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EMERGENCY TRACKING SYSTEM FOR SAFETY USING IoT

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ABSTRACT :-In today's current global scenario, women were facing a lot of challenges in their day to day life. The news of women harassment has heard than their achievements. More technologies are implemented for ensuring the safety of children and women. However, the existing systems are not powerful enough to prevent the crime against children. The main aim of the project is to provide security for people, especially for woman and children. In this project, the protection of women and young children were discussed. Here, Internet of Things (IoT) is exploited together with different localization techniques such as Radio Frequency module and Global Positioning System. The Global Positioning System is increasingly being adopted by the private and public enterprise to track and monitor humans for location-based services. Radio Frequency Identification tag can be placed in the children bag or in their uniform to check whether they are available in school or not. Global Positioning System technology can be used to find the women's location and also tracks the location of lost children. The following document describes a quick responding, cost protection system for an individual and especially for women and children.

1. INTRODUCTION

The Internet of Things is the network of physical devices, vehicles, home appliances, and other items embedded with electronics, software, sensors, actuators, and connectivity which enables these things to connect and exchange data, creating opportunities for more direct integration of the physical world into computer-based systems, resulting in efficiency improvements, economic benefits, and reduced human exertions. The number of IoT devices increased 31% year-over-year to 8.4 billion in the year 2017, and it estimates that there will be 30 billion devices by 2020. The global market value of IoT is projected to reach $7.1 trillion by 2020. IoT involves extending Internet connectivity beyond standard tools, such as desktops, laptops, smartphones, and tablets, to any range of traditionally dumb or non-internet-enabled physical devices and everyday objects. Technology which is embedded in these devices can communicate and interact over the Internet, and they can be remotely monitored and controlled. With the arrival of driverless vehicles, a branch of IoT, i.e., the Internet of Vehicle starts to gain more attention.

2. LITERATURE SURVEY

The idea for the project was erected from the projects that were glimpsed are listed below. However, plan in design uses some differential way from the projects mentioned below

J. Saranya, J.Selvakumar*et al.* [8]proposed **an** implementation of children tracking system on android mobile terminals which focuses on implementing children tracking system for every child attending school. However, the existing systems are not powerful enough to prevent the crime against children since these systems give information about the children group and not about each child resulting in low assurance about their child safety to parents and also does not concentrate on sensing the cry of the child and intimating the same to its parents. The proposed system includes a child module and two receiver modules for getting the information about the missed child on the periodical basis. The child module consists of an ARM7 microcontroller (lpc 2378), a Global positioning system (GPS), Global system for mobile communication (GSM), Voice playback circuit and the receiver module includes Android mobile device in parent's hand and the other as monitoring database in control room of the school. Finally, implementation results for the proposed system have provided.

S Shambhavi, M Nagaraja, M.Z Kurian*et al.* [1]presented a project which describes an electronic safety system for women, built in public transport vehicles such as cars, buses, and auto-rickshaws as nowadays women are being molested, kidnapped and harassed by the drivers. Hence implemented electronic system has fitted in the vehicle which has a display, keypad, GPS, GSM, and embedded board to control and interconnect all of the above. As soon as the journey starts passenger can enter her guardian, friend or relative mobile number, who is going to get all the notifications of the female passenger journey. First of all the driver's name, mobile number, vehicle registration number and the secure pin generated by the passenger are sent by SMS to the concerned person of the passenger. Destination region has added; even though if the relevant person does not check the updates, then also it would be useful in the investigation if any miss happening occurs. The passenger may always not get down at destination decided, she may get down little early or little further depending on various factors, hence an option to terminate destination is also provided called as the end of the

journey which is executed and validated using secure pin, which driver will not be aware of the position. This system uses serial EEPROM to store various places of cities, and hence new location can be added and thus project will work in any city because locations are not hardcoded in the code, but it is external to code.

Shreyas R.S, Varun.B.C, Shiva Kumar.H.K, Punith Kumar B.E, Kalpavi.C.Y*et al.* [2] proposed the design and development of women self-defense smart watch prototype. This proposed system deals with a quick responding cost protection system for an individual and especially for women using which a woman in anguish can call for help just with the press of a button on this smart gadget. Self Defense module for women safety was like a Smart Watch for Women safety. It helps women with technologies that have embedded as a compact device. It has the potential to help women with technologies that are embedded. It was designed for women safety and protection. It has a control button that will be used by women to inform nearby police when they are in distress. This watch directly gets connected to the satellite through GPS when activated. Then the location is transferred through the GSM; it also contains a shock mechanism to produce a non-lethal electric shock in emergencies to deter the attacker.

