GPS Based Technology for Women Safety During Panic and Insecurity

Prof. William Thomas[1], E Pavan Kumar[2], Dahanunjaya[3], A Shiva Sharan[4], Sabala Pavan Kumar[5]

Asst. Professor, Department of Electronics & Communication Engineering[1]
Students, Department of Electronics & Communication Engineering[2,3,4,5]
Ballari Institute of Technology and Management, Ballari, Karnataka, India

Abstract: *In our Country, even though it has super power and an economic development, but still there are many crimes against women. The atrocities against the women can be brought to an end with the help of device, specially designed for women in distress. women are facing problems like harassment. We propose to have a device which is the integration of multiple devices, hardware comprises of a wearable device that endlessly communicates with sensible phone that has access to the web. The device consists of trigger button, GPS module(Neo-6M), Switch, soil moisture sensor(continuity purpose), Buzzer, esp32 microcontroller, LCD display. In this project, when a woman senses danger she has to press the button of the device. Once the device is activated, it tracks the current location using GPS (Global Positioning System)and wifi is connected then it stors data in the google fire base from that it send stored data to the mobile App. From the app the user get notification and he/she can use that devise by pressing the switch. buzzer is used as an alarm to alert the nearby people so that they may understand that someone is in need.*

Keywords: GPS, Women Safety

I. INTRODUCTION

India is home to 662.90 million females where women from different fields have made the country proud. Today, a woman's identity is not by her husband or family, but she has built her own identity by not just limiting herself to household works but also by walking shoulder to shoulder with men in society. If the condition of women seems to change, then why, as a country, are we still failing to acknowledge something as big as women's safety in our society? With India emerging out as one of the most developing nations of the world, it still lacks to take measures regarding women's safety. India is considered to be one of the most dangerous countries for women. Indian women are constantly live in a state of fear when they are alone on the streets or at work, or in the markets. According to the latest NCRB report, 2019 saw over 4 lakh reported cases of crime against women. NCRB reported 32,033 rape cases which are about 88 rape cases daily. In 2018, more than 93 percent of the rape cases reported were done by someone known to the victim. Women report being raped and sexually harassed not just outside but also inside their homes.Delhi rape case in 2012, Unnao rape case of 2017, Kathua rape case 2018, Hyderabad rape case in 2019 or the recent Hathras rape case of 2020, names of the victims change with year, but the condition remains the same. While these cases triggered debate among people on sexual and the punishment which has to be given to the perpetrators, an estimated 99.1% of sexual violence cases are yet not reported in India

We provide a reliable security system for the safety of women. In case of emergency and help the user can ask for help either by pressing the Panic button that will be recognized by mobile app and will intimate the parents and/or police for help. The architecture of the proposed system is shown in the Figure.

Demo Points:
- Continuity of the belt is monitored by the soil moisture sensor.
- Wifi is connected to the GPS.
- GPS location is tracked.
- Continuity sensor is tracked to Avoid Sexual Harassment.
- Live update is provided on Google Firebase Cloud Platform.
- By pressing Panic Key Instant alert given to the Guardians/users mobile application (MIT app).

II. REVIEW OF LITERATURE

Reasons behind increasing violence against women in India Patriarchal Mindset

The first and the main problem is the Patriarchal mindset has conditioned men to believe in their superiority. The males are always considered as more powerful than women, of which they take advantage.

Unreported cases

There is a rise in the number of rape cases, of the reasons being that a lot of these cases go unreported, which gives power to those perpetrators to repeat violence against women. For every reported rape case, dozens of others go unreported because of fear and shame. Families fear getting their daughters' identities published and thus choose to remain silent on such issues.

Lack of awareness

Of all victims under 18, 2 out of 3 are ages 12-17. For girls to come out and report their problems, schools and colleges need to bring awareness about women's safety. In India, no proper counseling is provided to grownup boys and girls. This is also the reason that our youth is not aware regarding sex-related crimes.

Legal Loopholes

Rape is a non-bailable offense in the Indian penal code, but people get bail due to lack of evidence. Often accused are sheltered by policemen, politicians, and even lawyers. This makes the entire judicial process complex. It is said that 'Justice delayed is justice denied. While incidents like rape and sexual harassment are happening every day, giving Justice to the victims takes time.

Required Measures for Women Safety

At a very young age in many families, girls are treated lesser than boys. A lot of families believe that women should not have an opinion and that they are inferior to men. In this case, the condition for the non-working class of women is worse, as they have to depend on the male family members for survival. This patriarchal culture is the root cause of violence against women, which needs to stop.

