IOT Based Route Navigation System for Visually Impaired

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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

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DECLARATION

We hereby declare that, this project has been done by us under the **Mr. Md. Firoz Hasan, 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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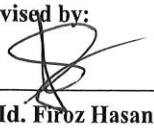

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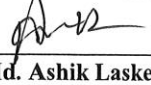

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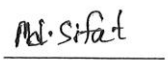

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Most importantly, we express appreciation to Allah. At that point we might want to accept this open door to offer our thankfulness and thanks to our project supervisor **Mr. MD. FIROZ HASAN,** Lecturer, Department of CSE Daffodil International University, Dhaka. For being devoted to supporting, inspiring and directing us through this project. This project isn't possible without his valuable counsel and makes a difference. Likewise, much thanks for allowing us the chance to pick this task.

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To our beloved family, we need to give them our most profound love and appreciation for being exceptionally steady and furthermore for their motivation and support during our investigations at this University.

ABSTRACT

The IOT device dependent on ultrasonic sensors and Arduino for visually impaired. There are approximately 1 billion peoples over the globe who are visually impaired by the World Health Organization (WHO-2018) [2]. People with visual impaired are frequently reliant on outside help which can be given by people, trained dogs, or exceptional electronic devices as emotionally supportive networks for basic leadership. Therefore, we were motivated to build up a smart IOT device to overcome these limitations.

We proposed a low cost and lightweight system designed with a microcontroller that processes the signal and alerts the visually impaired person over any obstacle through beeping sounds. The framework comprises of obstruction recognition sensors for accepting, handling and sending signals to the alarm system which at last alerts the client for brief activity.

The framework was structured, programmed utilizing C++ language and tried for exactness and checked by the outwardly disabled individual. Our device can detect obstacles within the distance of about 20cm. This paper describes the working of a Blind Stick dependent on a microcontroller ATmega328 (Arduino Uno). We also used a GPS to monitoring the visually impaired for knowing his location to his family. By using this GPS tracking system his family can continuously get update location of that people via server or android apps. The latitude and longitude will automatically have added on database and then it's can visible to his family.

If unfortunately, the blind people fall in danger or any problem then he can use an alarm button so that his family can noticed that. When he/she press the alarm button then the sounds to his family.

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LIST OF ABBREVIATIONS

GPS	Global Positioning System
EMI	Immune to Electromagnetic Interference
PCB	Printed circuit board
GVD	Group Velocity Dispersion
RF	Radio Frequency
MD	Material Dispersion
ETA	Electronic Travel Aids
VLSI	Very-large-scale integration
DC	Direct Current
IOT	Internet of Things

CHAPTER 1
INTRODUCTION

1.1 Introduction

World Health Organization (WHO) gauges there are 2.2 billion people on the earth with visual hindrance and 1 billion people visual impaired in 2018 insights. The most settled adaptability and customary helps for people with visual shortcomings are the walking stick (IOT based device) and guide dogs. This type of device helps blind people to Electronic Travel Aids. This type of frame work reasonable for open air. This is noticeable way to access via satellites. For saving from risk, GPS monitoring and Buzzer for alarming are used. To detect anything Sonar sensor is most important for walking. Our device can detect obstacles within the distance of about 20cm. Aside from the ordinary route frameworks, daze help frameworks can be given another component of RF-ID to distinguish the sitting region in office and RF module utilized for finding the stick alongside devoted hindrance recognition hardware consolidate ultrasonic sensor, profundity estimating hardware estimates the profundity if there should be an occurrence of managing the stairs and on stick vibration hardware to illuminate the impediment alert. These various units are talked about to execute the plan of a "Smart Stick" [2].

1.2 Project Objectives

The main objective is to help visually challenged people to navigate with ease using advanced technology. In this innovation-controlled world, where individuals endeavor to live Autonomously, this undertaking proposes an ultrasonic stick for visually impaired individuals to assist them with increasing individual autonomy. Since this is economical and not bulky, one can make use of it easily. We used location tracking system for monitoring those Visually Impaired via server. If visually Impaired people unfortunately fall any problems, then he presses that alarm button for helping him.

1.3 Scope of Project

The working behind this visually impaired stick is that it is utilized for a particular reason as a detecting device for visually impaired. The circuit gives 5V power supply to the circuit and keeps up its yield of the power supply at a consistent level. It is utilized generally to identify articles utilizing ultrasonic sensor. In the event that any

article is available, the ultrasonic sensor identifies the item by estimating the separation between the item and the client and pass the data to the Arduino UNO. To decide the separation of an article, calculate the separation between sending the sign and getting back the sign.

1.4 Report Outline

- **Introduction:** Introduction, Project Objectives, Scope of Project.
- **Equipment:** Introduction, Component List (Arduino UNO, NodeMcu V3, Sonar sensor, Buzzer, DC Connector, Connector, Breadboard, Jumper Wires, Soldering Wires, 433MHz RF module, 7805 IC), Summary.
- **Theoretical Model:** Basic Block Diagram, Circuit Diagram, and Explanation, Arduino Circuit, Summary.
- **Hardware Development:** Writing Programming, Burning the Program, Power Supply, System of the Flowchart, Server, Summary.
- **Result and Dictations:** Introduction, Our Project, Result, Cost Analysis, Discussion, Summary.
- **Conclusion and Recommendations:** Conclusion, Advantages, Future Scope.

CHAPTER 2
COMPONENTS

2.1 Introduction

To complete this project, many types of research and analyze the digital railway crossing system and their theories had been done. Several sources were being the reference for this research such as texts book, journals and internet source. From past research, many methods were achieved to solve the problem of this project and related to the theory.