A. Helen, M. Fathima Fathila, R. Rijwana, Kalaiselvi .V.K.G *et al*. [9]developed a smart watch for women security based on it concept ‘watch me' for women safety via smartphone it is activated only by touch or one click or shakes. It is not possible to have mobiles on our hand in all circumstances. This concept is used to provide security to women when women exposed to external challenges and harassments in the society. It works automatically based on heartbeat rate which gets increased due to the secretion of epinephrine hormone from hpa axis which has defined for every situation like fear, anger, anxiety, and another kind of reactions which will trigger the sensor. When a women or child wearing this ‘watch me' is exposed to sexual or vulnerable attack, the sensor present in it detects the heartbeat rate of a person which will be high at the moment by the secretion of epinephrine hormone from hpa axis and gets activated, this will not only provide an alarm sound to the attention of nearby people, it will automatically make a call to our registered contact and also through GPS/GSM it will detect the nearby police station and make a ring there so it will be helpful for police to arrive soon at the spot by tracking the GPS, such a system will lead to a safer and better environment.

Leonardo D’Errico, Fabio Franchi, Fabio Graziosi, Claudia Rinaldi, Francesco Tarquini*et al*. [6] proposed a system for increasing children's safety. The focus is on the daily route from home to school and vice versa, assuming the use of school buses. IoT paradigm is exploited together with different localization techniques, i.e., RFID and GPS, to design a solution for parents willing to secure their child's following the main steps to school or home. In this project, the applicability of RFID technology efficient tracking capabilities is tested in children's tracking and monitoring during their trip to and from school by school buses.

A. R. Al-Ali, Fadi A. Aloul, Nada R. Aji, Amin A. Al-Zarouni, Nassar H. Fakhro*et al*. [5] presented the design of an RFID Kids Tracking System. The project was designed to track a moving child in a wide area, such as a park or mall, using RFID technology. The proposed system has hardware and software components. The hardware architecture consists of an RFID active tag, RFID tag reader, web server and database server. The web server and database server have located in the master station. The tag readers have distributed around the open area, e.g., park. The tags are programmed with kid's profiles and worn by the kids. Communication between the tag reader and the web server have done via wireless LANs. The software architecture consists of a communication driver that handles all communication functions done at the master station, an Application Programming Interface (API) that handles and analyzes the data, a friendly GUI and a database that saves all readings and client information.

Katina Michael, Andrew McNamee, MG Michael *et al***.** [4] proposedthe emerging ethics of humancentric GPS tracking and monitoring**.** The Global Positioning System (GPS) is increasingly being adopted by the private and public enterprise to track and monitor humans for location-based services. Some of these applications include personal locators for children, the elderly or those who have Alzheimer's or memory loss, and the monitoring of parolees for law enforcement, security or personal protection purposes.The continual miniaturization of the GPS chipset means that receivers can take the form of wristwatches, mini mobiles, and bracelets, with the ability to pinpoint the longitude and latitude of a subject 24/7/365. This project employs usability context analyses to draw out the emerging ethical concerns facing current human-centric GPS applications.

Yu-Luen Chen *et al*. [3] proposed a project which describes the configuration of the computer mouse interface controlled with tilt sensors. It also explains the motivation and the design considerations of an economical head-operated computer mouse. Also, it focuses on the invention of a head-operated computer mouse that employs two tilt sensors placed in the headset to determine head position and to function as a simple head-operated computer mouse. One tilt sensor detects the lateral head-motion to drive the left/right displacement of the mouse. The other one detects the head's vertical motion to move up and down concerning the movement of the mouse. A touch switch device was designed to contact gently with operator's cheek. The operator may puff his cheek to trigger the machine to perform the single click, double clicks and drag commands. This system was invented to assist people with disabilities to live an independent professional life.

3. PROPOSED METHOD

The tracking system has achieved greatpopularity in the last decades, and it increases the comfort andquality of life. In this project, an overview of IoT and Emergency Tracking Systems has been discussed. Nowadays Emergency Tracking systems consist of a GPS and microcontroller. IoT is used to monitor the children and women using the different type of communicationtechniques. In this project, the working principle of different kind of wireless communication techniques have studied, and their features arecompared with each other so the users can choose their ownchoice of technology.

Moreover, in this research work, the survey of different trackingsystems is discussed, and their advantages and drawbacks have alsohighlighted. Women and Children Safety system have been increasing, used to provide safety, quality of life and security. Nowadays, most tracking systems are used to provide ease to women and children, thus reducing the chance of harassment and kidnapping.