III. METHODOLOGY AND IMPLEMENTATION

3.1 Problem Statement

Problems that women face in India Apart from feeling unsafe on roads when it gets dark, women go through a lot of different Women's rights violations. Women trafficking, dowry deaths, domestic violence, child marriage, women forced to give birth to only sons, female foeticides, forced evictions and exclusions, sexual harassment at the workplace, rapes are prevalent across the world. Something as basic as education which might be normal for a boy, is still a dream for many girls in India. These are some of the ill-happenings which are used by the male to display male superiority. This is one of the prime reason violence is increasing in India, and women's safety is a concern in India

3.2 Objectives

Real-time Location Tracking: The primary objective of the GPS-based technology should be to provide accurate and real-time location tracking of women in panic or insecure situations. This will enable authorities or designated individuals to locate and respond to the distress signal promptly.

3.3 Hardware Description
3.3.1 Hardware Requirements :
Operating System :
- Windows 10

Processor:

- Minimum: Any intel or AMD x36-64 processor
- Recommended: Any intel or AMD x36-64 processor with four logical cores and AVX2 instrustion set support

RAM :

- Minimum: 4GB Recommended: 8GB

Hardware Used :

- ESP32
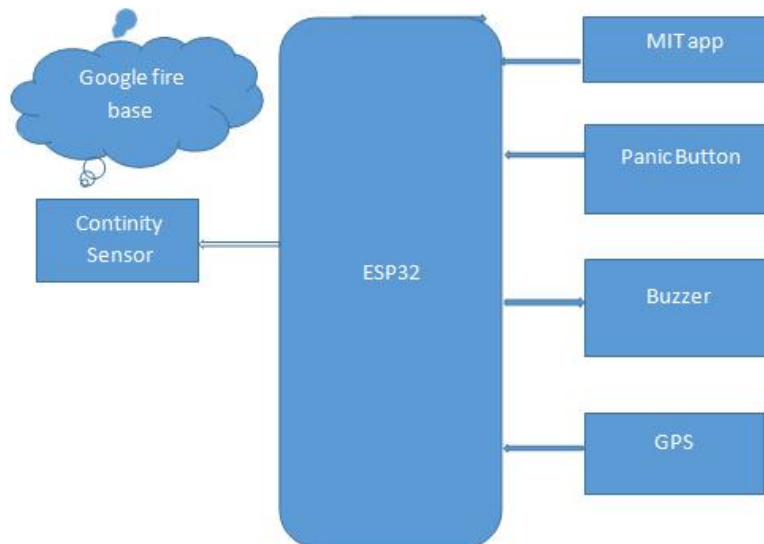- Buzzer
- Panic Button
- GPS
- Continity sensor