2.2 Component List

- Arduino UNO
- NodeMcu V3
- Sonar Sensor
- Buzzer
- GPS
- Connector
- Breadboard
- 7805 IC
- 433MHz RF Transmitter/Receiver
- Soldering Wire

2.2.1 Arduino UNO

In this venture, we have utilized a microcontroller to control entire the procedure of a framework that is Arduino UNO. All things considered, Arduino isn't a negligible controller as it has a working framework or boot-loader which runs on (Figure 2.1).

Figure 2.1 Arduino UNO [3].

2.2.2 NodeMcu

NodeMcu V3 is an open source hardware and advancement pack that assumes an essential job in structuring your very own IoT item utilizing a couple of take the content lines. NodeMCU V3 is for the most part utilized in the Wi-Fi Applications which the greater part of the other embedded modules neglects to process except if joined with some outside Wi-Fi convention (Figure 2.2).

Figure 2.2 NudeMcu [4].

2.2.3 Sonar Sensor

Sonar sensor worked distance measure to object. This sensor data passes a particular frequency. Compute the separation between the sonar sensor and the object. This sensor only used distance measurement. Sonar sensor worked short range recognition (Figure: 2.3).

Figure: 2.3 Sonar Sensor [5].

2.2.4 Buzzer

A buzzer o is a sound flagging device. A piezoelectric component might be driven by a swaying electronic circuit, driven with a piezoelectric sound enhancer. Buzzer used only output for this alarm, signal, notification etc. (Figure: 2.4).

Figure: 2.4 Buzzers [6].

2.2.5 GPS

The GPS (Global Positioning System) Connecting a Parallax GPS module to the NodeMcu v3, and utilizing Arduino code empowers us to read data like date, time, area and satellites in see from the GPS Sensor. GPS sensor is a 4-pin module, whose pin names are Vcc, Rx, Tx, and Ground individually. This GPS sensor is a well-known utilized in many methodologies where following area or course route are required. All together for a GPS device to work accurately, it should initially build up an association with the necessary number of satellites. This system can take wherever from two or three seconds to a few minutes, contingent upon the quality of the receiver. This device work via satellites (Figure**:** 2.5).

Figure**:** 2.5 GPS [1].

2.2.6 Jumper wire

Jumper wire are plain wire. Jumper wire used for two pins connect (Figure**:** 2.6).

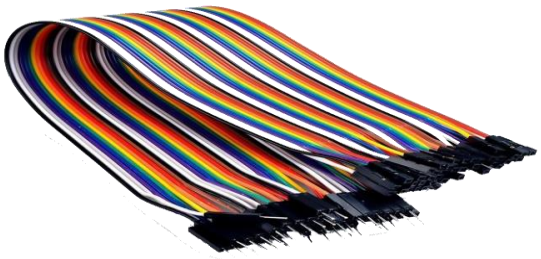

Figure**:** 2.6 Jumper wire [12].

2.2.7 Bread board

A breadboard is an advancement base for prototyping of device. Initially the word referred to an exacting bread board, a finished bit of wood used for cutting bread. A breadboard is a platform we can use to fabricate and test electronic circuits, for the most part without doing any soldering. Certain parts of the breadboard are wired together with the goal that power can flow from segment to segment in orderly rows (Figure: 2.7) [10].

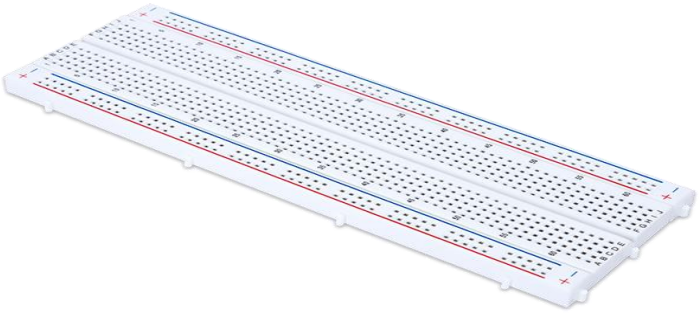

Figure: 2.7 Bread Board.

2.2.8 7805 IC

Voltage regulator 7805 IC is used to convert a battery +9V to +5V (Figure: 2.8).

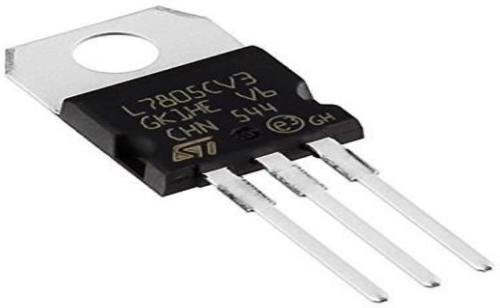

Figure: 2.8 7805 IC.

2.2.9 433mhz RF Transmitter-Receiver

433MHz RF Transmitter-receiver module is a (usually) little electronic device used to transmitter send radio signal or receiver get radio signals between two devices. They are utilized in all types of short-range, simplex-based correspondence between two microcontrollers with one of the microcontrollers filling in as the transmitter while different fills in as the recipient. Transmitter send direction and Receiver get those directions at that point Turn on Buzzer (Figure:2.9) [7].

Details RF 433MHz Transmitter module

- Input Voltage: +3 - +12V
- Transmission range: 90m (in open space)

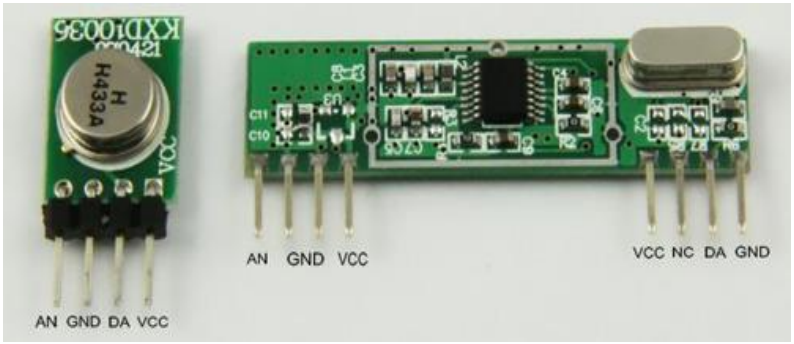

Figure:2.9 433mhz RF Transmitter-receiver.

