Development of Women Security Solution Using IoT (Internet of Things)

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

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APPROVAL

This Project/internship titled **"Development of Women Security Solution using IoT(Internet Of Things)''**, submitted by A.T.M. Junayed Ayan, ID No.: 171-15-1220, Tanvir Taher Pranta, ID No.:171-15-1373, Md. Anjamul Islam Anim, ID No.:171-15-1230 and Md. Yusuf Khan, ID No.:171-15-1202 to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of Bachelor of Science in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 05 December, 2020.

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DECLARATION

We hereby declare that this project has been done by us under the supervision of **Md. Reduanul Haque, Senior Lecturer, Department of CSE Daffodil International University**. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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ABSTRACT

In the current times, women are facing various harassment and molestation while they are out in the world. In broad daylight or at night, they are not safe in roads and places where they shouldn't have faced such incidents resulting in rape, hijacking, kidnapping etc. This device will be helpful for them and work as their emergency call in such situations which can be useful to save them from being the victim of such heinous crimes.

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CHAPTER ONE: INTRODUCTION

1.0 Introduction

Many of the major social problems are related to not having enough safety for women. Despite of having very strong law and enforcement infrastructure, a lot of women are raped, molested or harassed. This has been a very upsetting issue worldwide. Countries like South Africa, Botswana, Lesotho, Bermuda, Sweden etc. have the most incidents of rape and open-street harassment. According to a statistic in 2019, India has on an average of 87 reported cases daily. Countries like Japan, China, USA, Russia also has a very high number of molestation and rape reports daily. In Bangladesh, whenever we look at the newspaper or turn on the television, we are more likely to see handful numbers of molestation, violation and rape cases every day. According to a local human rights organization named 'Ain-o-Shalish Kendro', between January to September 2020, more than 975 rape cases has been reported, among them 208 are allegedly reported to be gang rape.

Currently there are a lot of safety measures available for the victims. Many technologies are also being used to prevent such acts. Our device, being an affordable and portable option for any woman, can replace the existing prevention or alerting method and reduce the rate of such crimes.

1.1 Motivation

- Women these days are facing problems like sexual harassment, rape, kidnapping etc. We want to reduce such incidents.
- Many incidents take place around quite and less secured places, where we want to ensure such events can be prevented in the most possible way.
- We want to ensure safety for women and make sure they can get help of law enforcement at the time of danger
- We want to utilize the most convenient way of carrying an inexpensive and portable device.

1.2 Objectives

- Ensuring the security of women.
- Reducing the time to identify criminals and abusers
- Confirming effective use of law and order.
- Reducing the crime which affects women security.
- Properly using the technology to prevent relevant social problems.
- In some cases, preventing crimes before it takes place.
- Giving the required medical attention to the victim as soon as the incident occurs.

1.3 Expected Outcomes

- It will be emerged as a complete safety device for women
- We want to see it being available to every woman all around the globe

1.4 Drawbacks

- In the primary stage, it is very tough to find accurate parameter to trigger the device for sending information
- To get 100% accuracy is a very big challenge.
- After Completion of this project, it will be tough to make people trust in the device's capability.
- If we want to increase the accuracy of the motion activation, it will be extremely tough to set a standard as the usual activity of every human is different from each other. Setting up unique sensitivity to accelerometer will be time consuming.

1.5 Literature Review

[1] The author has proposed a system that is working in full function when it is connected to GPRS and a smartphone. All the functionality of the device is solely based on an android smartphone. It has to be clicked to make some functions workable. The video and audio recording system are required smart device connection for working. However, this increases complexity and activating devices in some situation might be problematic. This device requires a lot of components which is not practical for some areas and some people. This problem can be solved by simplifying the system.

[2] In this paper, the existing system is a wearable device. The women can press the button in case of emergency to activate the device to send distress signal. Then only it can send the distress signal using the devices GPS and GSM module. In cases like where pressing the button is not an option, the device's usability comes into question. The device does not sense automatic danger and send message according to the data. This issue is reducing the effectivity of the device.

[3] The smart shield is a great device. It uses a lot of components such as the fall detector to detect when the device is thrown off to send a distress signal. It is wearable jacket and all the components are inside the jacket. It has 3 modes. Manual mode to activate it manually, Auto mode by using sensors and fall detection by throwing the device. It also sends the data using GPS and GSM module and have a camera in the jacket to record the incident for evidence.

[4] In these recent times the women's safety is at risk. This device helps the women's safety. By pressing the emergency button of the device, it gets the GPS module to accumulate the location and send the emergency text to the registered number through GSM. It also sends texts by detection unusual activity through its vibration sensor and Iot module update its last knows location. It also uses a piezo buzzer to alert nearby persons about the harassment. It will be usable for a harassment taking place in a crowder area

[5] This device is created for women's safety and security. This device works along with an android application. The device registers the user's fingerprint during initial setup. While the device is activated. It registered the user's fingerprint in every minute. Not getting any fingerprint for 1-minute trigger the device to send message to the registered number and law enforcement. Victims smartphone will also start audio recording of the incident. It can store current in its capacitor which comes from the step-up transformer stepping up the oscillating frequency. Which can electrocute the miscreants to help the victim run away from the situation or to get help.

CHAPTER TWO: PROBLEM DEFINITION

2.0 Problem Definition

We have seen in many women safety solution device that the developed system it needs to be pressed manually to get activate or send distress signal as they can't send the signal automatically. Also, in some existing system there is a loud piezo buzzer that might do more harm than it can be as useful. We have also come across a matter that in some devices you need to have GPRS and connected to smartphone to make the device work as it is not a standalone device, which can be problematic

2.2 Problem Statement

Paper Name	Working Idea	What's New?
Women safety device and application-FEMME	The applications need an android device to work and also required GPRS for full functionality	This is a standalone device that doesn't need an android smart phone to work and also sends distress signal using its own GPS and GSM system
Smart Security Device for Women Safety	Existing device needs manually turned on to send the distressed signal in case of emergency	Our following system has MPU6050 Accelerometer sensor to detect unusual activity and send distress signal when motion fluctuates from 0 to 50 percent and back to 0 for 10 times.
Smart Shield for Women Safety	Existing device is fabricated into a jacket and not suitable for all the seasons and also a complicated system to repair.	This device can be carried in handbag or pocket or even is bag pack and since it's a simple system repair process is also easy

Design and Implementation of Women Safety System Based On Iot Technology	Current system has a loud buzzer which might be disadvantageous in some cases and results in murder.	Our device sends the signal silently so there is no chance of the assailant to get knowledge of the device which can results in an advantage situation for the victim
Design of a Smart Safety Device for Women using IoT	This existing device will provide a shockwave to the assailant and also will get automatically triggered in the sensor is not touched in every one minute.	Our proposed system doesn't use ant shock generator so it can't be used against the victim in some cases. Also, as the system detect activity using accelerometer sensor, there is no need to press the sensor each minute which might alert the miscreants.

