A

PROJECT REPORT

ON

Smart blind stick using IoT

Submitted by

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For Partial Fulfillment of the Requirements for Bachelor of Technology in Information Technology

Guided by

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AY: 2021-22, Semester II

CERTIFICATE

This is to certify that the project work entitled **Blind Stick** has been successfully carried out by **Om Patel (18IT420), Yash Joshi (18IT442), Heet Bharti (18IT457) and Mahi Joshi (19IT610)** for the subject **Project II (4IT32)** during the academic year 2021-22, Semester-II for partial fulfilment of Bachelor of Technology in Information Technology. The work carried out during the semester is satisfactory.

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Acknowledgement:

We would like to thanks to the people who helped me most throughout our project. We aregrateful to our project guide Prof. Vishal polara sir and head of department Dr. keyur brahmbhatt sir for nonstop support for the project. A special thanks to my friends and classmates who helped us out in completing our project, where they all exchanged their own interesting ideas, thoughts and made this possible to complete our project with all accurate information. At last, but not least thanks to all who treasured us for our hard work and encouraged me and my teammates.

Abstract:

The study focuses on a simple method of detecting the obstacle and route by using an ultrasonic sensor that can detect a hole or stair with maximum range about 2 meters. As we can see, blind people is having their trouble to do their life routines because they can't see even a single things. With our idea, we want to help this kind of people to live their life freely. This modern blind stick has a several feature that surely can help this blind people to navigate routes and detect an obstacle that surely can make their life routines easier. The user just needs to use the blind the normal blind stick, the different is, blind people can detect a hole or stair faster and easily. Besides that, guardian or parent also can locate the location of the stick user using Global Positioning System (GPS) and Global System for Mobile Communication (GSM) module.

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Chapter 1: Introduction

1.1 Brief overview of project:

The study focuses on a simple method of detecting the obstacle and route by using an ultrasonic sensor that can detect a hole or stair with maximum range about 2 meters. As we can see, blind people are having their trouble to do their life routines because they can't see even a single thing. With our idea, we want to help this kind of people to live their life freely. This modern blind stick has a several feature that surely can help this blind people to navigate routes and detect an obstacle that surely can make their life routines easier. The user just needs to use the blind the normal blind stick, the different is, blind people can detect a hole or stair faster and easily. Besides that, guardian or parent also can locate the location of the stick user using Global Positioning System (GPS) and Global System for Mobile Communication (GSM) module.

1.2 Objective:

It is well known that people suffering from visual impairments face many difficulties in travelling independently. The objective of this project is to build a blind man stick that can detect obstacles, potholes and thus help the blind person travel independently. The main objective of this project is to design a smart walking stick that alerts visually impaired people over obstacles and water in front could help them in walking with less accident.

1.3 Scope:

We will provide many functionalities like message sending, GPS current or live location, emergency switch, object detection and vibration if object detect. So, using this tool as stick, it guides the visually impaired persons in his navigation independently in an efficient manner ensuring the person's safety.

1.4 Project Modules:

MODULES

- Object detection
- GSM
- Four channel relay module
- LDR (Light Dependent Resistor)
- Vibration motor
- Buzzer

1.5 Project hardware/software requirements:

1.5.1 Software requirements:

- Easy DA software
- Arduino.cc (for coding)

1.5.2 Hardware requirements:

- ESP 32 CONTROLLER (Transmission)
- Node MCU (receiver)
- Four channel relay module
- Light and switch
- Power supply cable
- GPP (general purpose board)
- Black header
- Buzzer
- Charging module (TP 4956)
- Lyion sell 18650
- Vibration Motor
- Ultra-Sonic Sensor
- LDR

Chapter 2: Literature review:

2.1 Blind person at disadvantage:

- Blind people may lose intention and have a higher risk of falling but people need to move whether at home, at work or addressing meeting.
- Most of blind people depend on other human for movement and environmental sensitivity. The impairment is not fixable, even though the employment of glasses, contact lenses or in extreme cases, surgical operation.
- The incapacity is generally caused by diabetes, macular degeneration, traumatic injuries, infection and
- eye disease. Alternative causes include blocked blood vessels, complications of premature birth, complication of eye surgery, stroke and tumors.
- Here square measure several early signs of blindness such a discomfort and weary eyes, foreign body sensation, and pain. Patients could experience discharge from the eyes.
- World Health Organization has calculable that regarding 285 million individuals worldwide square measure visually impaired; during which 39 million are blind while another 246 million have an occasional vision.
- The number of people stricken by loss of sight is increasing dramatically. The Royal National Institute of Blind individuals have foretold that by 2020, the amount of visually impaired in UK are going to be over two million people.

2.2 Ultrasonic sensors working:

- Ultrasonic sensors work by sending out a sound wave at a frequency above the range of human hearing.
- The transducer of the sensor acts as a microphone to receive and send the ultrasonic sound. Our ultrasonic sensors, like many others, use a single transducer to send a pulse and to receive the echo.
- The sensor determines the distance to a target by measuring time lapses between the sending and receiving of the ultrasonic pulse.
- Ultrasound is reliable in any lighting environment and can be used inside or outside. Ultrasonic sensors can handle collision avoidance for a robot, and being moved often, as long as it isn't too fast.
- Ultrasonics are so widely used, they can be reliably implemented in grain bin sensing applications, water level sensing, drone applications and sensing cars at your local drive-thru restaurant or bank.
- Ultrasonic rangefinders are commonly used as devices to detect a collision.

