management, Volume 3, Issue 4, April 2014.
- [8] Remya George, Anjaly Cherian.V, Annet Antony, Harsha Sebestian, Mishal Antony and Rosemary Babu.T, —An Intelligent Security System for Violence against Women in Public Places, ISSN: 2249 – 8958 International Journal of Engineering and Advanced Technology (IJEAT), Volume-3, Issue-4, April 2014.
- [9] Shreyas R. S, Varun B. C, Shiva Kumar H. K, Punith Kumar B. E, Kalpavi C. Y,-- Design and Development of Women Self Defence Smart Watch Prototype, ISSN: 2278-909X International Journal of Advanced Research in Electronics and Communication engineering (IJARECE), Volume 5, Issue 4, April 2016.
- [10] Arduino, "Arduino UnoRev3" Datasheet
- [11] QISDA, M33G GSM / GPRS Wireless Module, datasheet
- [12] Alison Brown, Jacob Griesbach, and Bruce Bockius, "GPS Tracking Location-based Service using Wristwatch GEOZIGBEE Sensors", NAVSYS Corporation Terry Boul, University of Colorado at Colorado Springs.
- [13] NEO-6, "u-blox 6 GPS Modules" Data Sheet
- [14] Sunrom Technologies, "Heart Beat Sensor" Datasheet
- [15] Texas Instruments , "LM35 Precision Centigrade Temperature Sensors" Data sheet
- [16] Bitalino, Electrodermal Activity (EDA) Sensor Data Sheet
- [17] Analog Devices, "Small, Low Power, 3-Axis ± 3 g Accelerometer ADXL335, Data sheet
- [18] HITACHI , "LM016 L LCD Display" Datasheet
- [19] Vivek P N, Sushma S, Suhas R C, Reshma B S, Raksha Ramakrishna, Roopa J, "Design and Implementation of Smart Wrist-Band for Safety Measures in Emergency", Proceedings of National Conference on Wireless Communication, Signal Processing, Embedded Systems, WISE 2013.
- [20] JaakkoMalmivou and Robert Plonsey, "Bioelectromagnetism : Principles and Applications of Bioelectric and Biomagnetic Fields", Oxford University press, 1995
- [21] Jeremy Blum, "Exploring Arduino: Tools and Techniques for Engineering Wizardry", Wiley Publications, 2013.
- [22] M.M.A. Hashem, Rushdi Shams, Md. Abdul Kader, and Md. Abu Sayed, "Design and Development of a Heart Rate Measuring Device using Fingertip"
- [23] Qiang Li, John A. Stankovic, Mark Hanson, Adam Barth, "Accurate, Fast Fall Detection Using Gyroscopes and Accelerometer-Derived Posture Information"JohnLach University of Virginia