2.3 Scope of The Problem

1. It takes a lot of time to report a rape incident, or molestation and hijacking as the victim has to report it in person, and majority of the time the mental and physical state of the victim doesn't remain sound for explaining every detail to the police or investigator.

2. Most of the cases are dispatched because of lack of proper evidence

3. Majority of the existing technology to prevent such crimes aren't affordable and easy to operate.

2.4 Finding Solutions

In spite of having multiple existing system for women security, the idea of making our standalone safety device which can provide automatic distress signal by detecting unusual movements using the accelerometer sensor for silently sending distress signal with a smart approach in security.

2.5 Related Works

1. MIST students have a similar device which is a smart band and sends distress signal. However, it has come to our attention that, their device needs to be connected to smartphone to make it work.

2. [6] Revolver is used in notifying loved ones about safe arrival and 3 clicks can trigger the distress alert, however it is not automated system

3. [6] Blinc sends alarm and siren and record evidence using a bodycam but it might be no use in less populated area and some incidents.

2.6 Challenges

1. In the primary stage, it is very tough to find accurate parameter to trigger the device for sending information
2. To get 100% accuracy is a very big challenge.
3. After Completion of this project, it will be tough to make people trust in the device's capability.
4. If we want to increase the accuracy of the motion activation, it will be extremely tough to set a standard as the usual activity of every human is different from each other. Setting up unique sensitivity to accelerometer will be time consuming.

CHAPTER THREE: METHODOLOGY

3.0 Methodology

This project has been initiated for the sole purpose of women safety. It has been very much clear that the device will alert a victim women's trusted contacts faster and more efficiently than any

other device existing. In this project we have used a microcontroller, which is a basic physically programmable circuit board used for uploading the required codes from computer to the physical circuit board. We used PCB Dot Varo Board to make sure the circuit gets the fulfillment. We ensured the final circuit design and added more required components to it. We added Accelerometer to detect unusual motion that rises above a specific range. We added GPS device to track the location. GSM module for sending alert texts to custom emergency contacts And Boost converters, Linear regulators, 16 MHz Crystal, Battery clips, Switches and capacitors, connecting wires to complete the purpose of a compact device made within a box.

3.1 Users of This Device

The users of this device will be women. This device will make their lives easier and save them from many unwanted situations when they step outside, solve crimes before it is even committed and maintain a healthy and safe world.

CHAPTER FOUR: HARDWARE REQUIREMENTS

4.0 Used hardware on the project

1. GPS NEO6M
2. GSM SIM800L

3. MPU6050 Accelerometer

4. DC to DC boost Converter 3.3V to 5V

5. 5V Regulator IC LM7805

6. Switch - Double pole double through

7. Switch - Single pole Single through

8. Microprocessor ATmega328p

9. 28pin IC base

10. 16MHz Crystal

11. 22Pf Capacitor

12. 3.7V Li-Po Battery

13. 18650 Single Battery holders

14. 9V Battery

15. 9V Battery clip

16. PCB dot Varo Board (5*7cm)

17. GSM PCB Antenna

18. 2200uf/50v Capacitor

19. connectors

20. Plastic Box for Enclosure

4.0.1 GPS NEO6M

GPS Neo-6M has industry's highest level of sensitivity, which is -161dB tracking with a very low power consumption, that requires only 45mA supply of current. It can track up to 22 satellites on 50 different channels. Unlike other GPS modules it can update the user on 5 locations within 2.5m horizontal position accuracy. It has u-blox 6 positioning engine that provides Time-To-First-Fix

of under 1 second. It also has power saving mode for reducing power consumption by switching the parts if the receiver on and off. It is a very suitable choice for this device if getting location is concerned.

Figure 4.0.1: GPS NEO-6M Module

4.0.2: GSM SIM800L

SIM800L GSM module is a miniature GSM modem and can be integrated in our project. This module is basically used to accomplish almost anything a conventional cell phone can; sending Short text messages, connecting through phone calls, connecting to the internet through GPRS, TCP/IP, and more signal network connections, This module supports quad-band GSM/GPRS

network, which can be used in almost anywhere in the world where there can be GSM/GPRS networks available. In our device, it will serve the purpose of sending automated texts whenever the unusual motion is being detected.

Figure 4.0.2: GSM SIM800L

4.0.3: MPU6050 Accelerometer and Gyroscope Module

The MPU6050 is a Micro Electro-Mechanical System (MEMS). It consists of a 3-axis accelerometer and 3- axis gyroscope inside. It is helpful for measuring velocity, acceleration, orientation, displacement and many other motion-relative parameters of an object. It has Digital Motion Processor inside, which is powerful to do any complex calculation and free up the system memory of microcontroller with its efficiency in comparison with other accelerometer devices.

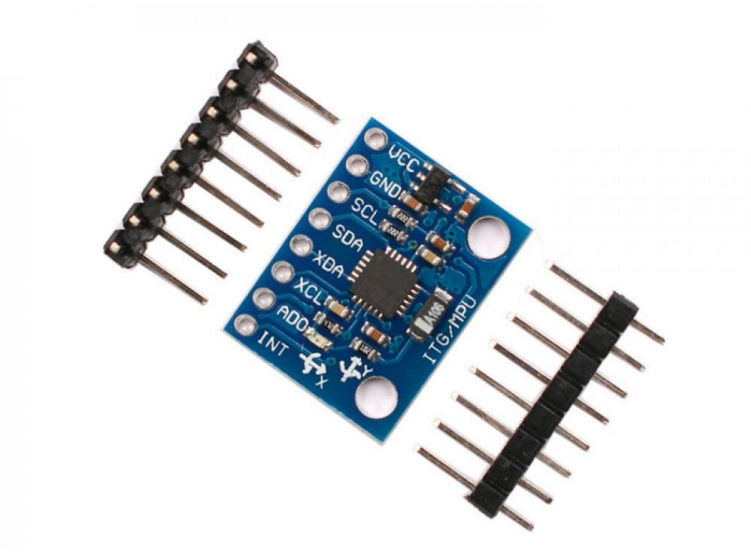

Figure 4.0.3: MPU6050 Accelerometer and Gyroscope module

In our device it will detect constant motion that will reach to a certain range and trigger the system to send text alerts to the emergency contacts.