2.3 GSM technology:

- A GSM modem is a device that can be either a mobile phone or a modem device that can be used to make a computer or any other processor communicate over a network.
- A GSM modem requires a SIM card to be operated and operates over a network range subscribed by the network operator. It can be connected to a computer through serial, USB, or Bluetooth connection.
- A GSM modem can also be a standard GSM mobile phone with the appropriate cable and software driver to connect to a serial port or USB port on your computer. GSM modem is usually preferable to a GSM mobile phone.
- The GSM modem has a wide range of applications in transaction terminals, supply chain management, security applications, weather stations, and GPRS mode remote data logging.

2.4 Light dependent resistor:

- As its name implies, the Light Dependent Resistor (LDR) is made from a piece of exposed semiconductor material such as cadmium sulphide that changes its electrical resistance from several thousand Ohms in the dark to only a few hundred Ohms when light falls upon it by creating hole-electron pairs in the material.
- The net effect is an improvement in its conductivity with a decrease in resistance for an increase in illumination.
- Also, photoresistive cells have a long response time requiring many seconds to respond to a change in the light intensity.
- Materials used as the semiconductor substrate include, lead sulphide (PbS), lead selenide (PbSe), indium antimonide (InSb)
- which detect light in the infra-red range with the most commonly used of all photoresistive light sensors being Cadmium Sulphide (Cds).

Chapter 3: System Analysis & Design

3.1 Comparison of Existing Applications with your Project with merits and demerits:

The patent document number “US 8606316” discloses portable blind aid device. A blind aid device including enabling a blind person to activate the blind aid device; capturing one or more images related to a blind person's surrounding environment; detecting moving objects from the one or more images captured; identifying a finite number of spatial relationships related to the moving objects; analyzing the one or more images within the blind aid device to classify the finite number of spatial relationships related to the moving objects corresponding to predefined moving object data; converting select spatial relationship information related to the one or more analyzed images into audible information; relaying select audible information to the blind person; and notifying the blind person of one or more occurrences predetermined by the blind person as actionable occurrences.
The above mention invention suffers various drawbacks therefore to avoid the shortcomings there is need to design and develop an improved and efficient walking stick for blind people.

Merits:

Therefore, present invention attempts to provide a smart stick for blind users comprising of various sensors to detect obstacles and the distant between blind person and obstacle and alert blind person by using vibration motor. Capturing the obstacles using ultrasonic sensor to recognize the obstacle which is in front of the blind person and voice alert is given to the person using ultrasonic sensor. Blind person can also send messages/call through GSM module. It is also possible to trace the location of blind person by his family member using GPS and blind person can also activate smart device using switches provided in stick.

Demerits:

Their Blind stick is using image processing that’s why some times sensor missout something with help of image processing will capture it.

3.2 Project Feasibility Study:

- **Feasibility Study:**

3.2.1. Technical Feasibility:

In this project technically it is possible for blind person to detect obstacle using stick. Also blind person send emergency message or live location to respective guardian by just switching on. And if blind person walks in the dark then it automatically on the light so it avoids the accident.

3.2.2. Operational Feasibility:

It is feasible for our project to make use of messaging functions. We use GSM module to implement this functionality in our stick. GSM module is act like phone which provide all the mobile functionality.

3.2.3. Implementation Feasibility:

Implementing our project is very feasible as it is very user friendly, what it requires from us is to just connect few micro controller and node mcu in esp 32 controller and It brings convenience to blind person as they do not have to rely on someone and only need to use this blind stick which detect the obstacle and provide many functionality like messaging, live or current location, operate smart room devices etc.