The emergency tracking system can be designed and developed by using a single controller which can monitor different interconnected appliances such as Radio Frequency module, Global Positioning System (GPS), Heartbeat sensor, accelerometer sensor, a vibration sensor, GSM module. One of the most significant advantages of the Emergency Tracking system is that it can be controlled and managed easily from an array of devices such as the smartphone, tablet, desktop, and laptop. The rapid growth of wireless technologies influences us to use smartphones to monitor the individual. Several tracking systems use smartphones to communicate with microcontrollers using various wireless communication techniques. Emergency tracking systems offer a wide range of functions and services, some of the features are tracking the location, analyzing the heartbeat. This project describes the implementation and working principles of some existing women and child tracking techniques, and it compares their safety, real-time existence, and other functionalities. There are different tracking technologies accessible in the market, but guidelines about this technologies are very low, in this research work a comparison of some existing tracking technologies have discussed so users can choose their own choice of technology. This project also examines the similarity of some popular tracking techniques and highlight their advantages and drawbacks. In chapter II, methodologies of some popular emergency tracking systems have discussed. In chapter III, methodologies of our work have discussed and finally, in chapter V conclusion and the future work is discussed.

3.1 Block Diagram:

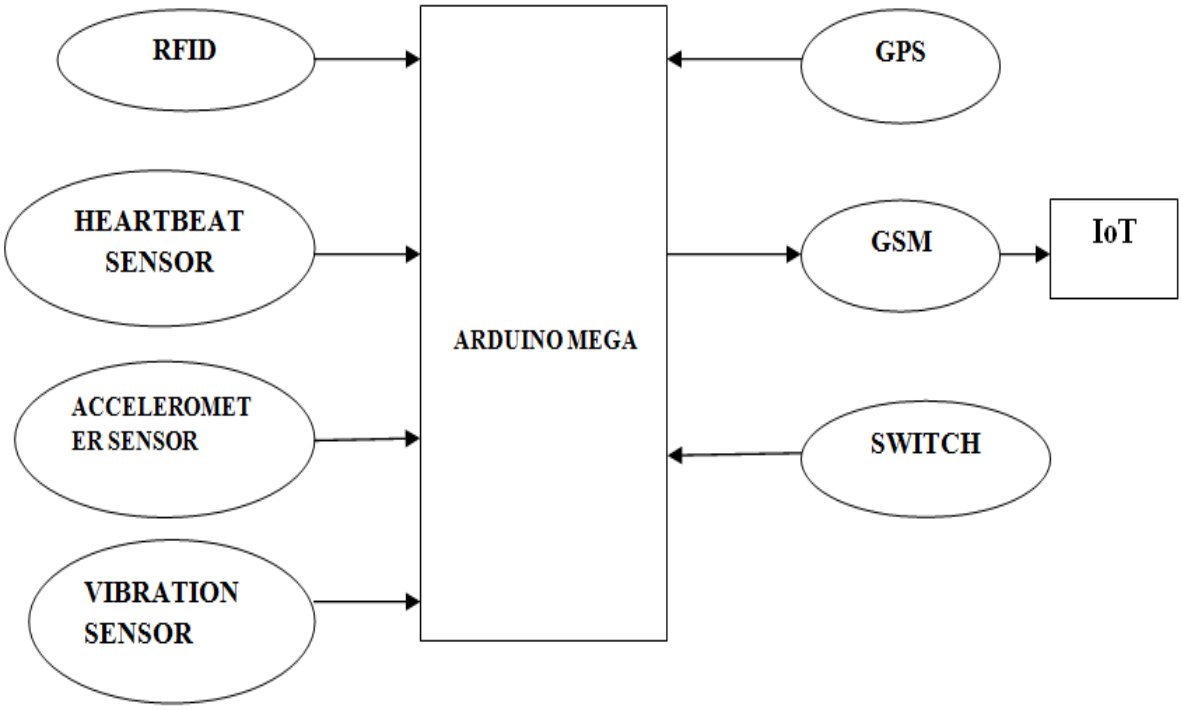

Fig.1: Block Diagram Of Arduino Interfaced With Sensors, Rfid, Gps, And Gsm Module

3.1.1 Block Diagram Description:

Arduino Mega 2560 Microcontroller is interfaced with the Active Radio Frequency module to find whether the particular person was located in the specific RF range.

It is interfaced with sensors such as a heartbeat sensor, accelerometer sensor, and vibration sensor and also interfaced with GPS to find the location of an individual, when necessary and updated on IoT.