3.4 Software Description
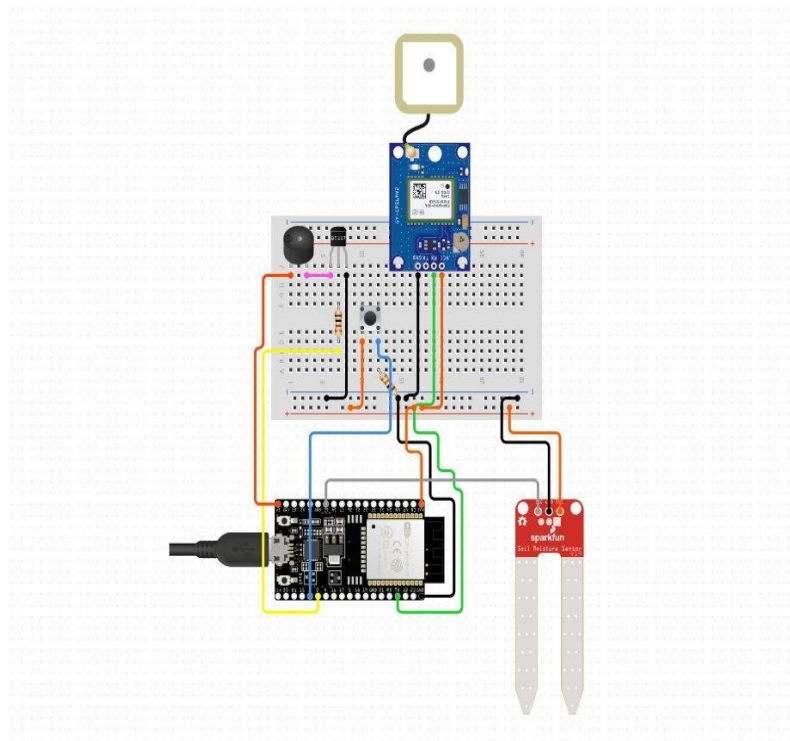### 3.4.1 Software Requirements :

- Google fire base
- MIT application
- Ardunio IDE

3.5 Implementation
3.5.1 : Block Diagram

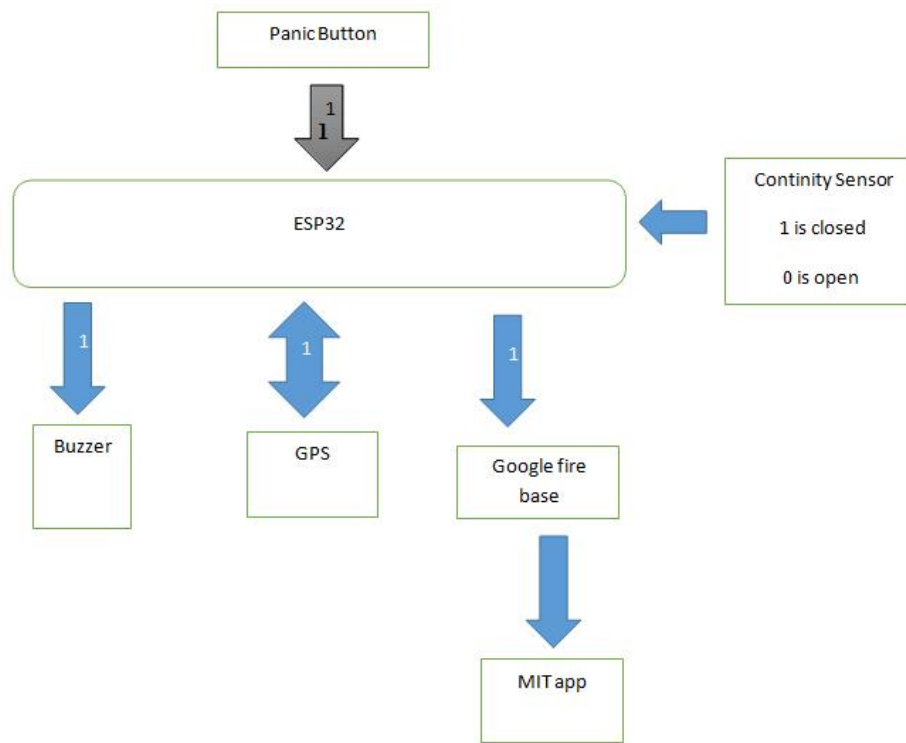**Reference model of the project :**

SYSTEM REQUIREMENTS
Hardware used

- ESP32 Microcontroller
- Buzzer
- Panic Button
- GPS
- Continity Sensor

Software used :

- Google fire base
- MIT app
- Embedded C
- Arduino IDE

3.6 Working

Step 1 : When the person press the panic button ESP32 will be active.

Step 2 : The ESP32 it comes to understand that person is in the danger. The ESP32 will active the buzzer, GPS.

Step 3 : The ESP32 will communicate with GPS.

Step 4 : The GPS will communicate about the location with ESP32.

Step 5 : ESP32 will communicate with the google firebase about location.

Step 6 : MIT app will communicate with the google firebase to get the location of the person.

CODE

```
#include <IOXhop_FirebaseESP32.h> #include <TinyGPS++.h>
const int buzzer = 13; const int beltpin = 33;
struct Button { const uint8_t PIN; bool pressed;
};
Button button1 = {12, false};
void IRAM_ATTR isr1() { button1.pressed = true;
}
TinyGPSPlus gps;
volatile float minutes, seconds; volatile int degree, secs, mins; double lat_val, lng_val; double latt = 13.151169; double
longg = 77.609756;
#define  FIREBASE_HOST        "fire-figting-robot-5d361-default-rtdb.firebaseio.com"
// the project name address from firebase id
#define  FIREBASE_AUTH        "WZ5UuqmfOxyCyEXdRRJgy6yRcfcLAY1QvFgKMvR"
// the secret key generated from firebase
#define WIFI_SSID "ABH"         // input your home or public wifi name #define WIFI_PASSWORD "12345678F"
String fireStatus; void setup() {
Serial.begin(115200); // Initiate a serial communication delay(200);
```