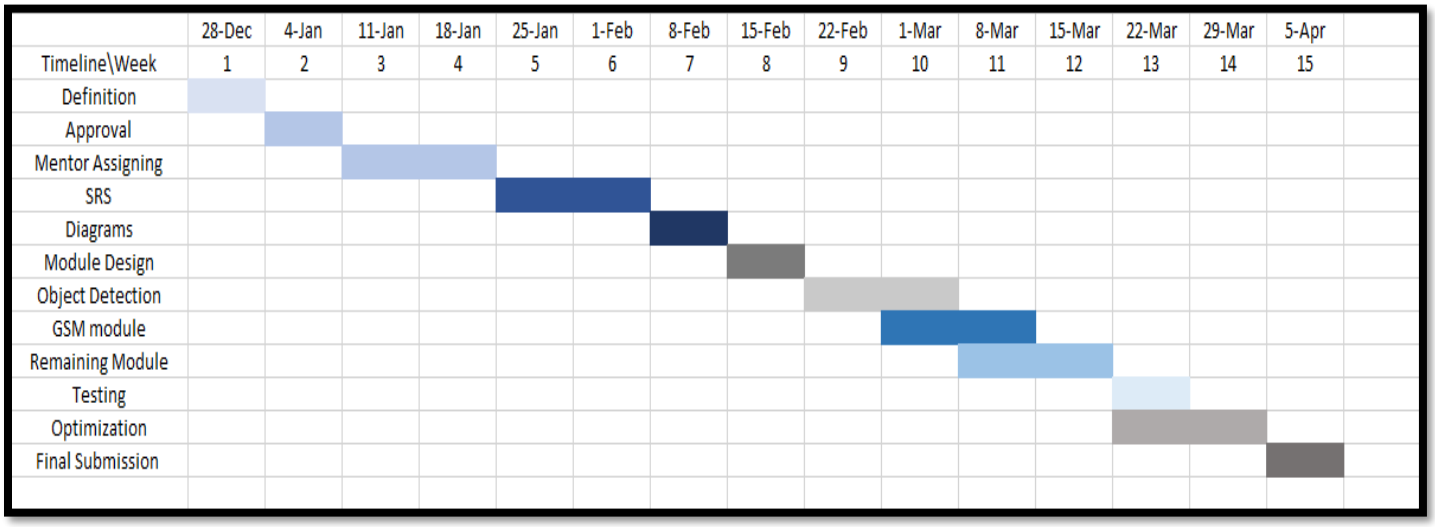
3.2.4. Economic Feasibility:

The system provides cost effective interface by considering less power consumption approach.It saves the probability of getting lost or get into an accident.

3.2.5 Resource Feasibility:

It is also an essential part of a feasibility study. There will be no waste of time and Customer will get their destination by the help of blind stick.

3.3 Project Timeline chart:



	28-Dec	4-Jan	11-Jan	18-Jan	25-Jan	1-Feb	8-Feb	15-Feb	22-Feb	1-Mar	8-Mar	15-Mar	22-Mar	29-Mar	5-Apr
Timeline\Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Definition															
Approval															
Mentor Assigning															
SRS															
Diagrams															
Module Design															
Object Detection															
GSM module															
Remaining Module															
Testing															
Optimization															
Final Submission															

(Figure 1)

3.4 Detailed Modules Description:

3.4.1. Object detection Module:

We are using ultrasonic sensor to detect the obstacle at a distance. Ultrasonic sensor emits ultrasonic wave and measure the distance of obstacle by receiving reflected wave.

3.4.2. Four channel relay module:

It is used for home automation using this Blind people can easily on and off their lights and fans.

3.4.3. GSM Module:

In this module ESP8266 will be used to create wireless network to use functionality like message/call thorough GSM module. With this module we have provided an emergency switch that can send messages/call to respective guardian. ESP8266 will be used for creating wireless network like wi-fi and with GSM module we can use functionality like message and call

3.4.4 LDR (light dependent resister) Module:

LDR Module is used to detect the presence of light / measuring the intensity of light. The output of the module goes high in the presence of light and it becomes low in the absence of light. The sensitivity of signal detection can be adjusted using the potentiometer. When its nighttime lights will be automatically switched on.

3.4.5 Vibration motor:

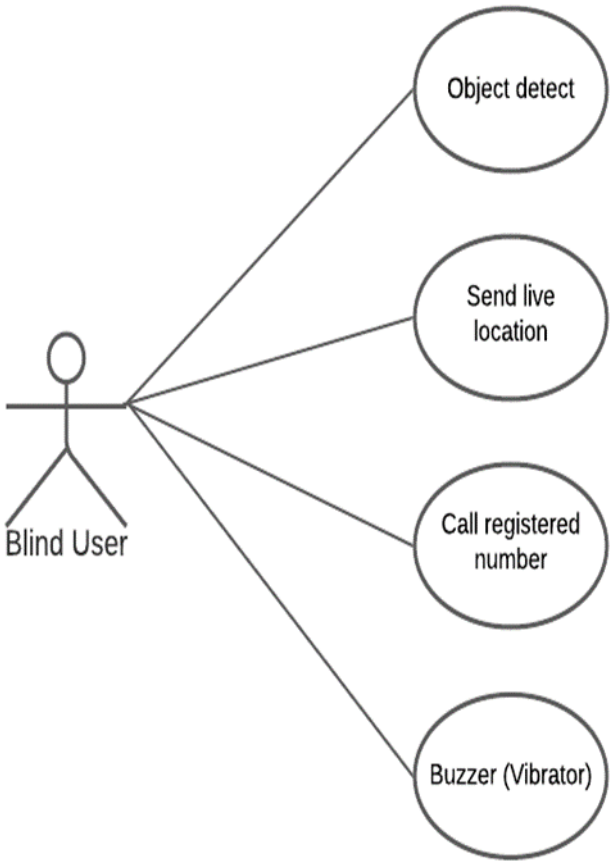
In this module vibration motor is used to vibrate whenever obstacle is ahead.

3.4.6 Buzzer Module:

It used when the object is detected by ultrasonic sensor it will make an alarming sound by use of buzzer.