3.2 Functional Diagram:

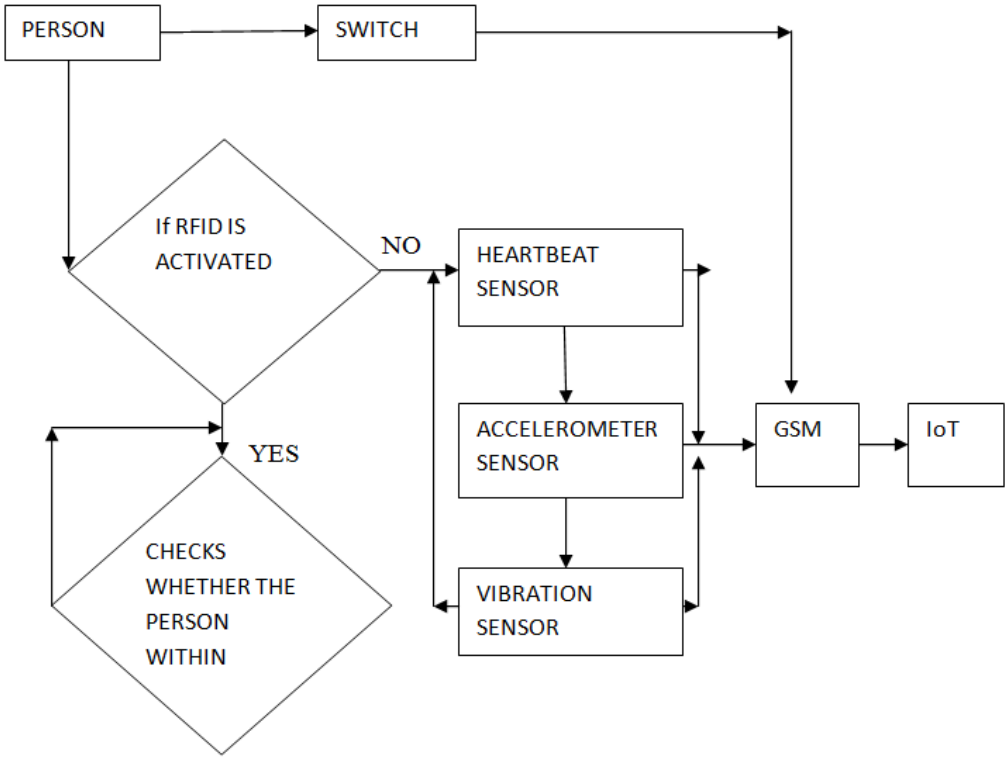

Fig.2: Functional Diagram

3.2.1 Functional Description:

Here the RF module is used to check whether the person is within the RF signal range. If the RF module gets activated, it checks whether the person was located in the given range.

If the RF module does not sense an RF signal, then it considers that the person was not available within the range and the location will be updated in IoT with the help of GPS.

If the RF module is not activated, then the sensors will get automatically activated. Further, the Heartbeat sensor senses the pulse rate. Accelerometer sensor detects the axis position or orientation. Vibration sensor senses the force acting on the person.

Also, an emergency switch has provided which sends the location when it is turned on.

3.3 Components:

- Arduino Mega 2560 R3
- GPS
- RF module
- IoT
- Sensors

Heartbeat sensor

Accelerometer sensor

Vibration sensor

3.4 COMPONENT DESCRIPTION:

3.4.1 Arduino Microcontroller :

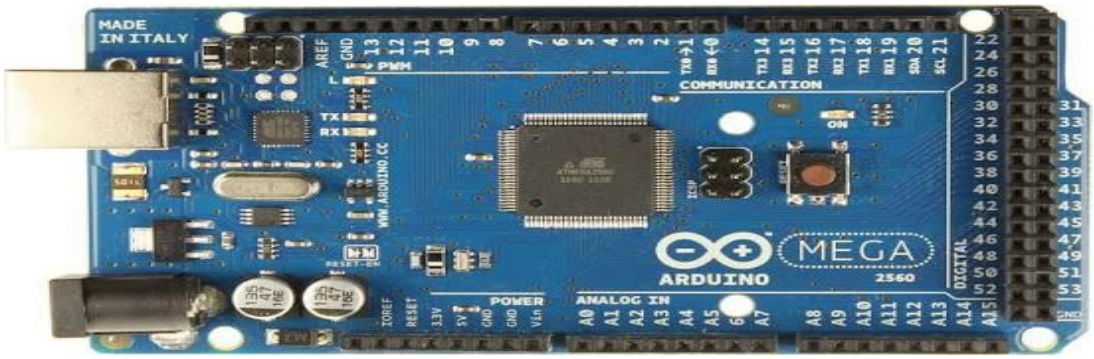

Fig.3: Arduino Microcontroller

The Arduino Mega is a microcontroller board based on the ATmega1280. It has 54 digital input/output pins, 16 analog inputs, 4 UARTs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; It should be connected to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. The Mega is compatible with most shields designed for the Arduino Duemilanove or Diecimila.

