A Project report on

SMART SHOES FOR BLIND PEOPLE

BACHELOR OF TECHNOLOGY

IN

INFORMATION TECHNOLOGY

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CERTIFICATE

This is to certify that the Project report titled "SMART SHOE FOR BLIND PEOPLE" is a bonafide work done and submitted by **M.MAHESH (17H61A1204), K.PRAJWAL (17H61A1208), T.ROHITH SINGH (17H61A1246)**, in partial fulfilment of the requirements for the award of B.Tech in **Information Technology to Anurag Group of Institutions(Formerly CVSR College of Engineering),** Affiliated to Jawaharlal Nehru Technological University, Hyderabad during the academic year 2020-2021 and the bonafide work has not been submitted elsewhere for the award of any other degree.

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This is to Certify that the project work entitled "SMART SHOE FOR BLIND PEOPLE" submitted to JNTU-H in partial fulfilment of the requirement for the award of the Degree of Bachelor of Technology (B-Tech), is an original work carried out by **M.MAHESH (17H61A1204)**, **K.PRAJWAL (17H61A1208), T.ROHITH SINGH (17H61A1246)** under the guidance of **Mrs. Niteesha sharma, Assistant Professor** in the Department of Information Technology. This matter embodied in this project is a genuine work, done by the students and has not been submitted whether the university or to any other university/Institute for the fulfilment of the requirement of any course of study.

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ABSTRACT

Sight is considered the most important sense and the blind people are observed with pity by others. Technology helps the blind people to communicate with the environment, the communication process and the dissemination of information has become very fast and on a wider scale to include all parts of the world which greatly affected human life, accordingly increasing the way of entertainment and comfort and reduced suffering and hardship in many things. Blind people are part of this world, so technology must leave a significant impact on their lives to make what was impossible for them as possible and available to them today. The assistance provided earlier for blind people was as a particular hardware device such as talking OCR Products, identifying color, barcode readers; that hardware was expensive and limited capabilities due to rapid change in hardware.The challenges faced by impaired/dazed people in their daily lives are not well understood. In this documentation, we try to present an application called SMART SHOES where it's a way to give hand to blind people with the aid of technology in order to solve some of their faced problems. The Application results enhance the understandingof the problems facing blind people daily, and may help encourage more projects targeted to help blind people to live independently in their daily lives.

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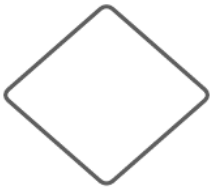
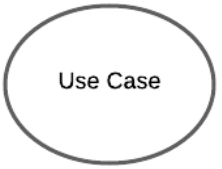
LIST OF FIGURES

LIST OF SYMBOLS

SNO	NOTATION NAME	NOTATION	DESCRIPTION
1	Actor		It aggregates several classes into single
2	Aggregation		Interaction between system and external environment
3	State		State of the process
4	Fork		Divides the Activity into multiple activities
5	Join		Joins the Multiple Activities into Single
6	Decision box		Represents decision making process from a constraint

7	Use case		Interaction between the system and external
8	Start		Start of an Activity

1. INTRODUCTION

1.1 OVERVIEW

Sight is considered the most important sense and the blind people are observed with pity by others. Technology helps the blind people to communicate with the environment, the communication process and the dissemination of information has become very fast and on a wider scale to include all parts of the world which greatly affected human life, accordingly increasing the way of entertainment and comfort and reduced suffering and hardship in many things.Blind people are part of this world, so technology must leave a significant impact on their lives to make what was impossible for them as possible and available to them today. The assistance provided earlier for blind people was as a particular hardware device such as talking OCR Products, identifying color, barcode readers; that hardware was expensive and limited capabilities due to rapid change in hardware.The challenges faced by impaired/dazed people in their daily lives are not well understood. In this documentation, we try to present an application called SMART SHOES where it's a way to give hand to blind people with the aid of technology in order to solve some of their faced problems. The Application results enhance the understanding of the problems facing blind people daily, and may help encourage more projects targeted to help blind people to live independently in their daily lives.