2.3.1 Soldering Wires

Weld is on a very basic level a metal wire with a "low" softening point, where low for our inspirations suggests low enough to be broken up with a coupling iron. For devices, it is usually a mix of tin and lead. Right when the attaching wire cooled an electrical affiliation will lead. This is getting a better than average mechanical relationship between the wires. The filaments of each wire should be turned together, continue progressively like a singular component. The underlying advance is to set up the wires by then tinning the wears, by joining the wires and weld unite together (Figure: 2.10) [11].

Figure: 2.10 Soldering Wires.

2.3 Summary

The part describes some significant gear identified with the project. Portrays of all equipment like Arduino, Microcontroller (Atmega328P U), Connector, Bread board, Ultrasonic Sensor that works appropriately use for show information read identified with this project.

CHAPTER 3

THEORETICAL MODEL

3.1 Basic Block Diagram

Arduino connect with ultrasonic sensor and then ultrasonic sensor detect object, send those data to Arduino then it sends that data to buzzer. If the obstacle is within a range, then the buzzer will turn on (Figure: 3.1).

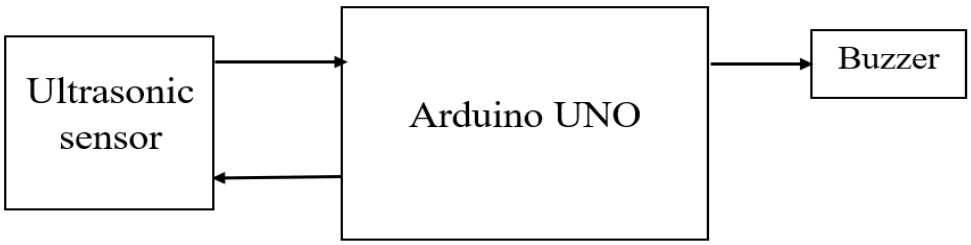

Figure: 3.1 Object Detect Basic Block Diagram.

NodeMcu connect with GPS and GPS tack the location. The output will be facilitating where you are located and you will see them in your serial monitor (Figure: 3.2).

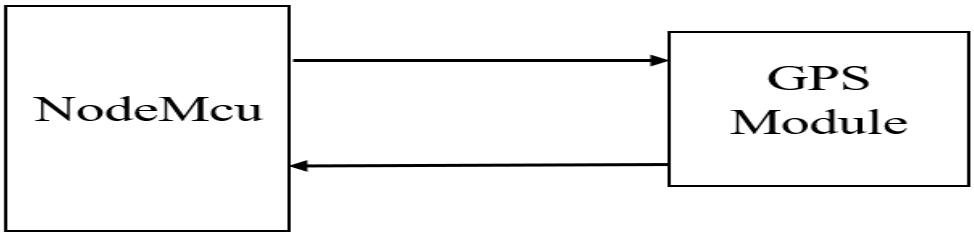

Figure: 3.2 Location Tracking Basic Block Diagram.

RF Moule transmitter send radio signal and receiver recivered radio signal. When process will done then the buzzeer is trun on. This application communicate with another device wirelessly (Figure: 3.3).

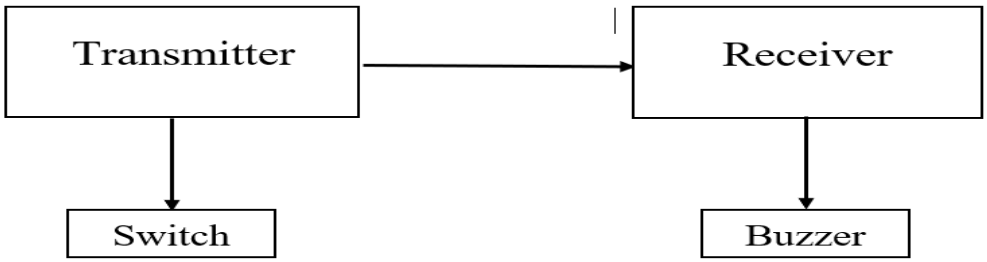

Figure: 3.3 433 MHz RF Basic Block Diagram.

3.2 Circuit Diagram and Explanation

Circuit diagram for Blind Stick using Arduino, Sonar sensor and Buzzer is shown in the above Distance. Sonar sensor has 4-pin VCC, Tring, Echo and GND. Sonar sensor VCC pin is connect with the Arduino +5V, Tring pin connect with 12 no Arduino pin, Echo pin connect with 13 no Arduino pin and GND pin connect with Arduino GND pin. Buzzer is consisting of two pin. The positive pin connected with 9 no port. The negative port added to the GND. We used 5-volt supply. We used voltage regulator 7805 IC in this procedure because our hardware can receive a maximum of +5V. Our device can detect obstacles within the distance of about 20cm (Figure: 3.4).

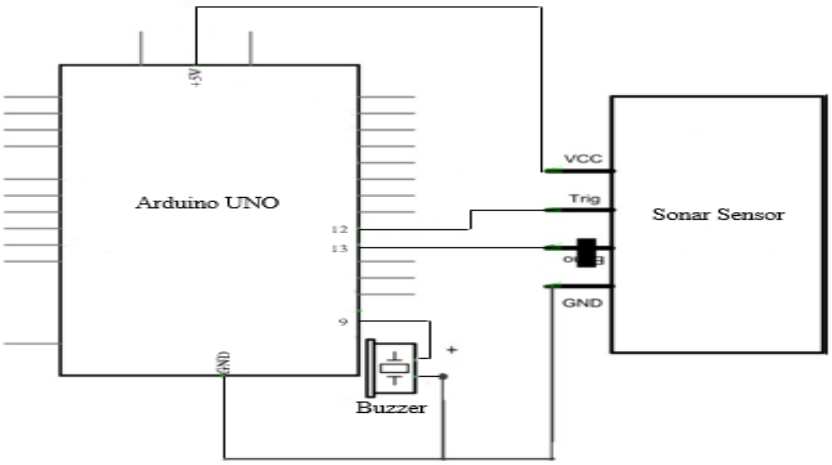

Figure: 3.4 Arduino & Sonar Sensor Circuit Unit.