3.4.2 Radio Frequency Module:

RFID tags, or simply "tags," are small transponders that respond to queries from a reader by wirelessly transmitting a serial number or similar identifier. They are heavily used to track items in production environments and to label items in supermarkets. They have usually thought of as an advanced barcode.RFID transponders (tags) consist in general of:

- Microchip
- Antenna
- Case
- Battery (for active tags only)

There are three types of RFID tags about power or energy:

- Passive
- Semi-passive
- Active

RFID tags fall into three regions in respect to frequency:

- Low frequency (LF, 30 - 500kHz)
- High frequency (HF, 10 - 15MHz)
- Ultra high frequency (UHF, 850 - 950MHz)

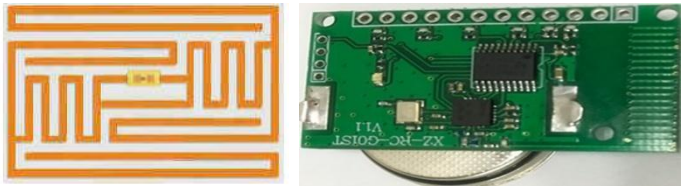

Fig.4: Passive Rfid Fig.5: Active Rfid

3.4.3 Heart Beat Sensor:

Heart Beat can be measured based on optical power variation as light is scattered or absorbed during its path through the blood as the heartbeat changes.

The heartbeat sensor has based on the principle of photo plethysmography. It measures the change in volume of blood through any organ of the body which causes a change in the light intensity through that organ (a vascular region). In the case of applications where heart pulse rate has to find, the timing of the pulses is more important. The flow of blood volume have decided by the rate of heart pulses, and since light has absorbed by blood, the signal pulses are equivalent to the heartbeat pulses.

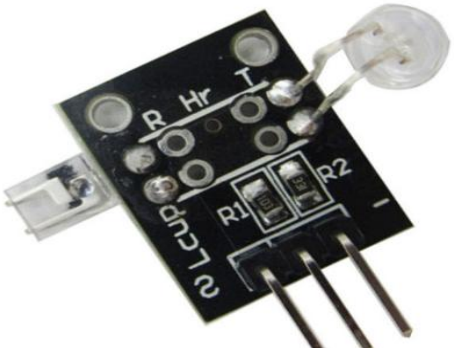

Fig.6: Heart Beat Sensor

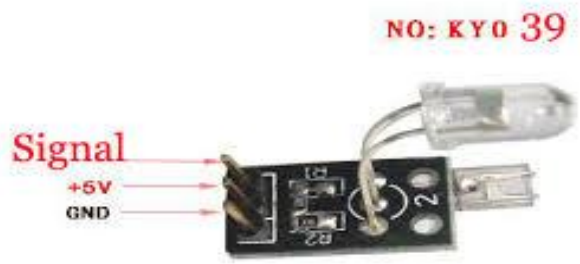

Fig.7: Pin Configuration Of Heart Beat Sensor

3.4.4 Accelerometer Sensor:

An accelerometer sensor is an instrument that has used for measuring the multiple axes of a reference plane. The sensors measure the axis position concerning gravity and have used in numerous applications. They enable the easy detection of orientation or inclination.

Fig.8: Accelerometer Sensor

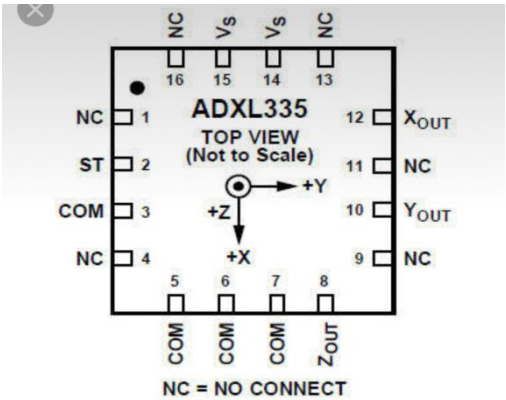

Fig.9:Pin Configuration Of Accelerometer Sensor

3.4.5 Vibration Sensor:

A vibration sensor is a device that uses the piezoelectric effect, to measure changes in pressure, acceleration, temperature, strain, or force by converting them to an electrical charge. The prefix piezo- is Greek for 'press' or 'squeeze.' The piezoelectric sensor generates a voltage when subjected to mechanical stress. Some examples are Quartz, Rochelle Salt and Titanate compounds.