1.2 INTRODUCTION

idea about dealing with the problems faced by visually impaired individuals through assistive devices in the form of shoes. According to the WORLD HEALTH ORGANIZATION (WHO) survey in 2014 there are estimated 285 millions of people are visually impairment in which 37 millions of people are BLIND across the Globe over 15 millions of people are from INDIA. Where INDIA contributes to 21% of the total blind population that’s why most of the blind people depend on other people for their activities.In India most of the people are facing the problem of visual impairment which are preventing them to become independent. where in an unknown environment it becomes a real

challenge for them to locomote. Where obstacles pass away from the visually impaired person, so that the blind people have to develop their hearing sense or any guide to localize him to the new atmosphere. Where they use cane, trained dog or other assistive electronics devices for movement.ence, we are introducing a assistive shoe for blind people which will help them in their needed activities. The shoes will detect the nearby objects or obstacles and simultaneously send a message to the receiver in audio/vibration form. So it helps the visually impaired person to acquire the extra knowledge about the obstacles around them without any help or any guidance. It will make them more independent because there should be an “EYE” for an “I”.This will also help them to survive freely in this fast-paced life-now-a day.

1.3 LITERATURE SURVEY

1.3.1. Smart Shoe for Visually Impaired

This paper presents a Shoes which is integrated with ultrasonic sensors, vibration sensors and Bluetooth. These shoes can direct the user to his destination and can alert him about the impending obstacles on the path via the attached vibration sensors. The system needs to be improved as there is no provision for water detection and the components of the shoes can get damaged if it comes in contact with water. Again there is no provision for counting the number of steps to the obstacle.[1]

1.3.2. Smart Navigational shoes for the blind obstacle detection

This paper presents a Shoes with Sensors that will detect obstacles and vibrators will vibrate according to direction. IR sensor is utilized for obstacle detection. In the project that the obstacle is distinguished out and about then the buzzer will turn ON. Additionally if the water is available on the street it will be distinguished by a water sensor lastly this information will show on LCD. However, this project needs to be modified as there is no provision for counting the number of steps to the obstacle.

1.3.3. Advanced Shoes for blind people

Advanced shoes can detect the obstacles within a particular distance with the help of ultrasonic sensors and the vibration sensors will vibrate in the direction of the detected obstacle. As this project doesn't have a water sensor, the shoes will get damaged in the presence of water. The project doesn't have the provision to find the route to destination as there is no attached GPS and also as there is no step counter, the exact position of the obstacle cannot be determined.

1.3.4. Wearable Obstacle Detection System for Visually Impaired People

This paper presents an obstacle detection system that can alert the blind people about obstacles while travelling. The proposed system can detect the nearest obstacle via a stereoscopic sonar system and sends back a vibro-tactile feedback to inform the user about its location. The main aim of the system is to increase the mobility of visually impaired people by offering new sensing abilities. The system needs to be improved as there is no water sensor and shoes can get damaged in water, also a step counter needs to be installed for locating the exact position of the obstacle.

1.3.5. Wearable navigation assistance - a tool for the blind

This paper describes a tool for navigation for visually impaired persons. The system includes a multi-sensory system (comprising stereo vision, acoustic range finding and movement sensors), a mapper, a warning system and a tactile human-machine interface The goal of the project is to provide an electronic tool for the blind to navigate. The system provides information about the direct surroundings to blind to help him move without collisions. The system needs to be improved as there is no water sensor and shoes can get damaged in water, also a step counter need to be installed for locating the exact position of obstacle.

1.4 OBJECTIVES

The objective of this project is to create an IoT application "Smart Shoe for Blind people", where any user (victim) comes across any obstacles, Our application will detect the nearby objects or obstacles and simultaneously send a message to the receiver in audio/vibration form. So it helps the visually impaired person to

acquire the extra knowledge about the obstacles around them without any help or any guidance. It will make them more independent.