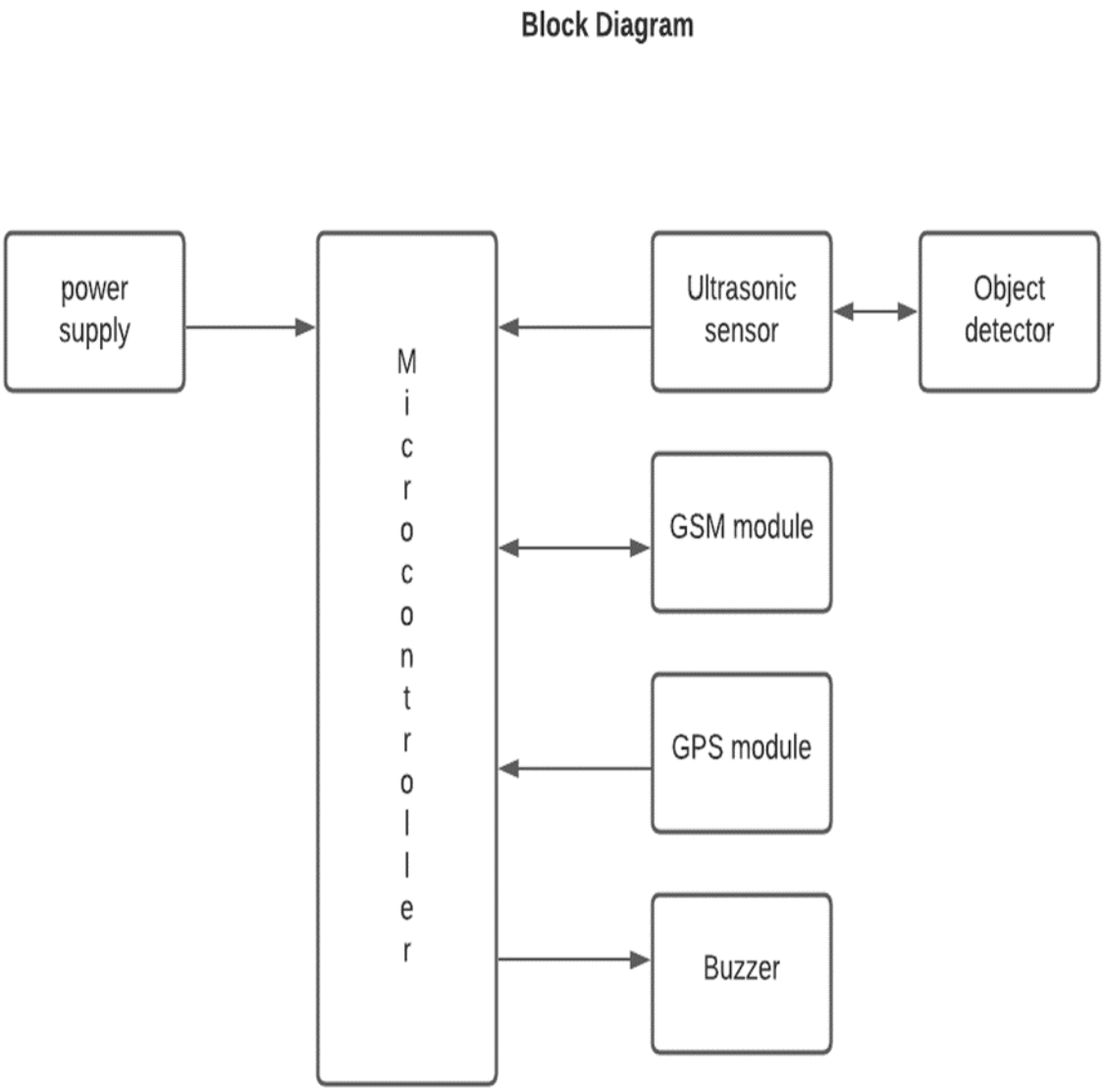
3.5 Project SRS:

3.5.1 USE CASE DIAGRAM:



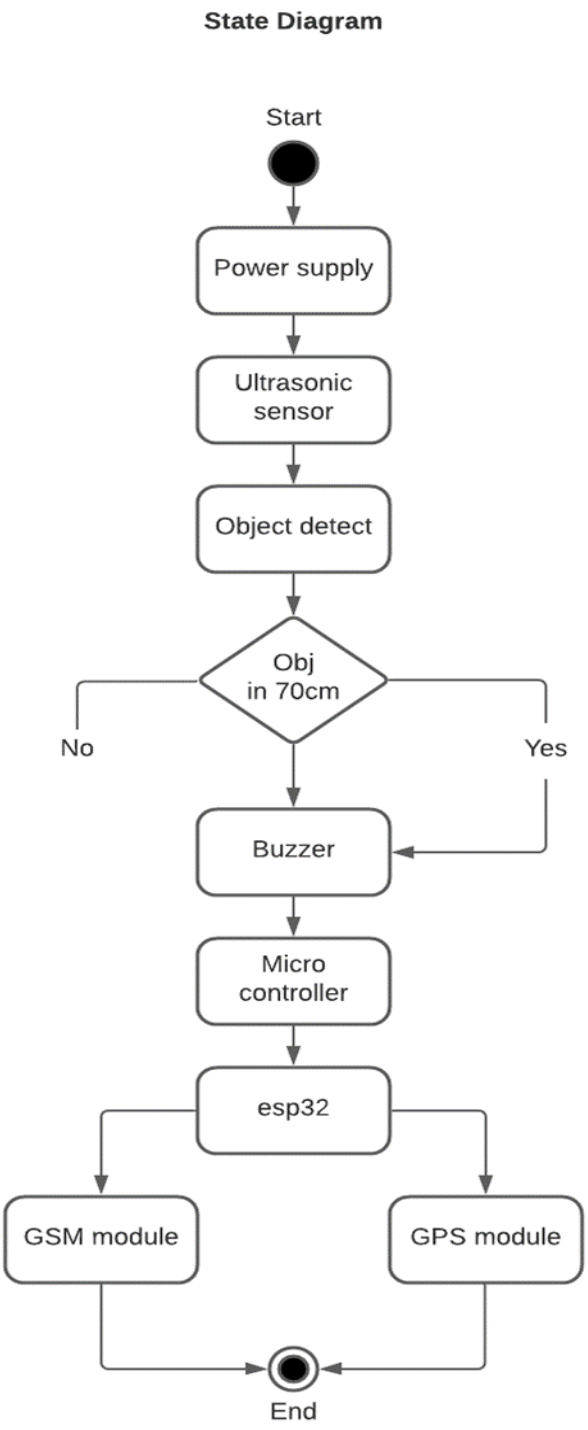
(Figure 2)

3.5.2 Block Diagram:



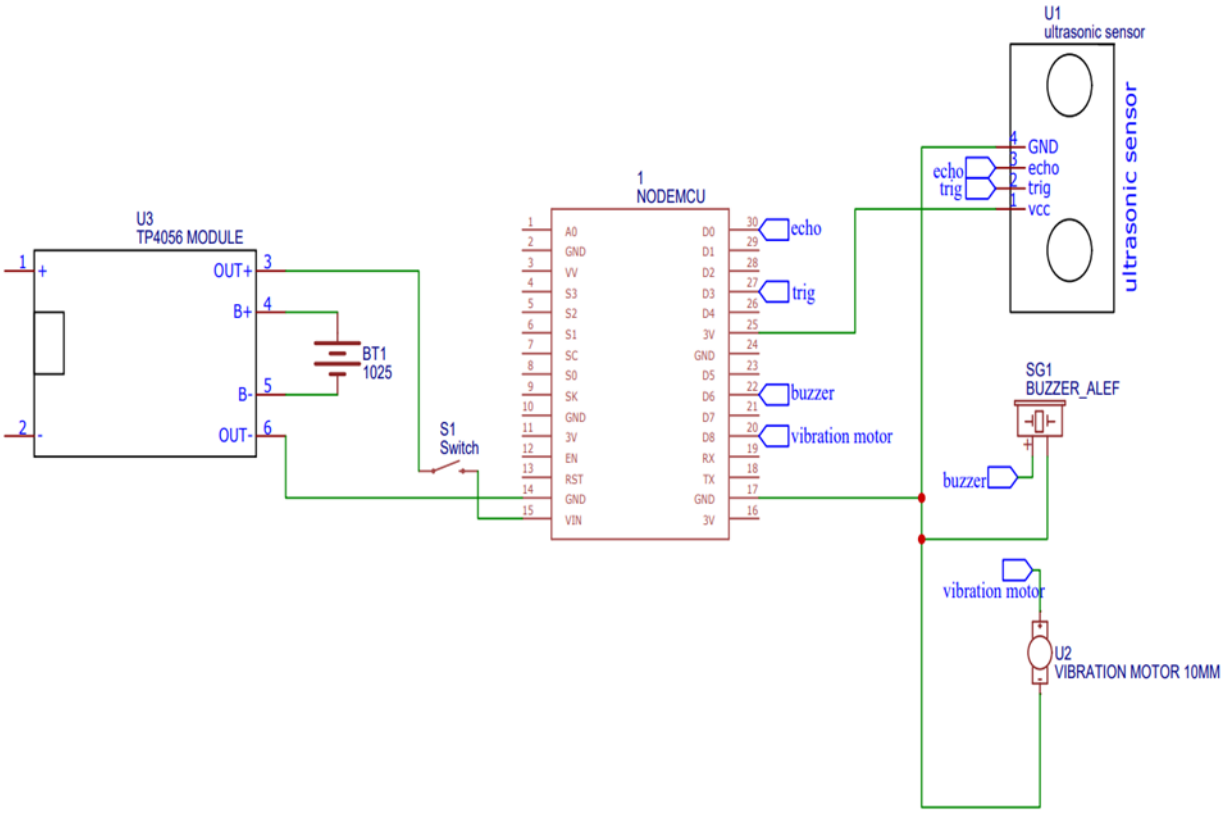
(Figure 3)

3.5.3 State Diagram:



(Figure 4)

3.5.4 Circuit Diagram:



(Figure 5)