Circuit diagram for location tracking system using NodeMcu V3 and GPS module. GPS module have 4-pin VCC, RX, TX and GND. Here, VCC pin is connect with NodeMcu +3V pin, RX pin is connecting with NodeMcu D1 pin, TX pin is connecting with NodeMcu D2 pin and GND pin is connecting with NodeMcu GND pin. We used voltage regulator 7805 IC in this procedure because our hardware can receive a minimum +3V and maximum of +5V power supply (Figure: 3.5).

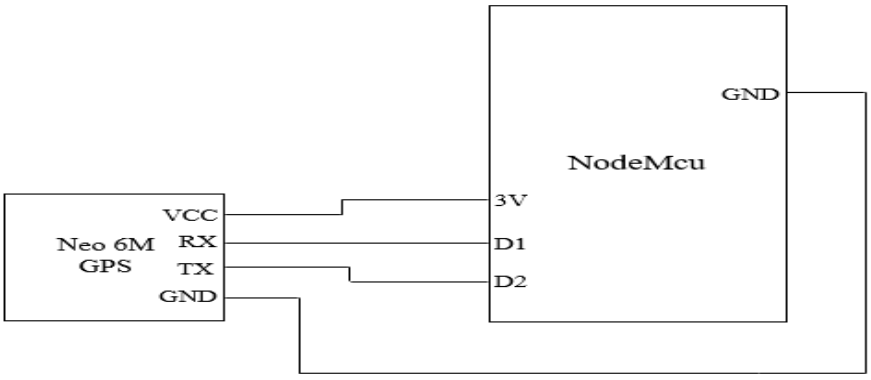

Figure: 3.5 NodeMcu & GPS Circuit Unit.

433MHz RF Transmitter/Receiver modules that work in a in similar manner. Now we discribe about RF transmitter. Here, Transmitter VCC pin is connect with Encoder +5V pin, Transmitter Data pin is connect with Encoder 17 no pin, Transmitter GND pin is connected with Encoder GND pin and Transmitter ANT pin is send radio signal to receiver ANT pin. Frequency range 433.92 MHz. Range 90 meter. Input voltage +5V (Figure: 3.6).

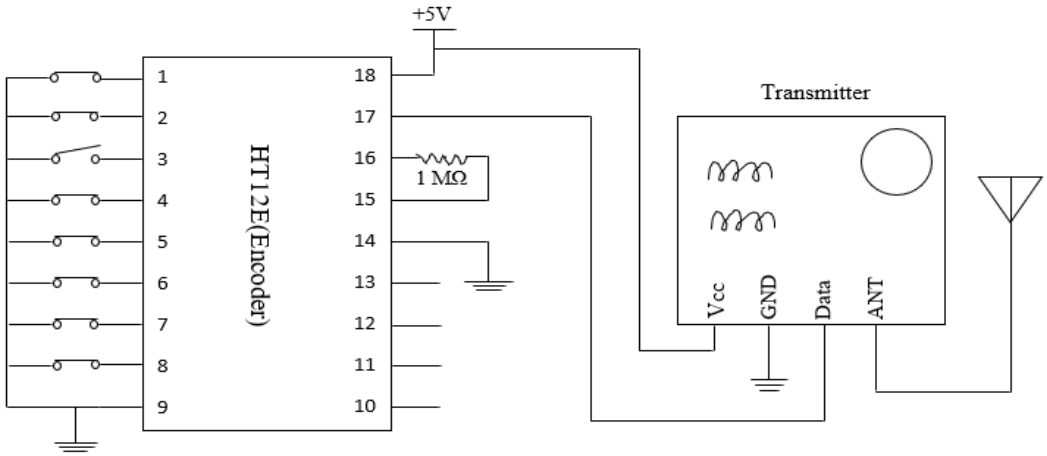

Figure: 3.6 433 MHz RF module Transmitter Circuit Unit.

Here, Receiverer Data pin is connect with Decoder +5V pin and 13 no pin, Receiver GND pin is connect with Decoder GND pin and Receiver ANT pin is receive radio signal from Transmitter ANT pin. Frequency 433.92 MHz. Input+ 3-+12V (Figure: 3.7).

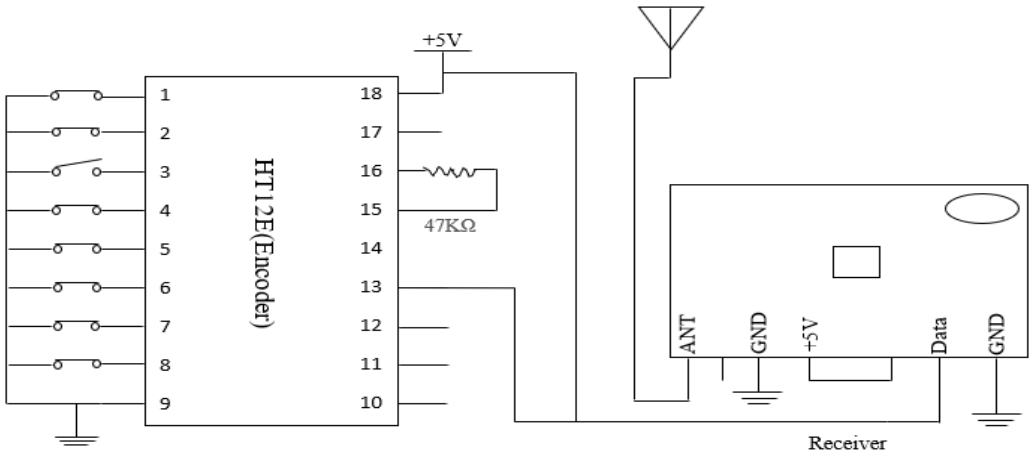

Figure: 3.7 433 MHz RF Receiver Circuit Unit.