4.0.4: DC to DC Boost Converter 3.3V to 5V

The DC to DC boost converter is basically used to convert 3.3 volt input to 5 volt output to provide the devices connected to it the required voltage. Our devices also needed to make use of the boost converter on the same purpose.

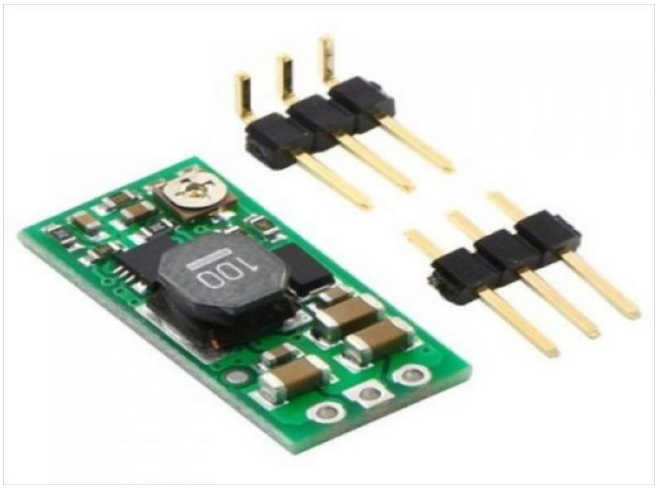

Figure 4.0.4: DC to DC 3.3V to 5V Boost Converter

4.0.5: 5V Regulator IC LM7805

Voltage regulators have common applications in electronic circuits. The 5V Regulator IC provides a constant output voltage for different input voltages. It is a positive voltage regulator. As the convertor processes a 3.3V to 5V output, this regulator ensures that constant 5V standard in our device to save other components.

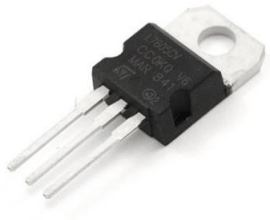

Figure 4.0.5: 5V Regulator IC LM7805

4.0.6: Switch – Double pole double through

A double pole double through push switch has been used to turn on or off the system connected with the devices that power up taking the current from the 18650 batteries.

Figure 4.0.6: Switch – Double Pole Double Through

4.0.7: Switch – Single pole single through

A single pole single through switch has been used to turn on devices running on the 9V battery powered devices.

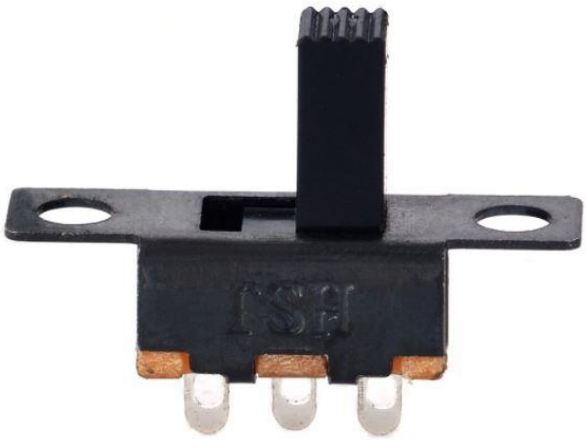

Figure 4.0.7: Switch – Single Pole Single through

4.0.8: Microprocessor ATMega328p

The used microcontroller is Atmel ATMega328p microcontroller which has 32 kb ISP flash memory along with1 kb EERPOM, 2 kb flash memory and 23 general purpose IO line along with 32 general purpose working register. This is programmable and will be very flexible to program our device. I t has proven to be more efficient when it comes to activating the device components in shortest possible time.

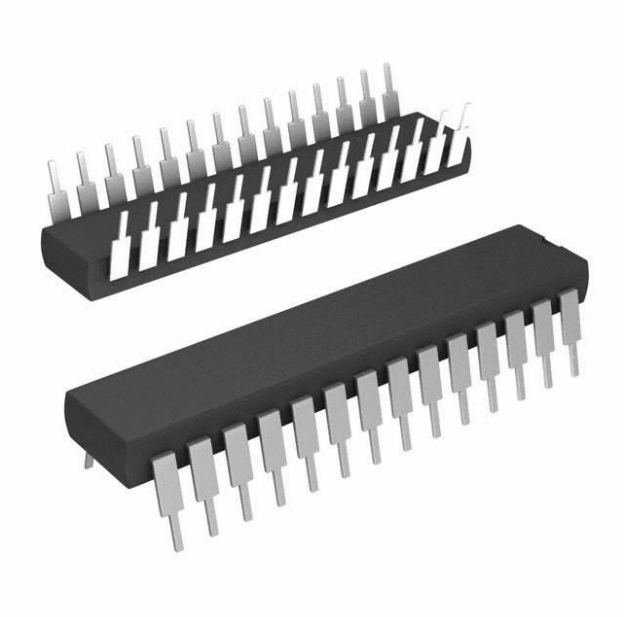

Figure 4.0.8: Microcontroller ATMega 328p

4.0.9: 28 Pin IC Base

This specific IC base is used to mount any 28 pin IC to the PCB. Here we used it to mount the microcontroller.

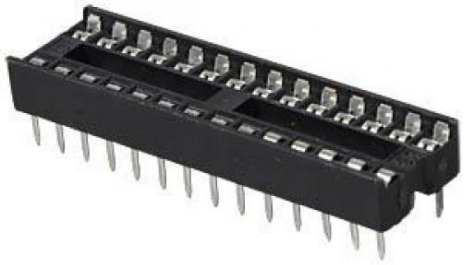

Figure 4.0.9: 28 Pin IC Base

4.0.10: 16 MHz Crystal Oscillator

The 16 MHz Crystal oscillator is used to provide clock input to microprocessors. We also used this for the same purpose

Figure 4.0.10: 16 MHz Crystal Oscillator

4.0.11. 22pF Capacitor

For loading purpose, this capacitor we are using is capable of work with crystals. The capacitance of this is 22pF and has a rated voltage of 200V. It has a tolerance of ±20% and due to its compatible to work in a breadboard(solderless), we have decided to use this on our proposed system

Fig: 4.0.11: 22pF Capacitor

4.0.12. 3.7V Li-Po Battery

We have two 3.7 Li-Po battery in our system. This battery uses Lithium Ion polymer for energy. These batteries are cheaper than Lithium Polymer and the efficiency rate is also higher than the later. Having a 2-3 years lifespan and 300-500 lifecycles and the high-power density, It is an ideal choice of using Li-Po Battery in our project.