Chapter 4: Implementation and Testing

4.1 User Interface and Snapshot:

(Figure 6)

4.2 Testing using Use Cases:

Code:

Sketch_apr12d.ino:

```
#include "WiFi.h"                          // Wifi name & Password
#include <FirebaseESP32.h>                 // Firebase & Esp32 communication
#define FIREBASE_HOST "smart-home-1d72b-default-rtdb.firebaseio.com"
#define FIREBASE_AUTH "QWPaRHrQURyiOSWYMUhm3ATsKuxyXOFl1hYUyRk2"
// private key
FirebaseData fbdo;                                 // the secret key generated from firebase

char ssid[] = "123456789";                 //WIFI Name
char pass[] = "123456789";          //WIFI Password

#include <SoftwareSerial.h>
SoftwareSerial mySerial(15,4);
const int trigPin2 = 17;
const int echoPin2 = 5;
const int trigPin1 = 18;
const int echoPin1 = 19;
String number="+916354307757";
// defines variables
long duration1,duration2;
int distance1,distance2;
#define vibration 25
#define S1 26
#define S2 27
#define S3 14
#define S4 12
#define S5 22
#define light 21

void setup()
{
  // Debug console
  Serial.begin(115200);
  mySerial.begin(9600);
   pinMode(trigPin1, OUTPUT); // Sets the trigPin as an Output
  pinMode(echoPin1, INPUT); // Sets the echoPin as an Input
   pinMode(trigPin2, OUTPUT); // Sets the trigPin as an Output
  pinMode(echoPin2, INPUT); // Sets the echoPin as an Input
  pinMode(vibration,OUTPUT);
   pinMode(light,OUTPUT);
```

```
  pinMode(A0,INPUT);
   WiFi.begin(ssid, pass);                    // wifi connection start
  while (WiFi.status() != WL_CONNECTED)        // till not connected
  {
    delay(500);
    Serial.print("*");
  }

  Serial.println("");                                // serial.println("") - why double or single ? - ?
  Serial.println("WiFi connection Successful");
  Serial.print("The IP Address of ESP8266 Module is: ");
  Serial.print(WiFi.localIP());// Print the IP addres
   Firebase.begin(FIREBASE_HOST, FIREBASE_AUTH);
  Firebase.setInt(fbdo, "/AA1",1);  //0=stop          // defined relay variable in fbdo object
  Firebase.setInt(fbdo, "/AA2",1);  //0=stop
  Firebase.setInt(fbdo, "/AA3",1);  //0=stop
  Firebase.setInt(fbdo, "/AA4",1);  //0=stop
  pinMode(S1,INPUT_PULLDOWN);
   pinMode(S2,INPUT_PULLDOWN);
    pinMode(S3,INPUT_PULLDOWN);
     pinMode(S4,INPUT_PULLDOWN);
      pinMode(S5,INPUT_PULLDOWN);


}

void loop()
{
  digitalWrite(trigPin1, LOW);
  delayMicroseconds(2);
  // Sets the trigPin on HIGH state for 10 micro seconds
  digitalWrite(trigPin1, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin1, LOW);
  // Reads the echoPin, returns the sound wave travel time in microseconds
  duration1 = pulseIn(echoPin1, HIGH);
  // Calculating the distance
  distance1 = duration1 * 0.034 / 2;
  // Prints the distance on the Serial Monitor
  Serial.print("Distance1: ");
  Serial.println(distance1);


  digitalWrite(trigPin2, LOW);
  delayMicroseconds(2);
  // Sets the trigPin on HIGH state for 10 micro seconds
  digitalWrite(trigPin2, HIGH);
```

```
delayMicroseconds(10);
digitalWrite(trigPin2, LOW);
// Reads the echoPin, returns the sound wave travel time in microseconds
duration2 = pulseIn(echoPin2, HIGH);
// Calculating the distance
distance2 = duration2 * 0.034 / 2;
// Prints the distance on the Serial Monitor
Serial.print("Distance2: ");
Serial.println(distance2);
int switch1=digitalRead(S1);
int switch2=digitalRead(S2);
int switch3=digitalRead(S3);
int switch4=digitalRead(S4);
int switch5=digitalRead(S5);
int ldr=analogRead(A0);
Serial.println(switch1);
Serial.println(switch2);
Serial.println(switch3);
Serial.println(switch4);
Serial.println(switch5);
Serial.println(ldr);
if(distance2<40 || distance1<40)
 {
    digitalWrite(vibration,HIGH);
  }
  else
  {
   digitalWrite(vibration,LOW);

    }
if(switch1==HIGH)
{
   Firebase.setInt(fbdo, "/AA1",0);  //0=stop
  }
  else
 {
   Firebase.setInt(fbdo, "/AA1",1);  //0=stop
    }
   if(switch2==HIGH)
{
   Firebase.setInt(fbdo, "/AA2",0);  //0=stop
  }
  else
 {
   Firebase.setInt(fbdo, "/AA2",1);  //0=stop
    }
   if(switch3==HIGH)
```

```
 {
   Firebase.setInt(fbdo, "/AA3",0);  //0=stop
  }
  else
  {
   Firebase.setInt(fbdo, "/AA3",1);  //0=stop
    }
    if(switch4==HIGH)
 {
   Firebase.setInt(fbdo, "/AA4",0);  //0=stop
  }
  else
  {
   Firebase.setInt(fbdo, "/AA4",1);  //0=stop
    }

 if(switch5==HIGH)
  {
   sendmessage();
   delay(500);


   }
  if(ldr>4000)
  {
   digitalWrite(light,HIGH);
   }
   else
   {
     digitalWrite(light,LOW);
     }

}

 // You can inject your own code or combine it with other sketches.
 // Check other examples on how to communicate with Blynk. Remember
 // to avoid delay() function!

 void sendmessage()
{
 mySerial.println("AT+CMGF=1");    //Sets the GSM Module in Text Mode
 delay(1000);  // Delay of 1000 milli seconds or 1 second
 mySerial.println("AT+CMGS=\"+917203829873\"\r"); // Replace x with mobile number
 delay(1000);
 mySerial.println("I am in trouble at B Block");// The SMS text you want to send
 delay(100);
  mySerial.println((char)26);// ASCII code of CTRL+Z
```

```
  delay(1000);

  mySerial.println("AT+CMGF=1");    //Sets the GSM Module in Text Mode
  delay(1000);  // Delay of 1000 milli seconds or 1 second
  mySerial.println("AT+CMGS=\"+916354307757\"\r"); // Replace x with mobile number
  delay(1000);
  mySerial.println("I am in trouble at B Block");// The SMS text you want to send
  delay(100);
   mySerial.println((char)26);// ASCII code of CTRL+Z
  delay(1000);

  }
```