IJARSCT

ISSN (Online) 2581-9429

International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Impact Factor: 7.53

Volume 4, Issue 6, May 2024

```
pinMode(buzzer,        OUTPUT);     Serial.println("WELCOME");        pinMode(button1.PIN,     INPUT_PULLUP);
attachInterrupt(button1.PIN, isr1, FALLING);
WiFi.begin(WIFI_SSID, WIFI_PASSWORD);
Serial.print("connecting");
while (WiFi.status() != WL_CONNECTED) { Serial.print(".");
delay(500);
}
delay(200); Serial.println();
Serial.print("connected: "); Serial.println(WiFi.localIP());
delay(200);
Firebase.begin(FIREBASE_HOST, FIREBASE_AUTH); delay(200);
Firebase.setFloat ("Lat", latt ); delay(200);
Firebase.setFloat ("Long", longg); delay(200);
}
void buzzeron()
{
digitalWrite(buzzer, HIGH); delay(200); digitalWrite(buzzer, LOW); delay(200);
}
void gpslocation()
{
Serial.println("*****"); smartDelay(1000); unsigned long start;
bool loc_valid, alt_valid, time_valid; lat_val = gps.location.lat(); loc_valid = gps.location.isValid(); lng_val =
gps.location.lng();
if (!loc_valid)
{
Serial.print("Latitude : "); Serial.println(latt, 6); Firebase.setFloat("Lat", latt); delay(100); Serial.print("Longitude : ");
Serial.println(longg, 6); Firebase.setFloat("Long", longg); delay(100);
}
else
{
DegMinSec(lat_val);
Serial.print("Latitude in Decimal Degrees : "); Serial.println(lat_val, 6); Firebase.setFloat("Lat", lat_val);
delay(200);
Serial.print("Longitude in Decimal Degrees : "); Serial.println(lng_val, 6); Firebase.setFloat("Long", lng_val);
delay(200);
}
delay(300);
}
static void smartDelay(unsigned long ms)
{
unsigned long start = millis(); do
{
while (Serial2.available()) /* Encode data read from GPS while data is available on serial port */
gps.encode(Serial2.read());
/* Encode basically is used to parse the string received by the GPS and to store it in a buffer so that information can be
extracted from it */
} while (millis() - start < ms);
}
```

```
void DegMinSec( double tot_val)    /* Convert data in decimal degrees into degrees minutes seconds form */
{
degree = (int)tot_val; minutes = tot_val - degree;
seconds = 60 * minutes; minutes = (int)seconds; mins = (int)minutes; seconds = seconds - minutes; seconds = 60 *
seconds;
secs = (int)seconds;
}
void beltread()
{
int beltval = analogRead(beltpin); Serial.print("Beltval: "); Serial.println(beltval);
if (beltval > 100)
{
Serial.println("Belt Removed"); Firebase.setString ("Belt", "OPEN"); delay(200);
}
else
{
Serial.println("Belt Closed"); Firebase.setString ("Belt", "CLOSED"); delay(200);
}
}
void loop()
{
if (button1.pressed)
{
Serial.println("EMERGENCY" ); Firebase.setFloat ("emergencyflag", 1); delay(200);
Firebase.setFloat ("emergencyflag", 0); delay(200);
button1.pressed = false; buzzeron();
}
gpslocation(); beltread();
}
```

IV. HARDWARE DESCRIPTION

4.1 ESP32 :

1. Overview ESP32 is a single 2.4 GHz Wi-Fi-and-Bluetooth combo chip designed with the TSMC ultra-low-power 40 nm technology. It is designed to achieve the best power and RF performance, showing robustness, versatility and reliability in a wide variety of applications and power scenarios. The ESP32 series of chips includes ESP32-D0WD-V3, ESP32-D0WDQ6-V3, ESP32- D0WD, ESP32-D0WDQ6, ESP32-D2WD, ESP32-S0WD, and ESP32-U4WDH, among which, ESP32-D0WD-V3, ESP32-D0WDQ6-V3, and ESP32-U4WDH are based on ECO V3 wafer. For details on part numbers and ordering information, please refer to Section 7. For details on ECO V3 instructions, please refer to ESP32 ECO V3 User Guide. 1.1 Featured Solutions

1.1.1 Ultra-Low-Power Solution ESP32 is designed for mobile, wearable electronics, and Internet-of-Things (IoT) applications. It features all the state-of-the-art characteristics of low- power chips, including fine-grained clock gating, multiple power modes, and dynamic power scaling. For instance, in a low-power IoT sensor hub application scenario, ESP32 is woken up periodically and only when a specified condition is detected. Low-duty cycle is used to minimize the amount of energy that the chip expends. The output of the power amplifier is also adjustable, thus contributing to an optimal trade-off between communication range, data rate and power consumption. Note: For more information, refer to Section 3.7 RTC and Low-Power Management.