Fig: 4.0.12: 3.7V Li-Po Battery

4.0.13. 18650 Single Battery Holders

These battery holders are used in setting up the 3.7 Volt Batteries in to the device to keep them in position. These are easy to connect in the device and because of its easy functionality we have used this component.

Fig: 4.0.13: 18650 Single Battery Holders

4.0.14. 9V Battery

This is a common size of battery consists of round edges and a rectangular prism shape. The connectors of this battery are of polarized snap type and both of the connectors situated in the top

Fig: 4.0.14: 9V battery

4.0.15. 9V Battery Clip

This connector is connected in the snap connectors of the 9V battery. It is a cheap and money saving solution as it directly can supply electricity to our device using its positive and negative cable.

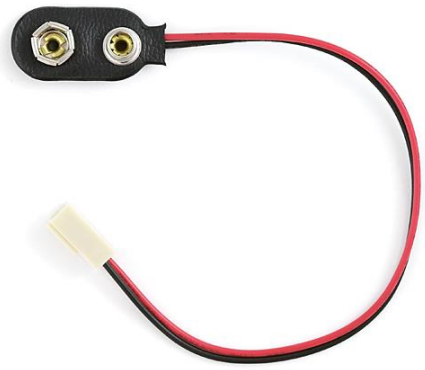

Fig: 4.0.15: 9V battery clip

4.0.16. PCB dot Varo Board (5X7cm)

The PCB dot Varo board is where we have soldered all of our components it has a 2.54mm hole pitch with a thickness of 2mm. Each hole has a diameter of 0.95mm. It is a budget friendly option and soldering in this is also easy is one more reason to use this Board.

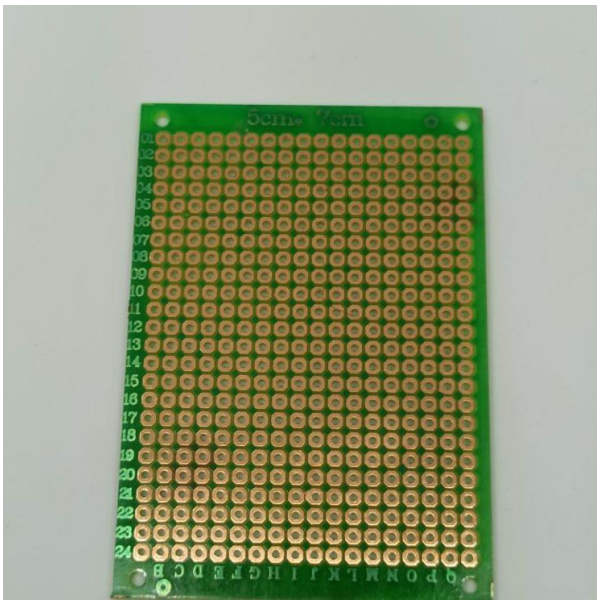

Fig: 4.0.16: PCB dot Varo Board (5X7cm)

4.0.17. GSM PCB Antenna

The GSM PCB antenna used in this device is a custom-designed FR4 quad band. One of the great things about its functionality is that is can be used for a tracking device which is suitable to our need. It is an ultra-small 74. x 8.2 x 0.8 size and the gain of this device is 1.5 dbi ~ 3 dbi having the impedance of 50 Ω. It can operate is GMS 850,900,1800,1900 with different efficiency .

Fig: 4.0.17: GSM PCB Antenna

4.0.18. 2200uf/50v Capacitor

This capacitor has the capacitance of 2200uF with the voltage of 50V. This has the maximum temperature of 105°C and also has a formfactor of 16x30mm. This will meet our requirements so we are using this on our device.

Fig: 4.0.18: 2200uf/50v Capacitor

4.0.19. Connectors

We have used jumper cables as connectors to connect all the components. Reason of using this is this doesn't break easily and easy to connect and remove.

Fig: 4.0.19: Connectors

4.0.20. Plastic Box for Enclosure

We have used this box as enclosure to keep all the components inside safely. This box helped us to stick all the components using glue so they don't move and it works well all the time. This also helps to make the device looks discreet so the miscreants will be unware about the device.

Fig: 4.0.20

: Plastic Box for Enclosure

CHAPTER FIVE: REQUIREMENT ANALYSIS

5.0 Requirement Analysis

At first, we research with our requirements of this proposed system and after analyzing the gathered requirements we have come to the conclusion that as per the rules our project requires waterfall model.

System Design:

On the initial stage we need to come up with a model and then work on the requirement findings and analyzing those requirements. In this step we mapped the architecture of our proposed project. This will help us in hardware choosing and also help us understand easily in doing the next steps.

Implementation:

From our prototype design we had to specify the project in some individual portions. Every portions or unit had to be tested and find their capabilities and limits. After that we checked individual unit's functionalities.

Testing:

In our testing phase we have gone through the non-functionality of the units and also the integrity before going into the next step.

Deployment:

In the previous steps, we cross checked all unit's functionality along with non-functionality. Now is the time to give the device to our selected testers.

Maintenance:

The testers can report issues about our device and for that we need to the device by users demand and launch updated versions of our device.

5.1 Why we used this model

1. Clear and fixed requirements in this model

2. Familiar technology makes it easy to finish.

3. Fixed definition about the project is another important factor.

5.2 Advantages Using this Model

1. As the project is easy understandable and simple.

2. All stages of work are clearly defined so that we know which stage to work on the specific problem.

3. Phases and processes are done once and due to that unexpected requirements in any phases won't occur.

4. If we happen to come across new requirements, the arranging of new tasks will be easier.

5.3 Disadvantages

1. Sometimes measuring accurate thing in all phases can be difficult.

2. Not suitable when working on a complex project.

3. Poor model choice if the project is lengthy and continuous.

5.4 Reason of choosing waterfall instead of having limitations

1. Although there are limitations such as measuring phases and lengthy situations, we have specified solutions for those. Such as:

1. Clear documentation of all the steps.

2. We will be patching updates on our device based on requirements by long and ongoing.

5.5 Reason for not using other models for this project

Here is the elaboration of other models and why we picked waterfall model over those is given:

Spiral Model:

Complex models and each step has more complexity. The estimating finish line of the project will be unknown, until the project is finish. A large number of intermediate stages is also required on this.

Agile Model:

The sustainability and maintenance of this project model bring risks. On small projects this is fine, but on bigger ones its safe to avoid this model. This model depends highly on the interaction of users. If we have unclear users the project can go out of track suddenly at any time.

V- Model:

A high risk and uncertain model is the V-model. If there is any problem in the testing phase, the model requires going through all the previous steps and checking the functionalities again. This is not much flexible and know to be rigid.