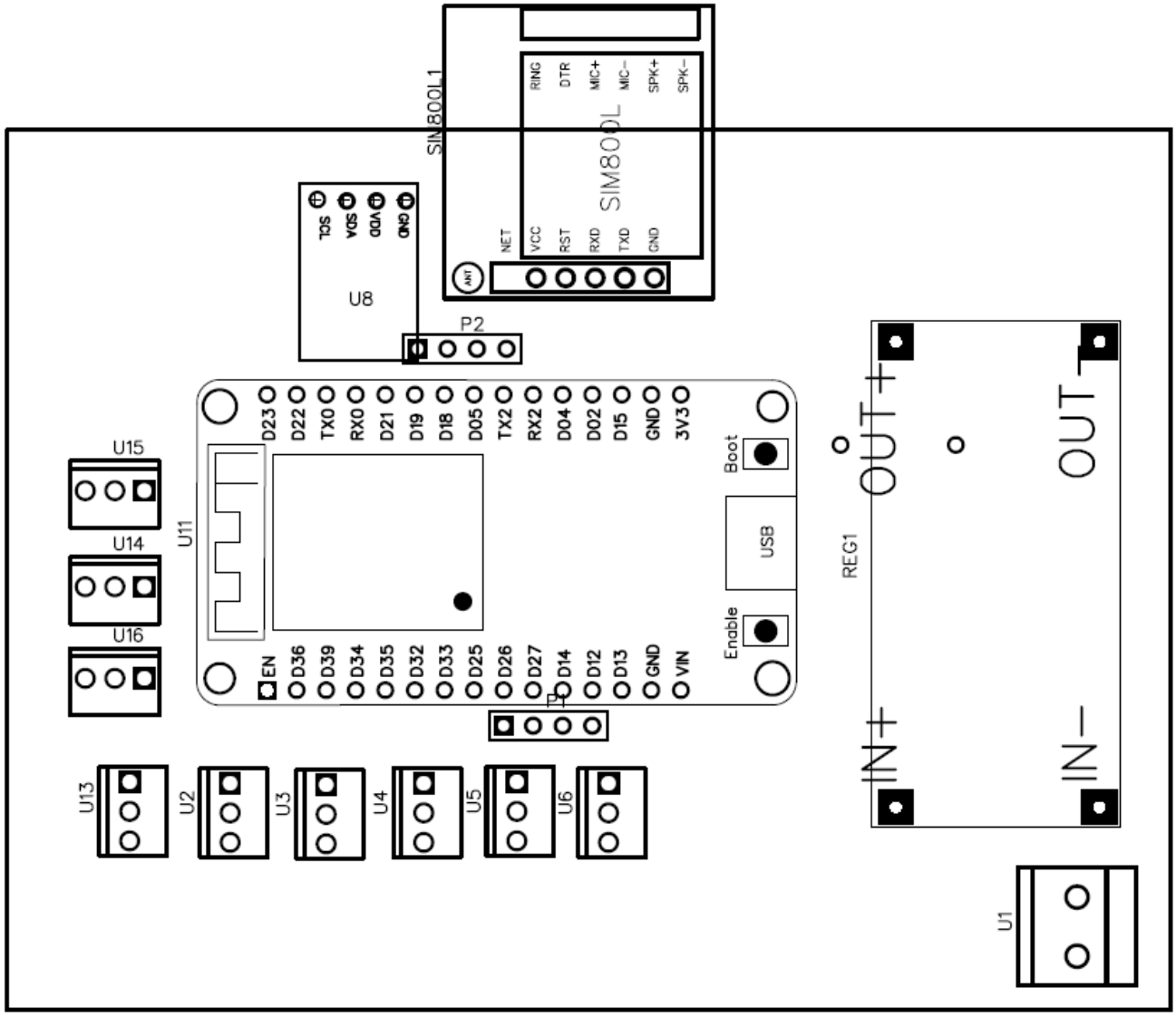
Home_code.ino:

```
#include "WiFi.h"                          // Wifi name & Password
#include <FirebaseESP32.h>                       // Firebase & Esp32 communication

int Relay1=14,Relay2=27,Relay3=26,Relay4=25;
String value1,value2,value3,value4;

#define FIREBASE_HOST "smart-home-1d72b-default-rtdb.firebaseio.com"    // kaya mokalva nu che
#define FIREBASE_AUTH "QWPaRHrQURyiOSWYMUhm3ATsKuxyXOFl1hYUyRk2"        //
private key
FirebaseData fbdo;                                        // the secret key generated from firebase

char ssid[] = "123456789";                  //WIFI Name
char pass[] = "123456789";          //WIFI Password

void setup() {

  Serial.begin(9600);                  // 9600 baud rate - USB and ESP32 communication
  pinMode(Relay1,OUTPUT);                     // ESP32 pin defined as output
   pinMode(Relay2,OUTPUT);
    pinMode(Relay3,OUTPUT);
     pinMode(Relay4,OUTPUT);
     digitalWrite(Relay1,LOW);               // Check relay - not necessory
     digitalWrite(Relay2,LOW);
     digitalWrite(Relay3,LOW);
     digitalWrite(Relay4,LOW);
     delay(2000);                       // for 2 sec for check
      digitalWrite(Relay1,HIGH);             // high - off , low - on
     digitalWrite(Relay2,HIGH);
     digitalWrite(Relay3,HIGH);
     digitalWrite(Relay4,HIGH);
                          // sensor started
   WiFi.begin(ssid, pass);                   // wifi connection start
```

```
  while (WiFi.status() != WL_CONNECTED)        // till not connected
  {
    delay(500);
    Serial.print("*");
  }

  Serial.println("");                          // serial.println("") - why double or single ? - ?
  Serial.println("WiFi connection Successful");
  Serial.print("The IP Address of ESP8266 Module is: ");
  Serial.print(WiFi.localIP());// Print the IP addres
   Firebase.begin(FIREBASE_HOST, FIREBASE_AUTH);
}

void loop()
{
      if (Firebase.getString(fbdo, "/AA1")) {              // ESP32 will take data from relay 1
       String s = fbdo.to<String>();
      Serial.println(s);
       if(s=="0")
      {
        digitalWrite(Relay1,LOW);
        Serial.println("Relay 1 ON");
        }
        else
        {
          digitalWrite(Relay1,HIGH);
          Serial.println("Relay 1 OFF");
          }
      }