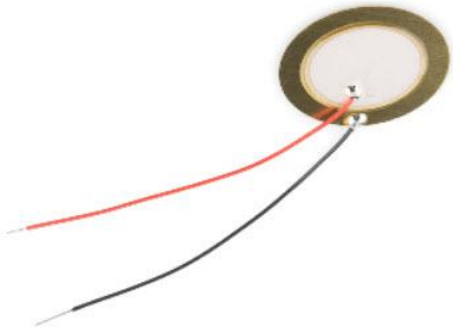

Fig.10: Vibration Sensor

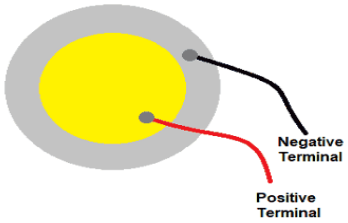

Fig.11: Pin Configuration Of Vibration Sensor

3.4.6 Global Positioning System:

GPS is a satellite navigation system used to determine the ground position of an object. GPS technology was first used by the United States military in the 1960s and expanded into civilian use over the next few decades. Today, GPS receivers have included in many commercial products, such as automobiles, smartphones, exercise watches, and GISdevices.

The GPS includes 24 satellites deployed in space about 12,000 miles (19,300 kilometers) above the earth's surface. They orbit the earth once every 12 hours at a pace of roughly 7,000 miles per hour (11,200 kilometers per hour). The satellites are evenly spread out so that four satellites are accessible via direct line-of-sight from anywhere on the globe.

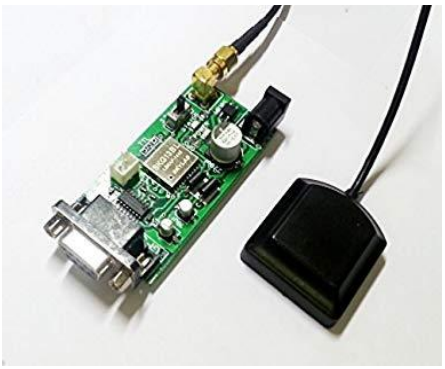

Fig.12: Global Positioning System

4. RESULTS& DISCUSSION

This chapter presents the results obtained with Arduino mega 2560 R3 microcontroller interfaced with sensors such as heartbeat sensor, accelerometer sensor, and tilt sensor.

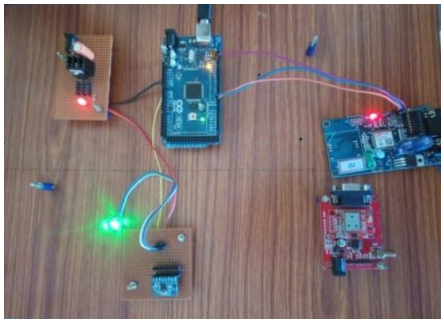

Fig.13: Hardware Implementation

RFID module is used to identify the presence of an individual within the RF range. If the RFID doesn't sense an RF signal, then the sensors such as heartbeat sensor, tilt sensor, vibration sensor will be activated, and the data's will be updated through IoT to the website. Hence, the person who keeps monitoring will be alerted. If RFID senses the RF signal, then the normal process continues.

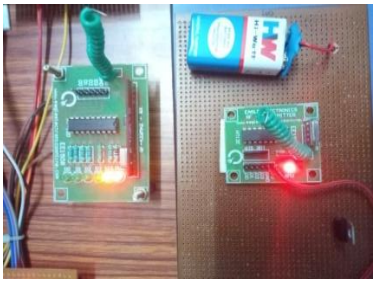

Fig.14:When RFID is connected

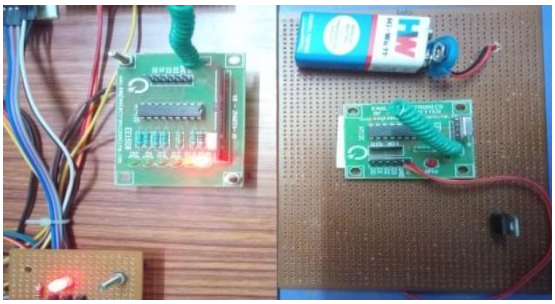

Fig.15: When RFID is not connected

The result uploaded in the website when RFID is not connected as shown in the figure (4.3) as,