3.3 Summary

In this chapter has discussed about block diagram, Circuit Diagram and Explanation of this project.

CHAPTER 4

HARDWARE DEVELOPMENT

4.1 Writing and Burning Programming into the Arduino

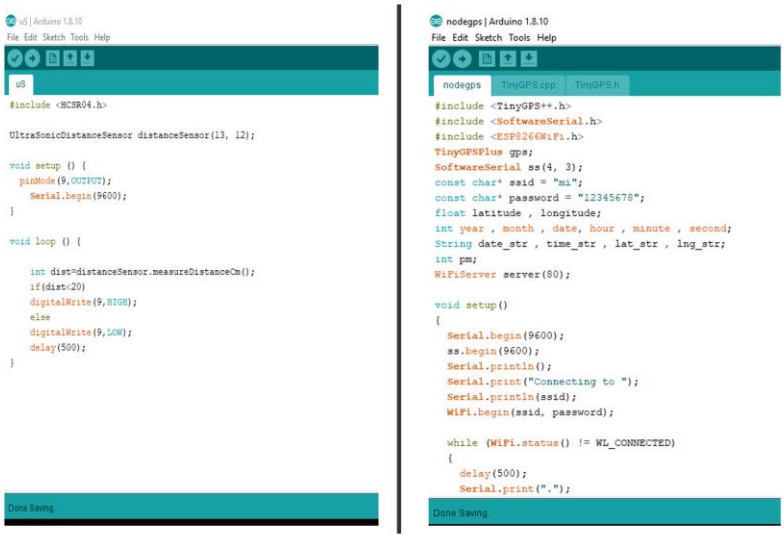

Figure: 4.1 Burning Program.

Interface the all circuit association currently open the Arduino programming and select Tools->Board - >Arduino Uno (5V, 16MHZ)/ATmega328. On the off chance that we select the Arduino UNO we can see the chose board in the base of the product as appeared in the above picture.

Also, open the coding we need to program and tap the transfer button. Presently we can see that program transferring into an Arduino UNO. Article identify with Sonar sensor program transferred in (Figure 3.4) and Location Tracking with GPS code transferred in (Figure 3.5). We can see the Tx and Rx Led in Arduino Uno board flickering while program transferring. In the wake of transferring the code. Presently evacuate all association and give power supply to the Arduino UNO. Our code works perfectly on Arduino UNO (Figure: 4.1).

4.2 Power Supply

+9V, is a battery that was presented for the early transistor radios. It has a polarized snap connector at the top and a rectangular prism shape with rounded edges. We convert that +9V battery into +5V because our hardware can receive a maximum of +5V. We used voltage regulator 7805 IC in this procedure. This type of battery

normally used in walkie-talkies, smoke detector and many type of IOT device (Figure: 4.2).

Figure: 4.2 Power Supply.

4.3 System of the Flowchart

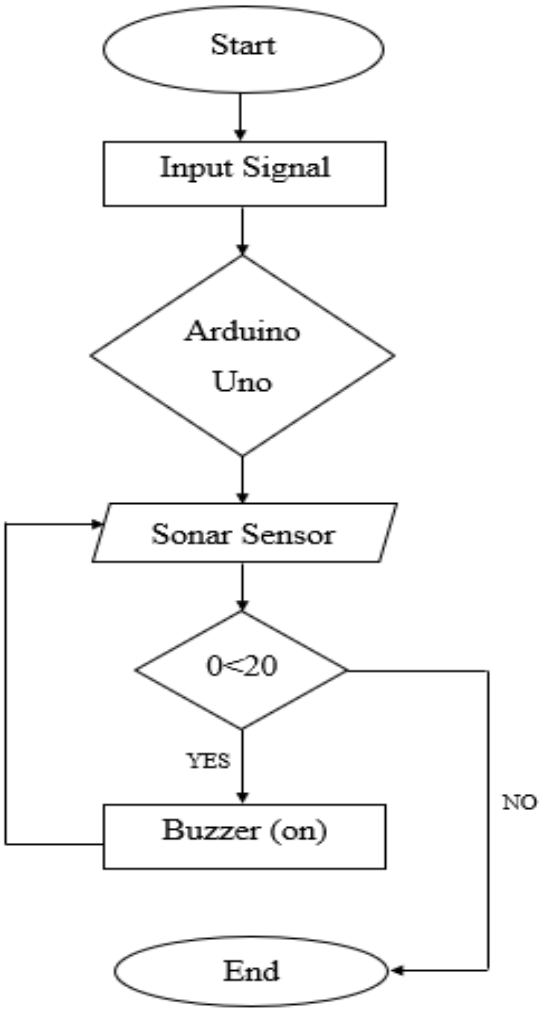

Figure: 4.3 System of the Flowchart.

4.4 Server

A web server is a computer that runs websites. It's a PC program that appropriates site pages as they are demanded. The fundamental goal of the web server is to store, process and convey pages to the clients. In our server we store GPS data using NodeMCU to our database. Our database contains the latitude, longitude, and the timestamp. Using HTML code. Using this latitude and longitude one can easily search the present and the past position a blind people.

The application location monitoring work GPS module, NodeMcu, and server. This system, the function gives the latitude and longitude as output the value then our website calculates the value output displaying exact location [8].