       if (Firebase.getString(fbdo, "/AA2")) {              // ESP32 will take data from relay 1
        String s = fbdo.to<String>();
      Serial.println(s);
       if(s=="0")
      {
        digitalWrite(Relay2,LOW);
        Serial.println("Relay 4 ON");
        }
        else
        {
          digitalWrite(Relay2,HIGH);
          Serial.println("Relay 4 OFF");//done
          }
      }
       if (Firebase.getString(fbdo, "/AA3")) {              // ESP32 will take data from relay 1
        String s = fbdo.to<String>();
      Serial.println(s);
       if(s=="0")
```

```
{
  digitalWrite(Relay3,LOW);
  Serial.println("Relay 2 ON");
  }
  else
  {
    digitalWrite(Relay3,HIGH);
    Serial.println("Relay 2 OFF");
    }
}
 if (Firebase.getString(fbdo, "/AA4")) {              // ESP32 will take data from relay 1
  String s = fbdo.to<String>();
Serial.println(s);
 if(s=="0")
{
  digitalWrite(Relay4,LOW);
  Serial.println("Relay 3 ON");
  }
  else
  {
    digitalWrite(Relay4,HIGH);
    Serial.println("Relay 3 OFF");
    }
}


}
```

Circuit Diagram:



(Figure 7)

Chapter 5: Conclusion & Future work

Conclusion:

blind people are having their trouble to do their life routines because they can't see even a single thing. With our idea, we want to help this kind of people to live their life freely. This modern blind stick has a several feature that surely can help this blind people to navigate routes and detect an obstacle that surely can make their life routines easier.

Future work:

the additional features of this instrument and increase the range of ultrasound sensors and incorporate technologies to measure the intensity of obstacles approaching. With this approach, our targets in all of the developing countries were particularly addressed towards visually impaired and blind people. In this analysis the machine built can only sense obstacles and humidity. No holes can be identified with this device or with the form of barrier. Thus, ultrasonic sensor systems, Arduino Uno and other tools can be designed for an approach to warn users about the direction of movement by using audio commands. For easy use and flexibility. Further enhancements to boost system performance will be made in future.

Chapter 6: References

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