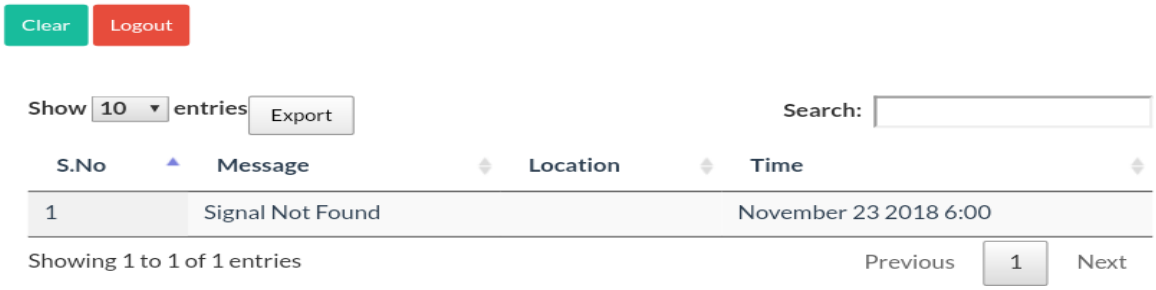

Fig.16: When Rfid Is Not Sensed

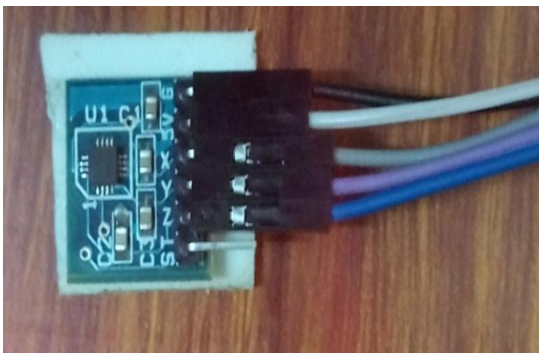

Fig.17: Accelerometer sensor at normal state

Fig.18: When Accelerometer sensor position changed

The result uploaded in the website when accelerometer sensor position is changed shown in the figure (4.6) as,

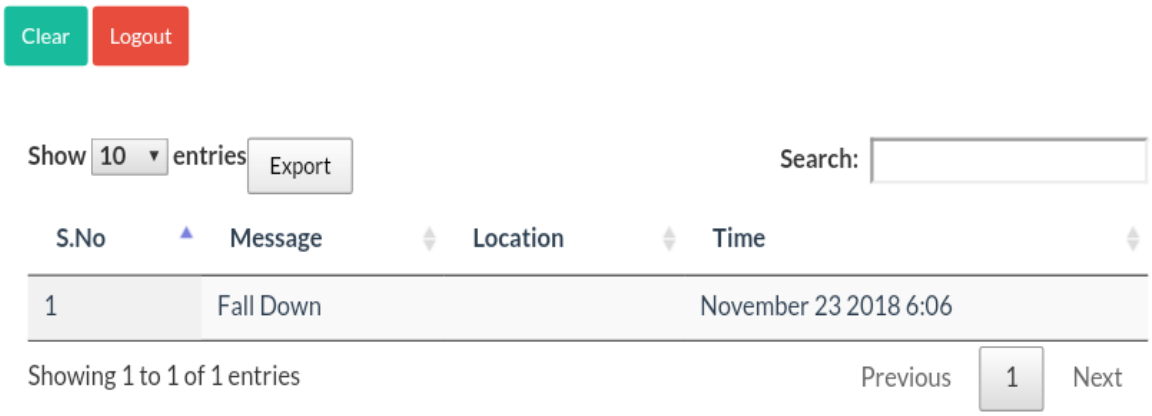

Fig.19: When Accelerometer Sensor Position Changed

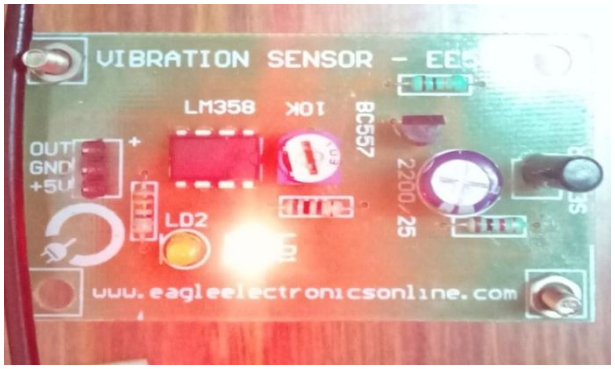

Fig.20: Vibration sensor before sensing

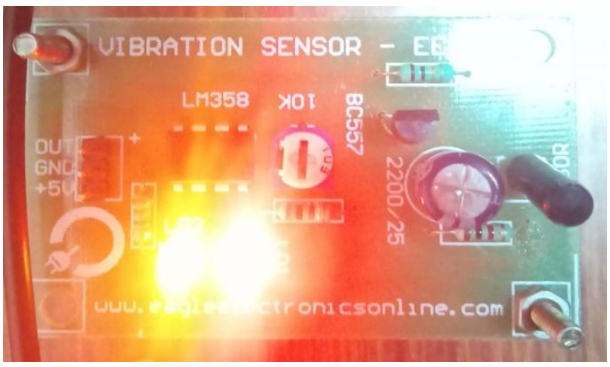

Fig.21: Vibration sensor after sensing

The result uploaded in the website when the vibration sensor is sensed shown in the figure (4.9) as,