4.5 Summary

In this section has talked about Writing and burning program. Additionally, examined power supply, Flowchart System and Server It has likewise clarified about these topics of the venture.

CHAPTER 5
RESULTS AND DISCUSSIONS

5.1 Introduction

This chapter will introduce the outcomes and calculations and important discussions.

5.2 Our Project

After associating all equipment as per the circuit, we had made the body structure following the other experimental model from the web. Subsequent to setting up the body structure and association of the circuit we arranged a logic program with the assistance of C++ program by Arduino.

Figure: 5.1 Our Project Picture.

After complete the program, we transferred the program to the Microcontroller. At that point we interface the product and equipment part. In the wake of finishing the whole program and body with the interface we had attempted to explore it will be it work or not. We saw that our project working flawlessly (Figure: 5.1).

5.3 Result

The application route navigation system using Arduino UNO, Sonar Sensor, Buzzer, RF Transfer-Receiver module. Sonar sensor detect objects and send data to Arduino then Arduino send it to Buzzer. When Buzzer receive commands then turn on. When blind people fall in trouble then he could press the alarm button then turn on Buzzer.

The application location monitoring using GPS module, NodeMcu, and server. This system, the function gives the latitude and longitude as output displaying the value on the server of the family of visually impaired (Figure: 5.2).

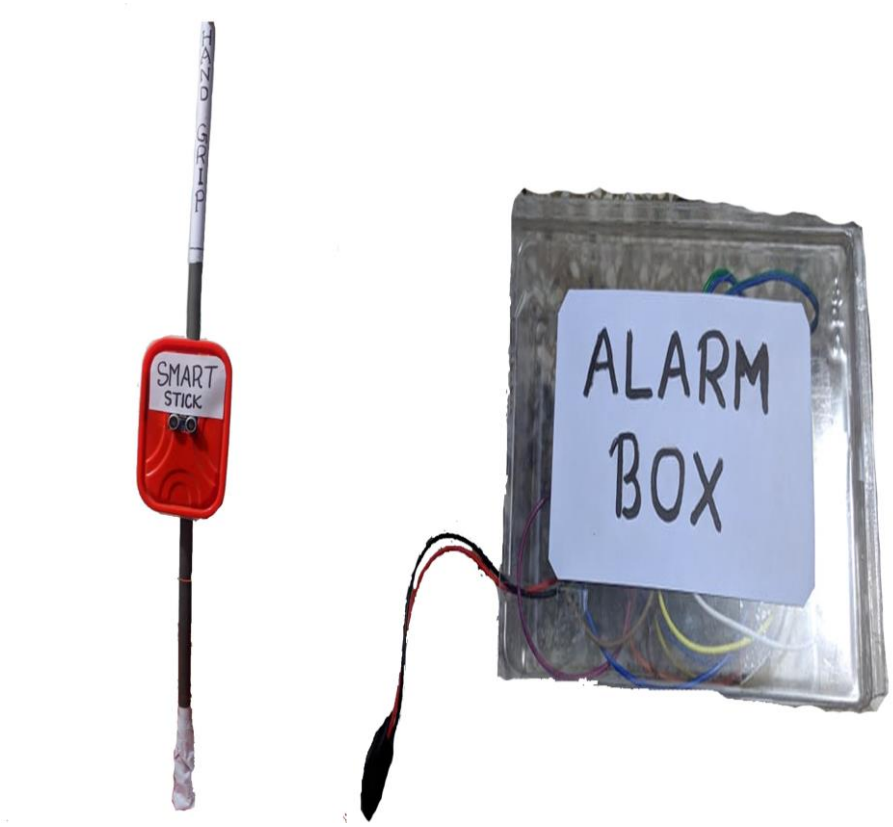

Figure: 5.2 Full Project picture.

Location monitoring using GPS (Figure: 5.3).

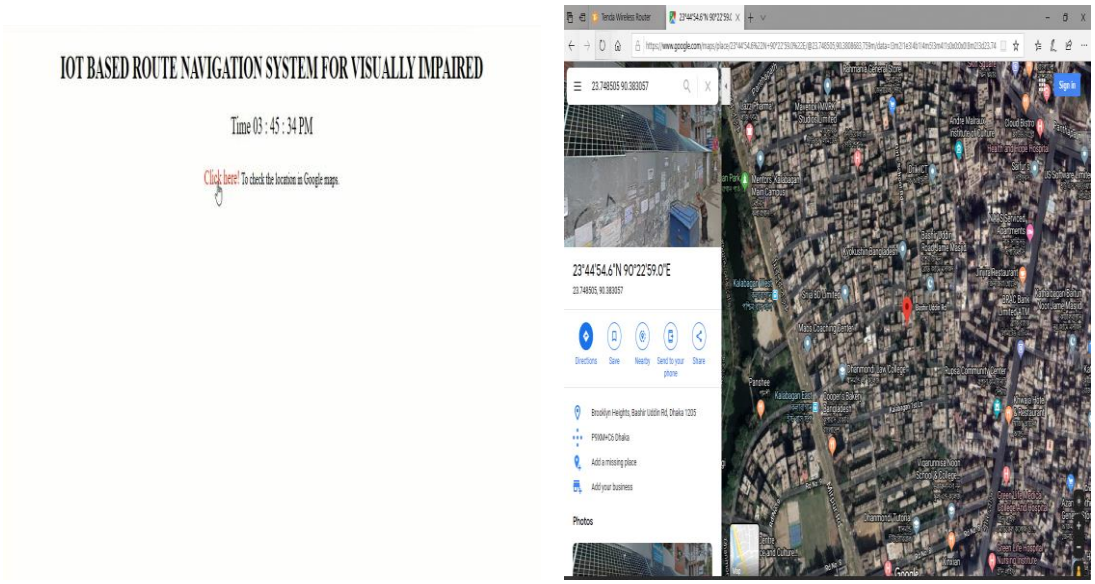

Figure: 5.3 Location Track picture.