1.1.2 Complete Integration Solution ESP32 is a highly-integrated solution for Wi-Fi-and- Bluetooth IoT applications, with around 20 external components. ESP32 integrates an antenna switch, RF balun, power amplifier, low-noise receive amplifier, filters, and power management modules. As such, the entire solution occupies minimal Printed Circuit Board

(PCB) area. ESP32 uses CMOS for single-chip fully-integrated radio and baseband, while also integrating advanced calibration circuitries that allow the solution to remove external circuit imperfections or adjust to changes in external conditions. As such, the mass production of ESP32 solutions does not require expensive and specialized Wi-Fi testing equipment.

1.2 Wi-Fi Key Features • 802.11 b/g/n • 802.11 n (2.4 GHz), up to 150 Mbps • WMM • TX/RX A-MPDU, RX A-MSDU Espressif Systems 1 Submit Documentation Feedback ESP32 Datasheet V3.4 1. Overview • Immediate Block ACK • Defragmentation • Automatic Beacon monitoring (hardware TSF) • 4 × virtual Wi-Fi interfaces • Simultaneous support for Infrastructure Station, SoftAP, and Promiscuous modes Note that when ESP32 is in Station mode, performing a scan, the SoftAP channel will be changed. • Antenna diversity
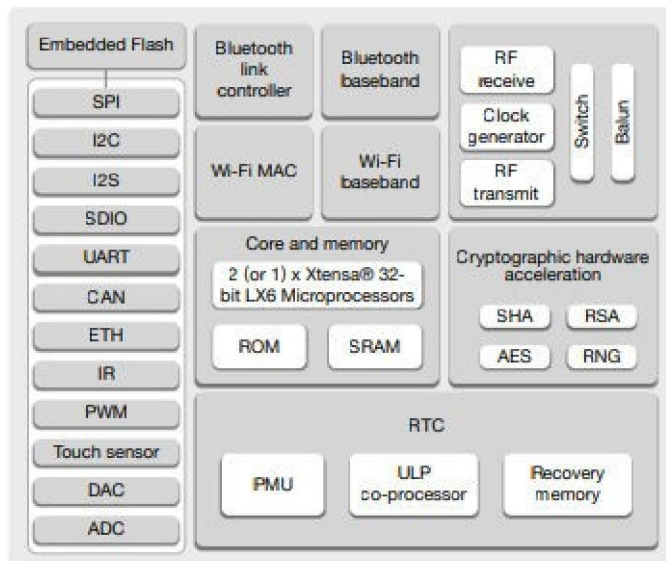
4.1.1 BLOCK DIGRAM

Figure 1: Functional Block Diagram
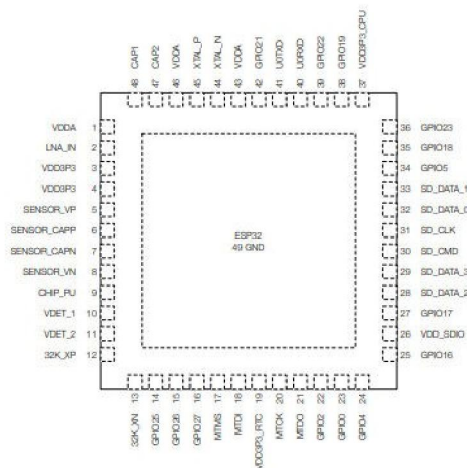
PIN LAYOUT :

Figure 2: ESP32 Pin Layout (QFN 6*6, Top View)

Buzzer :

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric (*piezo* for short).

It is widely used in computers, printers, photocopiers, alarms, electronic toys, automotiveelectronic devices, telephones, timers and other electronic products for voice devices.

Panic Button:

A **panic alarm** is an electronic device that can easily be activated to request help during an emergency situation where danger to persons or property exists. It is designed to minimize time until assistance can arrive.