Iterative Model:

This model requires more resource. The risks are hard to calculate at the end of the project. Not a great choice for bigger projects. We require an analyzer which is highly skilled to analyze the existing risks on this model.

CHAPTER SIX: SYSTEM ANALYSIS

6.0: Project Functionality

- Sends startup prompt to trusted contacts if all the components start working fine.
- Detects unusual motion which exceeds to 50% of the accelerometers sensitivity and comes back to 0% a few times (in this case we fixed 10 times as standard).
- Sends alert texts message to trusted contacts along with location in longitude and latitude value if found.

- Repeat sending texts if it finds unusual motion that exceeds the standard set to the device until the device is turned off along with location if found.

6.1: Design Requirement

- GPS Module
- GSM Module
- Accelerometer – Gyroscope Sensor

6.2: System Development

Device Circuit Diagram:

We have 3 major components which has been programmed to work alongside the microcontroller being used as the brain. Those 3 major components are GPS module, GSM module and the Accelerometer sensor. The GSM module, GPS Module and the Accelerometer sensor is connected to the microcontroller via wires and is powered by two 3.7V 18650 battery and a 9V battery. LM7805 regulator has been used to pass through current deliberately. 3.3V booster has been connected alongside the 3.7V battery to the GPS module so that it gets static voltage delivery. 16MHz crystal has been included in the PCB board with the microcontroller, along with 220F capacitor.

When the first single pole single through switch is pressed, The GPS module and the GSM module starts up. Then we switch on the second switch and the accelerometer gets connected. It has been programmed in a way that only when the GPS and GSM module starts, the accelerometer starts its activity and detects unusual movement. When all the device is turned on and working well, the programmed emergency contacts gets their text that confirms the device is working well.

If it detects the motion fluctuation from 50% to 0% of its sensitivity constantly (Here, 10 times of the fluctuation has been set as standard), it sends signal to the GSM module. The accelerometer has I2C communication which is triggered by how it has been programmed and that communication is sent to the GPS and GSM module

The GSM module sends the alert text to the emergency contacts along with the location parameters i.e Latitude and Longitude, and keeps on doing it within a time duration of 20 seconds if the accelerometer detects unusual motion.

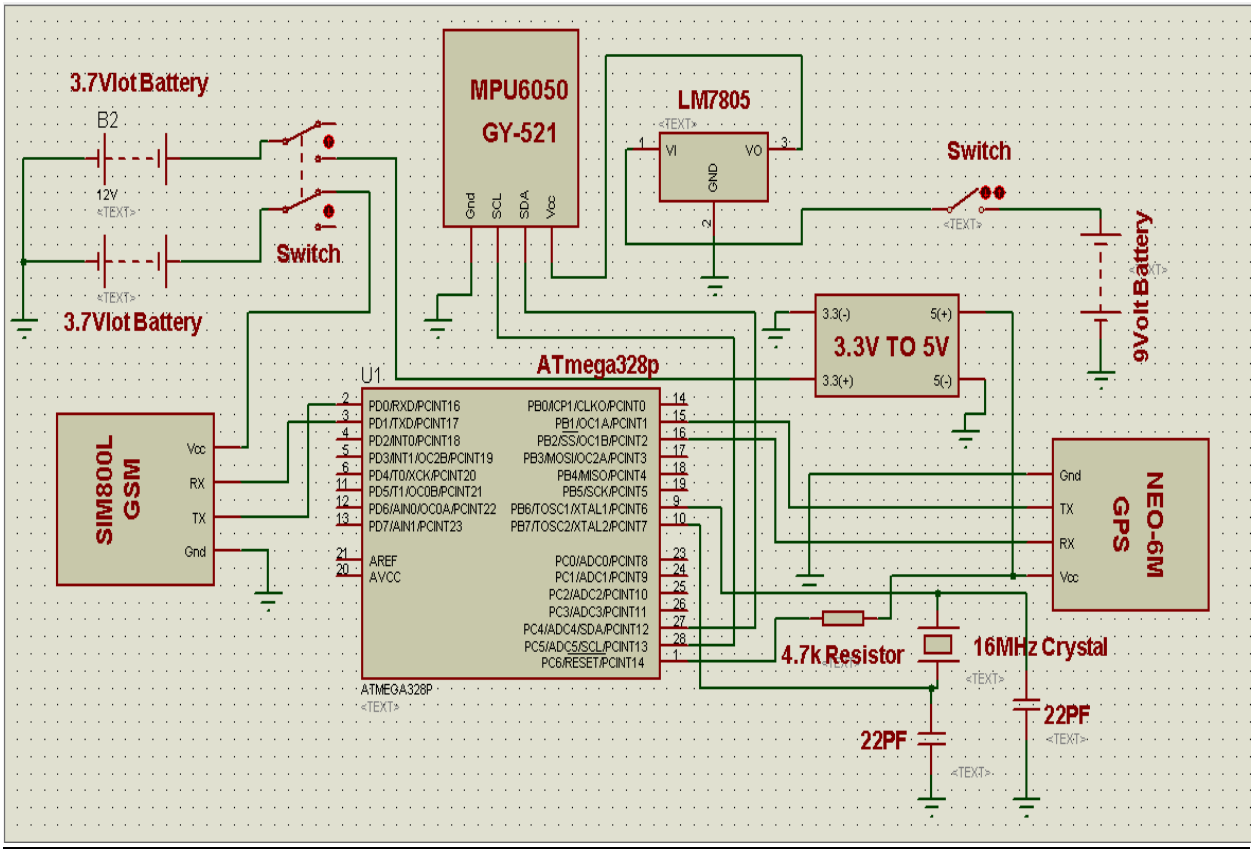

Figure 6.2: Circuit Diagram

CHAPTER SEVEN: DESIGN REQUIREMENT

7.0: Activity Diagram

Activity diagram is basically flowchart, or a UML that explains the activities happening in the system within a flow. We can get the idea of the whole process through this activity diagram. The flowchart is as follows:

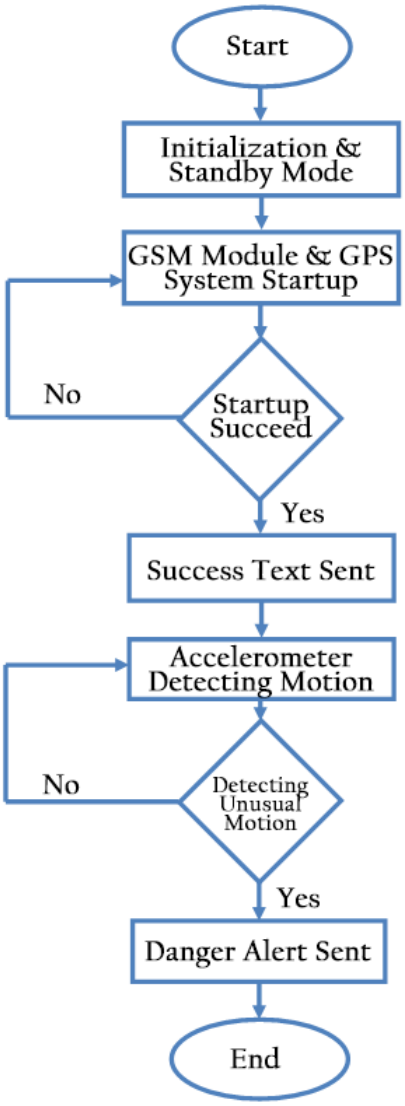

Figure 7.0: Activity Diagram

7.1: Use Case Diagram

The use case diagram shows the activity between the actuators with system and user in an environment. The use case diagram for our system is as follows:

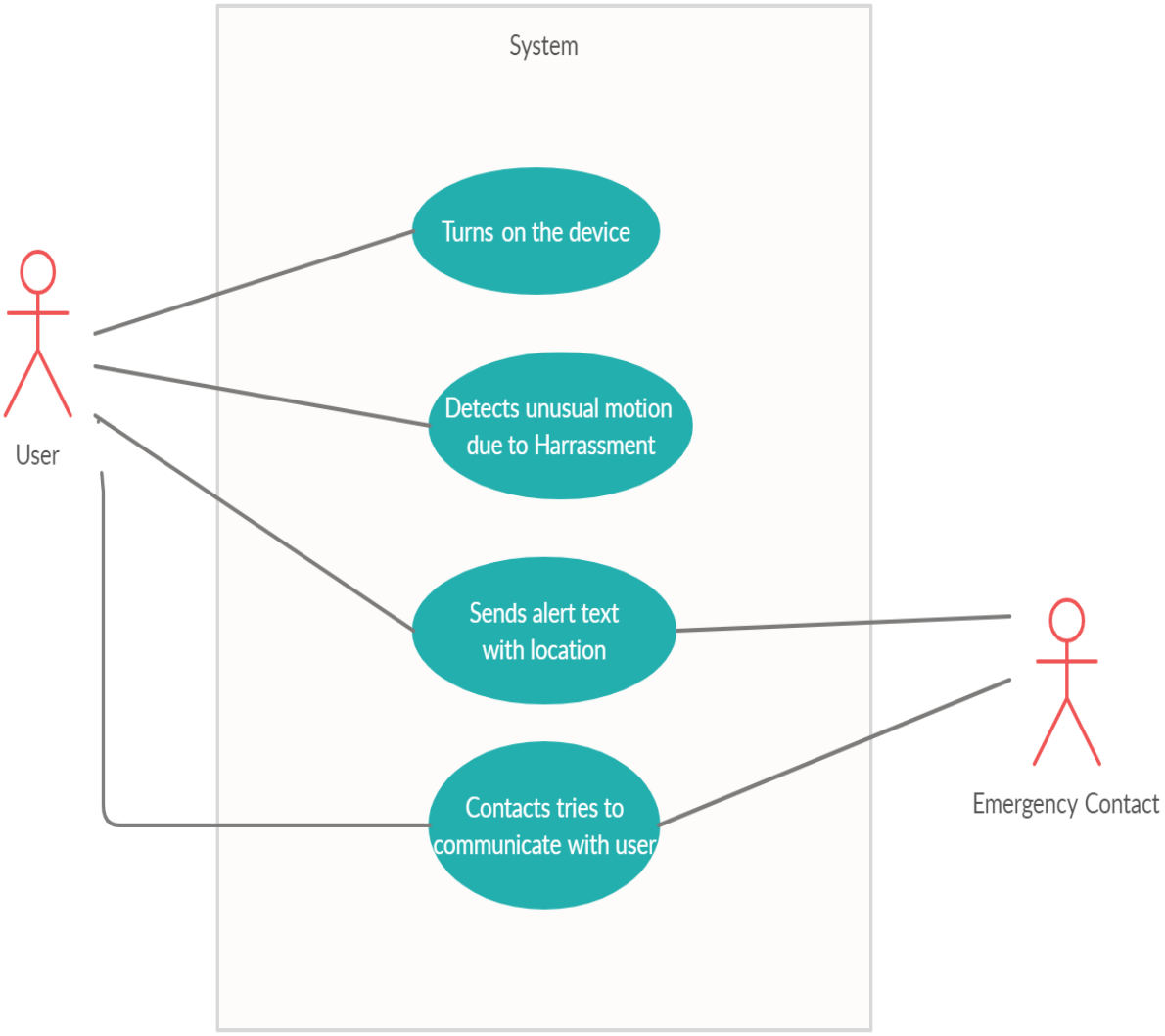

Figure 7.1: Use Case Diagram

CHAPTER EIGHT: IMPLEMENTATION AND TESTING

8.0: Implementation

In this part, it will be stated how we implemented the process of making this device even though we have explained it before. As per design diagram, we have used and implemented components like Microcontroller ATMega 382p, GPS Module NEO-6M, GSM SIM800L Module, MPU6050 Accelerometer-Gyroscope Module and more other components.