5.4 Cost Analysis

Serial	Components	Quantity	Price in (BDT)
01	Arduino UNO	1	390/-
02	GPS	1	700/-
03	433 MHz-RF- Transmitter Receiver	1	150/-
04	Power supply	2	400/-
05	5V DC Adapter	1	200/-
06	NodeMcu	1	400/-
07	Buzzer	2	40/-
08	Glue Gun Stick	1	50/-
09	Jumper Wire	30	60/-
10	Bread board	2	185/-
11	Box	1	40/-
12	Sonar sensor	1	80/-
Total Cost:			2695/-

Table 5.1 Cost Analysis

5.5 Discussion

Circuit board's associated with the monitoring port. Control ports is open challenge yield. There is a rare sort of people who don't. Sending power supply +5V used another board regulator. When walking through a path, stick can detect obstacle and give the information.

5.6 Summary

In this chapter has talked about our full project, result, outcome, discussion and cost analysis. With our project, we got fruitful to exhibit with in regards to the goals of the task. Finally, finishing this section the project is prepared to utilize.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion

All the studies reviewed show the systems like as sonar system visually impaired. That device can sense any type of obstacle using sonar sensor. This type of stick is easy to carry. Buzzer also added there so that blind can use alarm system in this device. It merits referencing now that the point of this examination which is the structure and execution of a keen strolling stick for the visually impaired has been completely accomplished. The Smart Stick goes about as an essential stage for the coming age of all the more supporting devices to help the outwardly obstacle to explore securely both indoor and open air. It is successful and moderate. It prompts great outcomes in identifying the obstructions on the way of the client in a scope of 20 cm. This framework offers a minimal effort, dependable, versatile, low power utilization and vigorous answer for route with the undeniable short reaction time. Expanding the scope of the ultrasonic sensor and actualizing innovation for deciding the speed of moving toward obstructions. While growing such an enabling arrangement, outwardly disabled and visually impaired individuals in every single creating nation were over our needs. The device built in this work is just fit for distinguishing impediments and dampness. Gaps can't be distinguished utilizing this device nor the idea of the hindrance. Hence, a superior device developed using ultrasonic sensors, Arduino Uno and different devices that utilize sound directions to caution the client of what is in his way of development. Further adjustments to improve the presentation of the framework will be included. By the GPS family member can detect those people locations via server. Alarm button is provided to that smart stick. Family can monitor via server with GPS. It should also accommodate wide differing grips for flexible handling.

6.2 Advantages

• The structure can be utilized in both indoor and outside course.

• Visually impaired individual’s region can be pursued at whatever point required which will ensure additional security.

• Detects obstacles and alerts the visually impaired people.

• Turn on alert to his family when the visually impaired individuals fall in a tough situation.

• Flexible handling.

6.3 Disadvantages

• The structure created here is a moderate spending plan navigational guide for visually impaired.

• Holes can't be distinguished using this device nor the idea of the obstacle.

• It can be damaged when it rains because this device is not waterproof.

6.4 Future Scope

We can provide a waterproof system and also can provide a vibrator for the partially deaf person. In future it also can detect holes. It very well may be additionally upgraded by using VLSI innovation to design the PCB unit. We will make this device lighter weight and smooth.

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APPENDIX

// Program: Blind Stick (MMI)

```
#include <HCSR04.h>
UltraSonicDistanceSensor distanceSensor(13, 12);
void setup () {
  pinMode(9,OUTPUT);
    Serial.begin(9600);
}
void loop () {

    int dist=distanceSensor.measureDistanceCm();
    if(dist<20)
    digitalWrite(9,HIGH);
    else
    digitalWrite(9,LOW);
    delay(500);
}
```

// Program: Navigation (NodeMcu and GPS)

```
#include <TinyGPS++.h>
#include <SoftwareSerial.h>
#include <ESP8266WiFi.h>
TinyGPSPlus gps;
SoftwareSerial ss(4, 5);
const char* ssid = "rhs";
const char* password = "12345678"
float latitude , longitude;
int year , month , date, hour , minute , second;
String date_str , time_str , lat_str , lng_str;
int pm;
WiFiServer server(80);
void setup()
{
  Serial.begin(115200);
  ss.begin(9600);
  Serial.println();
  Serial.print("Connecting to ");
  Serial.println(ssid)
  WiFi.begin(ssid, password);
  while (WiFi.status() != WL_CONNECTED)
  {
    delay(500);
    Serial.print(".");
  }
  Serial.println("");
  Serial.println("WiFi connected");
  server.begin();
  Serial.println("Server started");
```