GPS (Global Positioning System):

The L86 GPS Module can give the value of Latitude, Longitude, Speed, Altitude, Date, and Timeonce it is synchronized with the satellite. We will display these parameters on a 0.96″ OLED Screen. Then using the ESP32 WiFi chip we will send the GPS coordinates to ESP32 Webserver The Global Positioning System (GPS) is a satellite based navigation system that provides locationand time information. The system is freely accessible to anyone with a GPS receiver and unobstructed line of sight to at least four of GPS satellites. A GPS receiver calculates its position by precisely timing the signals sent by GPS satellites. GPS is nowadays widely used and also hasbecome an integral part of smart phones.

The GTPA010 module is easy to use, having RS232 as well as USB interface. It operates over 3.2to 5V supply range thus enabling interfacing with microcontrollers with 3.3V as well as 5V. The module outputs GPS data in NMEA0183 format. Each of message string starts with '$' and then the message identifier. Each parameter is separated using a comma so that the message can be parse with the help of the commas

Features

- MediaTek MT3329 Chipset, L1 Frequency, C/A code, 66 Channels
- 3m position accuracy
- Jammer detection and reduction
- Data output Baud rate: 9600 bps(Default)
- Low Power Consumption: 55mA @ acquisition, 40mA @ tracking
- High Sensitivity, -165 dBm, TCXO Design , superior urban performances
- Patch antenna
- High sensitivity
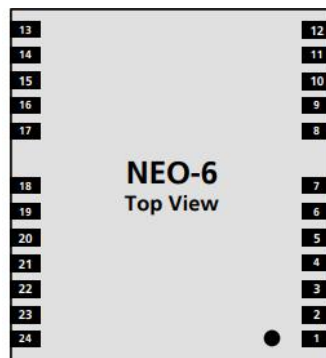- DGPS(WAAS/EGNOS/MSAS/GAGAN) support

4.4.1 PIN LAYOUT :


Figure 2 Pin Assignment

582

Continity Sensor or Soil Moisture Sensor :

The soil moisture sensor is one kind of sensor used to gauge the volumetric content of water withinthe soil. As the straight gravimetric dimension of soil moisture needs eliminating, drying, as wellas sample weighting. These sensors measure the volumetric water content not directly with the help of some other rules of soil like dielectric constant, electrical resistance, otherwise interaction with neutrons, and replacement of the moisture content.

The relation among the calculated property as well as moisture of soil should be adjusted & may change based on ecological factors like temperature, type of soil, otherwise electric conductivity. The microwave emission which is reflected can be influenced by the moisture of soil as well as mainly used in agriculture and remote sensing within hydrology.

Soil Moisture Sensor Pin Configuration

The FC-28 soil moisture sensor includes 4-pins
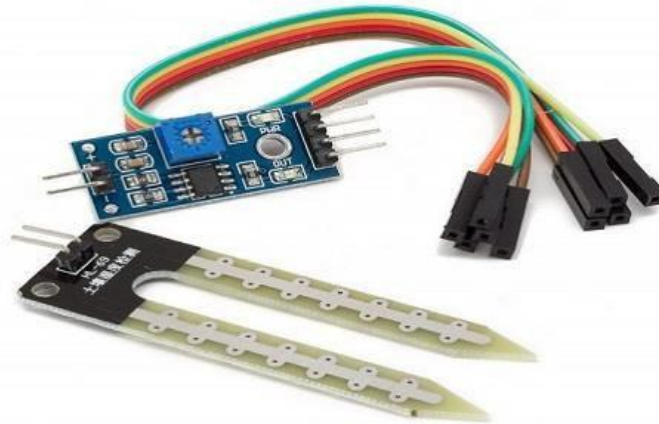
soil-moisture-sensor

- VCC pin is used for power
- A0 pin is an analog output
- D0 pin is a digital output
- GND pin is a Ground

This module also includes a potentiometer that will fix the threshold value, & the value can be evaluated by the comparator-LM393. The LED will turn on/off based on the threshold value.

4.5.1 Specifications

The specification of this sensor includes the following.

- The required voltage for working is 5V
- The required current for working is <20mA
- Type of interface is analog
- The required working temperature of this sensor is 10°C~30°C

V. SOFTWARE DESCRIPTION

5.1 Google fire base:

Firebase and Google Cloud share three products: Cloud Firestore, Cloud Functions, and Cloud Storage. These are the same products that exist in Google Cloud, simply exposed for client-side developers via Firebase. You can access the same data from the server SDKs (Google Cloud) and the client SDKs (Firebase), so your frontend and backend teams can work in concer

firebase can power your app's backend, including data storage, user authentication, static hosting, and more. Focus on creating extraordinary user experiences. We will take care of the rest. Build cross-platform native mobile and web apps

with our Android, iOS, and JavaScript SDKs. You can also connect Firebase to your existing backend using our server-side libraries or our REST API. Firebase Features • Real-time Database − Firebase supports JSON data and all users connected to it receive live updates after every change.