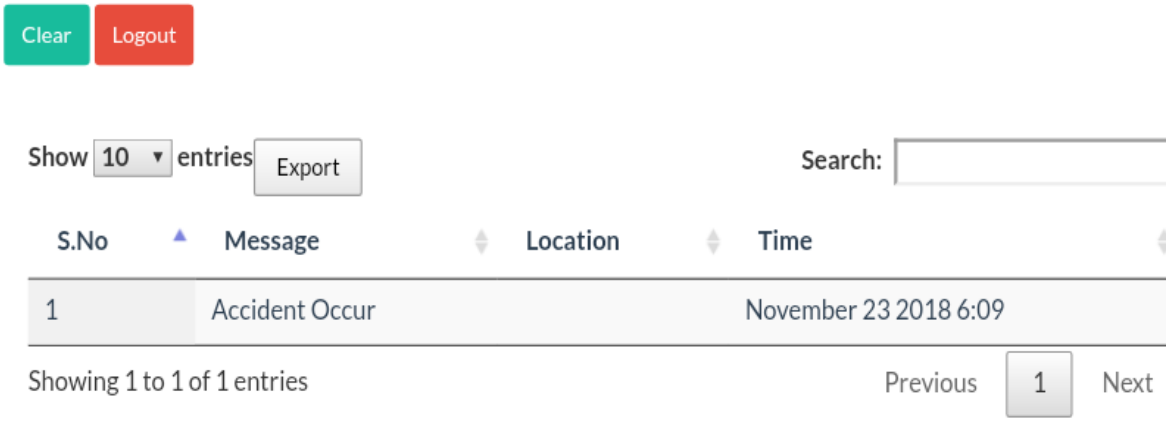

Fig.22: When Vibration was sensed

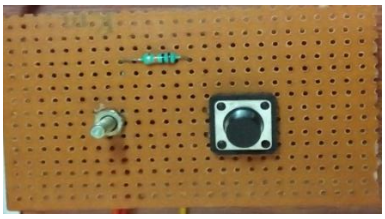

Fig.23: When Switch is pressed

The result uploaded in the website when the emergency switch is pressed shown in the figure (4.11) as,

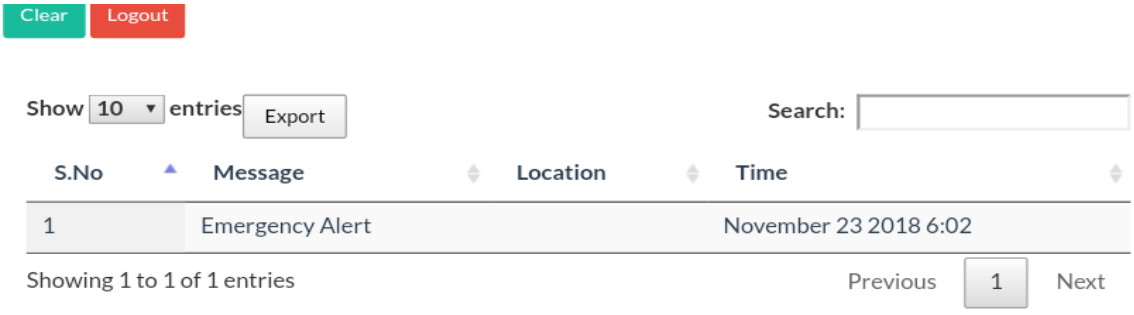

Fig.24: When Emergency Switch Is Pressed

CONCLUSION AND FUTURE WORK

In our Country, even though it has a superpower and economic development, there are many crimes which are happening against women and children. In this project, it is inferred that the Global Positioning System is increasingly being adopted by the private and public enterprise to track and monitor humans. A system for increasing children and women safety has also been proposed. This proposed project deals with a quick responding cost protection system for an individual and especially for women using, where a woman in anguish can call for help just with the press of a button. This project shows the ability to help women with technologies that have been embedded in a compact device. It has the potential to help women with technologies that are embedded. IoT paradigm is exploited together with different localization techniques, i.e., RF module and GPS, to design a solution for the children and women who are in danger.

In the future, instead of using Arduino microcontroller, Raspberry Pi can be used, since it has an in build Wi-Fi module. Also, multitasking can be made easier in case of Raspberry Pi. In addition to it, mini-camera can be fitted with the board, which ensures more safety towards women and children.

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