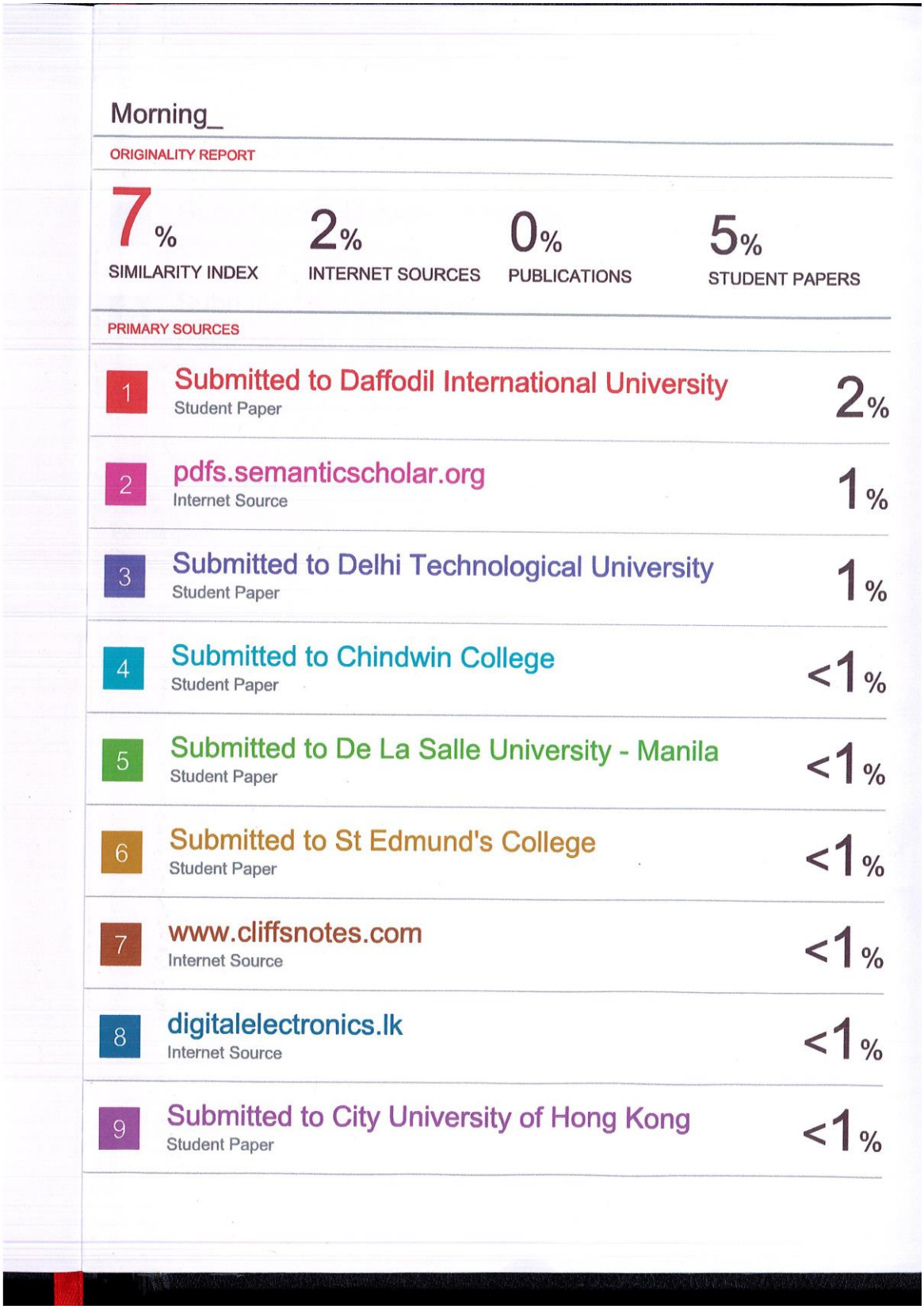
```
  // Print the IP address

  Serial.println(WiFi.localIP());
}
void loop()
{while (ss.available() > 0)
    if (gps.encode(ss.read()))
    {
      if (gps.location.isValid())
      {
        latitude = gps.location.lat();
        lat_str = String(latitude , 6);
        longitude = gps.location.lng();
        lng_str = String(longitude , 6);
      }
      if (gps.date.isValid())
      {
        date_str = "";
        date = gps.date.day();
        month = gps.date.month();
        year = gps.date.year();
        if (date < 10)
          date_str = '0';
        date_str += String(date);
        date_str += " / ";
        if (month < 10)
          date_str += '0';
        date_str += String(month);
        date_str += " / ";
        if (year < 10)
          date_str += '0';
        date_str += String(year);
      }

      if (gps.time.isValid())
      {
        time_str = "";
        hour = gps.time.hour();
        minute = gps.time.minute();
        second = gps.time.second();
        minute = (minute + 30);
        if (minute > 59)
        {
          minute = minute - 60;
          hour = hour + 1;
        }
        hour = (hour + 5) ;
        if (hour > 23)
          hour = hour - 24;
```

```
      if (hour >= 12)
        pm = 1;
      else
        pm = 0;
      hour = hour % 12;
      if (hour < 10)
        time_str = '0';
      time_str += String(hour);
      time_str += " : ";
      if (minute < 10)
        time_str += '0';
      time_str += String(minute);
      time_str += " : ";
      if (second < 10)
        time_str += '0';
      time_str += String(second)
      if (pm == 1)
        time_str += " PM ";
      else
        time_str += " AM ";
    }
  }
  // Check if a client has connected
  WiFiClient client = server.available();
  if (!client)
  {
    return;
  }
  // Prepare the response
  String s = "HTTP/1.1 200 OK\r\nContent-Type: text/html\r\n\r\n <!DOCTYPE html> <html> <head> <title>LOCATION; IOT BASED ROUTE NAVIGATION SYSTEM FOR VISUALLY IMPAIRED</title> <style>";
  s += "a:link {bkground-color:YELLOW;text-decoration: none;}";
  s += "table, th, td {border: 1px solid black;} </style> </head> <body> <h1  style=";
  s += "font-size:200%;";
  s += " ALIGN=CENTER>IOT BASED ROUTE NAVIGATION SYSTEM FOR VISUALLY IMPAIRED</h1>";
  s += "<p ALIGN=CENTER style=""font-size:150%;""";
  s += "width:50%";
  s += "</td></tr> <tr> <th>Time</th> <td ALIGN=CENTER >";
  s += time_str;
  s += "</td>  </tr> </table> ";
  if (gps.location.isValid())
  {
    s += "<p align=center><a style=""color:RED;font-size:125%;"" href=""http://maps.google.com/maps?&z=15&mrt=yp&t=k&q=";
    s += lat_str;
    s += "+";
    s += lng_str;
```

```
   s += """ target=""_top"">Click here!</a> To check the location in Google maps.</p>";
  }
  s += "</body> </html> \n";
  client.print(s);
  delay(100);
}
```



Morning_

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