- o Authentication – We can use anonymous, password or different social authentications.
- o Hosting – The applications can be deployed over secured connection to Firebase servers. Firebase Advantages
- o It is simple and user friendly. No need for complicated configuration.
- o The data is real-time, which means that every change will automatically update connected clients.
- o Firebase offers simple control dashboard.
- o There are a number of useful services to choose. Firebase Limitations
- o Firebase free plan is limited to 50 Connections and 100 MB of storage. In the next chapter, we will discuss the environment setup of Firebase.

5.2 Embedded C

Embedded C is most popular programming language in software field for developing electronic gadgets. Each processor used in electronic system is associated with embedded software.

Embedded C programming plays a key role in performing specific function by the processor. In day-to-day life we used many electronic devices such as mobile phone, washing machine, digital camera, etc. These all device working is based on microcontroller that are programmed by embedded C.

5.3 Arduino IDE

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.

5.4 MIT App

The Design Window, or simply "Designer" is where you lay out the look and feel of your app, and specify what functionalities it should have. You choose things for the user interface things like Buttons, Images, and Text boxes, and functionalities like Text-to-Speech, Sensors, and GPS

Our project needs a button. Click and hold on the word "Button" in the palette. Drag your mouse over to the Viewer. Drop the button and a new button will appear on the Viewer

One of the neatest things about App Inventor is that you can see and test your app while you're building it, on a connected device. If you have an Android phone or tablet, follow the steps below. If you do not have a device, then follow the instructions for setting up the on-screen emulator (opens a new page) and then come back to this tutorial once you've gotten the emulator connected to App Inventor

The preferred method for getting the AI2 Companion App is to download the app from the Play Store by searching for "MIT AI2 Companion".

If for some reason you can not connect to the Google Play store, you can download the AI2 Companion as described here. First, you will need to go into your phone's settings (#1), choose "Security", then scroll down to allow "Unknown Sources", which allows apps that are not from the Play Store to be installed on the phone. Second, do one of the following: A) Scan the QR code above (#2) or B) Click the "Need help finding..." link and you'll be taken to the download page. From there you can download the MITAI2Companion.apk file to your computer and then move it over to your device to install it On your phone or tablet, click the icon for the MIT AI Companion to start the app. NOTE: Your phone and computer must both be on the same wireless network. Make sure your phone's wifi is on and that you are connected to the local wireless network. If you can not connect over wifi, go to the Setup Instructions on the App Inventor Website to find out how to connect with a USB cable.
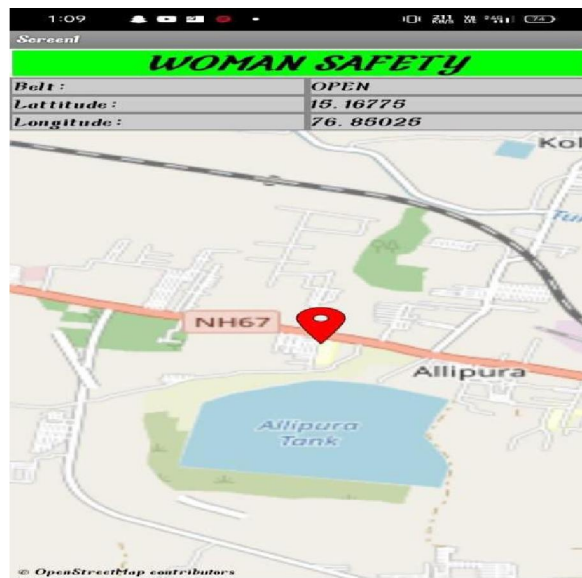
VI. ADVANTAGES AND APPLICATIONS