8.1: Arduino Code

```
#include<Wire.h>

#include<MPU6050.h>

MPU6050 mpu;


#include<SoftwareSerial.h>

SoftwareSerial gps(9,10);


char str[70];

String gpsString="";

char *test="$GPGGA";


String latitude="No Range";

String longitude="No Range";


int temp=0,i,j,k;

int value;

boolean gps_status=0;




void setup()
```

```
{
 Serial.begin(9600);
 gps.begin(9600);
 delay(20000);
 Gsm_initialize();
 delay(20000);
 get_gps();
 Serial.begin(9600);
 delay(200);
 Serial.println("AT+CMGF=1\r");
 delay(200);
 Serial.println("AT+CMGS=\"+8801913299922\"");
 delay(200);
 Serial.println("All device working well.");
 delay(200);
 String gps_location=("Latitude: "+String(latitude)+"Longitude: "+String(longitude));
 Serial.println(gps_location);
 delay(400);
 Serial.println((char)26);
 delay(200);
 Serial.println();
 delay(5000);
```

```
  delay(1000); //delay one seconds
  while(!mpu.begin(MPU6050_SCALE_2000DPS, MPU6050_RANGE_2G))
  {
   //Serial.println("Could not find a valid MPU6050 sensor, check wiring!");
   delay(500);
  }
  delay(2000);
}

void loop()
{
  Vector rawAccel = mpu.readRawAccel();
  int value = map(rawAccel.XAxis,17000,3000,0,100); //convert accelration to percentage
  delay(10);
  if(value > 100)
  {
    if(j==0)
    {
      k=k+1;
      j=1;
    }
  }
```

```
if(value < 20)
{
 if(j==1)
 {
  j=0;
 }
}
 while(k==10)
 {
  delay(1000);
  Wire.endTransmission();
  delay(1000);
  get_gps();
  Serial.begin(9600);
  delay(200);
  Serial.println("AT+CMGF=1\r");
  delay(200);
  Serial.println("AT+CMGS=\"+8801913299922\"");
  delay(200);
  Serial.println("Please try to contact me.");
  delay(200);
```

```
Serial.println("I am in danger.");
delay(200);
String gps_location=("Latitude: "+String(latitude)+"Longitude: "+String(longitude));
Serial.println(gps_location);
delay(400);
Serial.println((char)26);
delay(200);
Serial.println();
delay(5000);
Wire.endTransmission();
delay(1000);
get_gps();
Serial.begin(9600);
delay(200);
Serial.println("AT+CMGF=1\r");
delay(200);
Serial.println("AT+CMGS=\"+8801680467481\"");
delay(200);
Serial.println("Please try to contact me.");
delay(200);
Serial.println("I am in danger.");
delay(200);
```

```
    String gps_data=("Latitude: "+String(latitude)+"Longitude: "+String(longitude));
    Serial.println(gps_data);
    delay(400);
    Serial.println((char)26);
    delay(200);
    Serial.println();
    delay(10000);
    k=0;
   }
}
/*****************************************************************************/
void Gsm_initialize()
{
 boolean at_flag=1;
 while(at_flag)
 {
  Serial.println("AT");  //finding gsm module
  while(Serial.available()>0)
  {
   if(Serial.find("OK"))
   at_flag=0;
  }
```

```
  delay(1000);
 }
 Serial.println("ATE0"); //finding gsm network
 boolean net_flag=1;
 while(net_flag)
 {
  Serial.println("AT+CPIN?");
  while(Serial.available()>0)
  {
   if(Serial.find("READY"))
   net_flag=0;
   break;
  }
  delay(1000);
 }
  Serial.println("AT+CNMI=2,2,0,0,0\r\n");
  delay(1000);
  Serial.println("AT+CMGF=1\r\n");
}


/****************************** GPS Code
*************************************/
void gpsEvent()
```

```
{
 gpsString="";
 while(1)
 {
  while (gps.available()>0)            //checking serial data from GPS
  {
   char inChar = (char)gps.read();
    gpsString+= inChar;                    //store data from GPS into gpsString
    i++;
    if (i < 7)
    {
     if(gpsString[i-1] != test[i-1])        //checking for $GPGGA sentence
     {
       i=0;
       gpsString="";
     }
    }
   if(inChar=='\r')
   {
    if(i>65)
    {
      gps_status=1;
```

```
      break;
     }
     else
     {
      i=0;
     }
    }
  }
   if(gps_status)
   break;
  }
}



void get_gps()
{
   gps_status=0;
   int x=0;
   while(gps_status==0)
   {
    gpsEvent();
    int str_lenth=i;
```

```
latitude="";
longitude="";
int comma=0;
while(x<str_lenth)
{
  if(gpsString[x]==',')
  comma++;
  if(comma==2)        //extract latitude from string
  latitude+=gpsString[x+1];
  else if(comma==4)       //extract longitude from string
  longitude+=gpsString[x+1];
  x++;
}
int l1=latitude.length();
latitude[l1-1]=' ';
l1=longitude.length();
longitude[l1-1]=' ';

i=0;x=0;
str_lenth=0;
delay(2000);
}
```

```
}
```

8.2: Implementation of power supply

Without batteries, the components won't get power supply required for those to work. So, we connected two 3.7V Li-ion batteries and a 9V battery with the circuit. The 3.7V Li-ion batteries are rechargeable, and the 9V battery is long lasting.

Figure 8.2: Implementation of Power Supply.

We tested the battery longevity and performance 100 times, all the battery worked 100%.

8.3: Implementation Accelerometer-Gyroscope sensor

The sensor has been placed at one side of the box for better recognition of unusual motion, and is connected with the Microcontroller. It works when the device will be tilted and it will reach the sensitivity more than 50% and fluctuate to 0% 10 times.

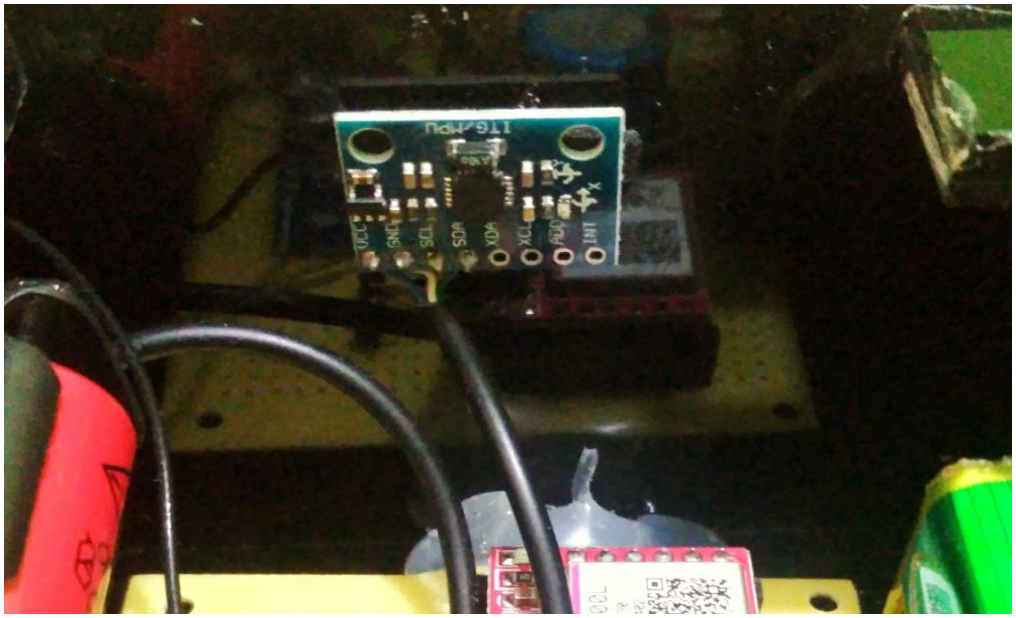

Figure 8.3: Implementation of Accelerometer-Gyroscope sensor.