6.1 Advantages
- o Eassy to implement to reach real time response. Take little amount of time.
- o Gives the accurate live location
- o Usefully women who are in the trouble situation
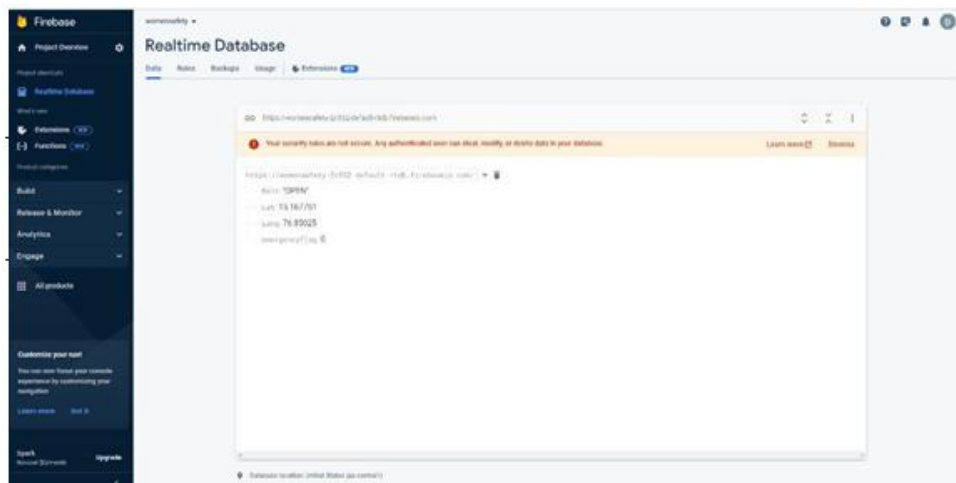- o It can be use for both men and women

6.2 Applications
- Smart watches
- Mobile phones

VII. EXPECTED OUTPUT

We provide a reliable security system for the safety of women. In case of emergency and helpthe user can ask for help either by pressing the Panic button that will be recognized by mobileapp tracking the location and sends to the mobile in the MIT app

VIII. CONCLUSION AND FUTURE SCOPE

CONCLUSION

Our project focuses on improving women safety and also helps in self-defence. On successful implementation of our project, help can arrive quickly to the women in danger thereby reducing threat. Using defence mechanism, we enable women to tackle threat until the help arrives. Hence our motive of providing safety and defence edge to the women will be accomplished with the help of technology and contribute to major society problem faced by women.

FUTURE SCOPE :

We provide a reliable security system for the safety of women. In case of emergency and help the user can ask for help either by pressing the Panic button that will be recognized by mobile app and will intimate the parents and/or police for help. The future scope of the project in the very fast growing technology is growth it will be use decrease the crime among the womens. It can implemented in the watches in also phones etc.

REFERENCES

[1]. A Nithu, R Revathi, H Akshay Kumar, N Divyashree and Yeresime Suresh, Anuti - An Application to Aid During Emergency.

[2]. G Arjun, S Ananda Kanagaraj and A Shahina, "Cheeka : A mobile application for personal safety", 9th IEEE International Conference on Collaborative Computing Network Applications and Worksharing (CollaborateCom), 2013.

[3]. Gautam Patel Dantu Sai Prashanth and B. Bharathi, "Research and development of a mobile based women safety application with real-time database and data-stream network", INTERNATIONAL CONFERENCE ON CIRCUITS POWER AND COMPUTING TECHNOLOGIES [ICCPCT], 2017.

[4]. Karthik S. Bhat Shivani Parikh Yuvraj Singh Dhruv Chand, Sunil Nayak and Amita Ajith Kamath, "A Mobile Application for Women's Safety: WoSApp", IEEE, 2015.

[5]. Edward A. Fernandez, Danica Jane V. Quije, Rheaxena C. Gorres, Eliseo D. Francisco, Reynold A. Delizo, Ester Dhenise G. Vinarao, et al., "Athena: A Mobile Based Application for Women's Safety with GPS Tracking and Police Notification for Rizal Province", IEEE Student Conference on Research and Development (SCOReD), 2019.

[6]. Fiza Abdul Rahim, Muhammad Sufyian, Mohd Azmi, Feninferina Azman, Qistina Suraya and Noor Afiza Mohd Ariffin, "My Guardian: A Personal Safety Mobile Application", IEEE Conference on Open Systems (ICOS), 2018.

[7]. Ma. Corazon and G. Fernando, "STREETWATCH: A Mobile Application for Street Crime Incident Avoidance and Safety Solution", IEEE, 2015.

[8]. Francesc Sanahuja, Gerald Clemens and Christophe Beaugeant, "AUDIO-ENHANCED PANORAMIC IMAGE CAPTURING AND RENDERING ON MOBILE DEVICES", IEEE, 2005.

[9]. E. Cheng, M. Hamilton, F. Salim and S. L. Choy, "Transafe: A Crowd-sourced Mobile Platform for Crime and Safety Perception Management".