Test results: We tested the sensor for 100 times and the accuracy rate is 90%.

8.4: Implementation GSM Module

As we used a GSM SIM800L module to send alert texts to trusted contacts, placed it in the circuit connected to the board along with a SIM inside. It works when all the device works properly and when it gets the signal from the Accelerometer-Gyroscope sensor that reaches the requirement to send alert texts.

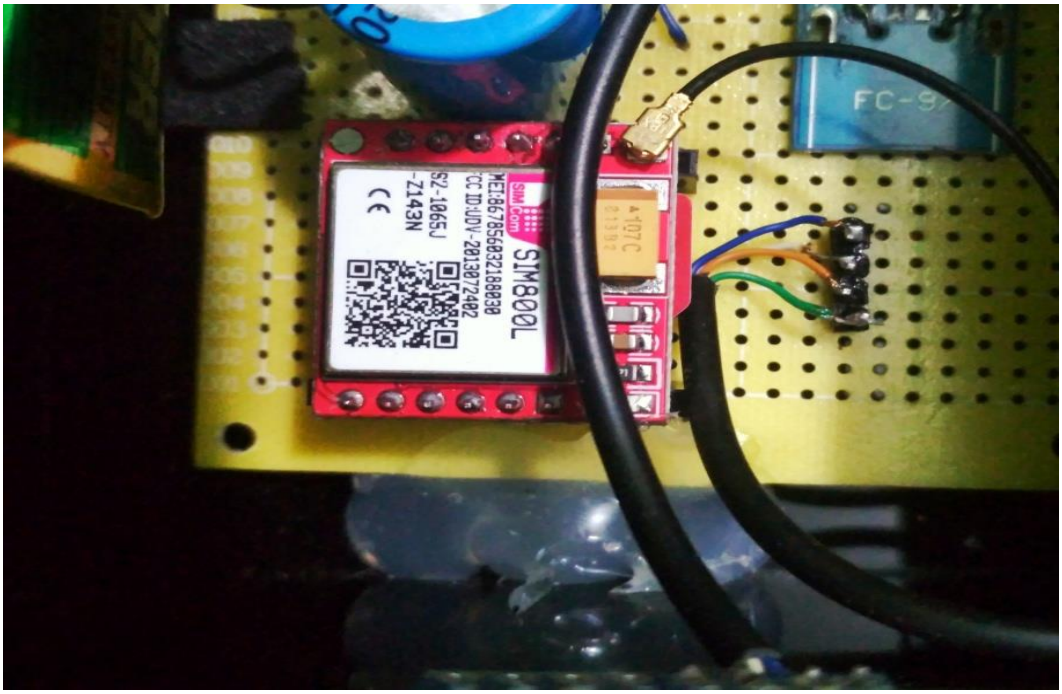

Figure 8.4: Implementation of GSM Module.

Test results: We tested the module 100 times and the accuracy rate is 90%.

8.5: Implementation of GPS Module

As we chose GPS module NEO-6M, which is a productive GPS module that can be found on the market and very much capable of detecting longitudinal and latitudinal values accurately, it works when the GSM module sends texts and if it fails to quickly read the position, it doesn't take time and lets GSM module to send the alert as a first priority and later on it sends the location along with the alert text. It is mounted with glue on the cover lid of the box and connected with the Microcontroller.

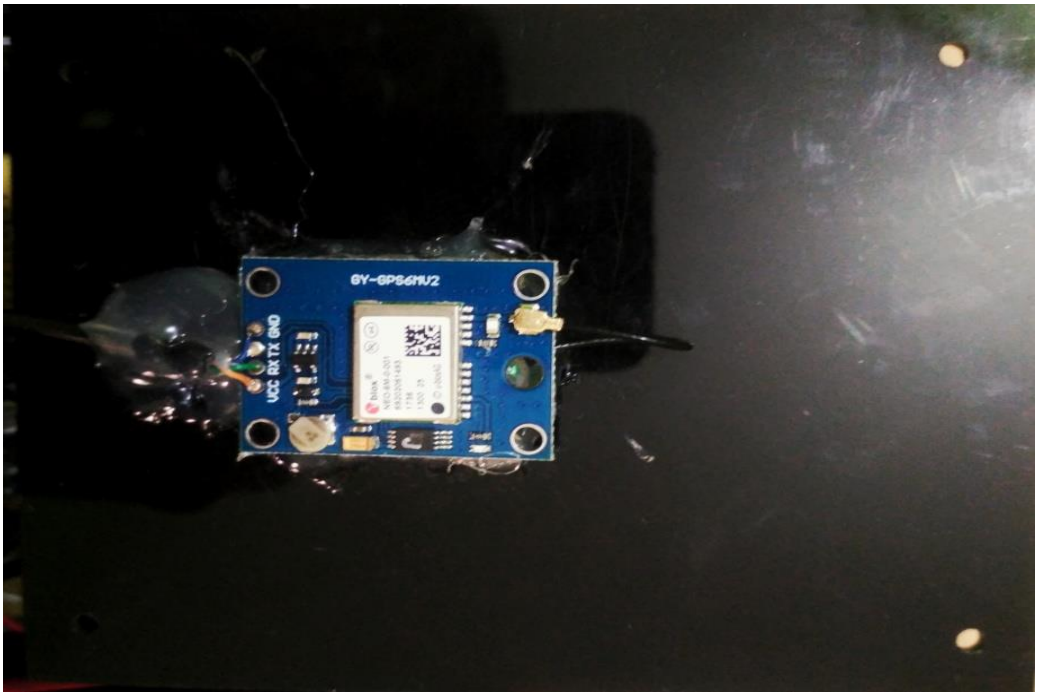

Figure 8.5: Implementation of GPS Module.

Test results: We tested the GPS module for 100 times and the accuracy is 88%

8.6: Full Implementation

Here is how the full implementation looks like:

Figure 8.6: Full Implementation

CHAPTER NINE: CONCLUSION

Despite of having various existing technologies and devices to ensure safety of women, we aspire to make this device compatible enough to make women feel safe and brave enough to cooperate with the technology for fighting criminals and help the law enforcement to serve justice to all the women around.

Future works

-Preparing the motion sensing process providing most possible accuracy than now.

-Adding the IP camera and making it fully functional with extra features

-Real-time video streaming to the devices of trusted contacts and emergency helpline.

- Adding voice recognition system to start the process of alert while needed.

-Providing more accuracy in GPS tracking so that we can get the location even inside the house.

-Combining our technology with local law enforcement and medical service to get rapid results out of the device.

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