1.5 PROBLEM FORMULATION

Counterfeit Vision is the main piece of human physiology as 83% of The data a person gets from the climate is by means of sight. The measurements by the World Well Being Organization (WHO) in 2014 appraised that there are 285 billion individuals in the world with visual weakness, 39 billion of individuals which are visually impaired and 246 with low vision. The most established, conventional portability helps for people with visual disabilities are the strolling stick (too called white stick or stick) and guide canines. The downsides of these guides are scope of movement Furthermore, almost no Information passed on. With the fast advances of present day innovation, both in equipment and programming front can possibly give clever route capacities. As of late there has been a great deal of Electronic Travel Aids (ETA) planned and contrived to assist the visually impaired individuals with exploring securely and autonomously. Likewise very good quality mechanical arrangements have been acquainted as of late with assistance dazzle people explore autonomously. The IR sensor and ringer won't give exact outcome to the visually impaired individuals, this is the primary disadvantage of past task, in past undertaking IR sensor are the item recognizing sensor, the issue related with these reasons and less effectiveness and misfortune the exactness to distinguish obstacles and one more issue is it won't give clean data to daze individuals.

1.6 PREVIOUS SYSTEM

In present systems like Integrated smart shoes for blind people do not have gyroscope facilities. Human guide: A blind person walks hand in hand with a sighted guide.The most obvious, but in practice not a permanent solution for aiding the blind in mobility and navigation. A blind lacks privacy and can have a feeling of being a burden to his or their guide. Guidance of dog: A specially trained dog assisting the blind in obstacle avoidance, but usually not aiding in wayfinding, e.g. the dog is trained to stop before obstacles, reacts to commands on walking directions. It is very costly, guide dog service period takes an average

of 6 years for a regular dog which increases cost and lifestyle changes. In present Smart Sticks there exists only beep sound that triggers any obstacle and there is no any assistance to direct them.

1.7 PRESENT SYSTEM

Sight is considered the most important sense and the blind people are observed with pity by others. Technology helps the blind people to communicate with the environment, the communication process and the dissemination of information has become very fast and on a wider scale to include all parts of the world which greatly affected human life, accordingly increasing the way of entertainment and comfort and reduced suffering and hardship in many things.Blind people are part of this world, so technology must leave a significant impact on their lives to make what was impossible for them as possible and available to them today. The assistance provided earlier for blind people was as a particular hardware device such as talking OCR Products, identifying color, barcode readers; that hardware was expensive and limited capabilities due to rapid change in hardware.The challenges faced by impaired/dazed people in their daily lives are not well understood. We are proposing an IoT based implementation which is a wearable device i.e. Smart Navigational Shoe. Electronic kit is fixed in shoes which can be used by a blind or visually impaired person. The hardware kit consists of vibrators, Arduino, Ultrasonic Sensor and Gyroscope Sensor. Sensors will sense any obstacle detected while moving along a path and it will be informed to users. At any point of time if any individual or obstacle comes in front, it cautions them with the assistance of a vibratory circuit.

1.8 SCOPE

The scope of this project is that, Our application will detect the nearby objects or obstacles and simultaneously send a message to the receiver in audio/vibration form. So it helps the visually impaired person to acquire the extra knowledge about the obstacles around them without any help or any guidance. It will make them more independent.

1.9 FEASIBILITY:

It is to find out whether the current work practices and procedures support new system. Also, social factors i.e., how the organizational changes will affect the working lives of those affected by the system. This involves questions such as whether the technology needed for the system exists, how difficult it will be to build, and whether the firm has enough experience using that technology.

1.10 SYSTEM REQUIREMENTS

1.10.1 SOFTWARE REQUIREMENTS

- Arduino IDE software
- Windows 7 or Windows 8/8.1 or Windows 10
- 512 MB RAM(1GB RAM recommended)
- 600 MB of free disk space

1.10.2 HARDWARE REQUIREMENTS

- Vibration Motor
- Buzzer
- Arduino UNO
- Bread Board
- Ultrasonic sensor
- Push Button
- Jumper Wires

2. REQUIREMENTS

2.1 REQUIREMENT SPECIFICATION

2.1.1 ARDUINO IDE SOFTWARE

- Arduino IDE is open-source software and a cross-platform application (for Windows, Mac OS, Linux) and is mainly used for writing and compiling/uploading the code into Arduino compatible boards. The code is mainly written in C++.

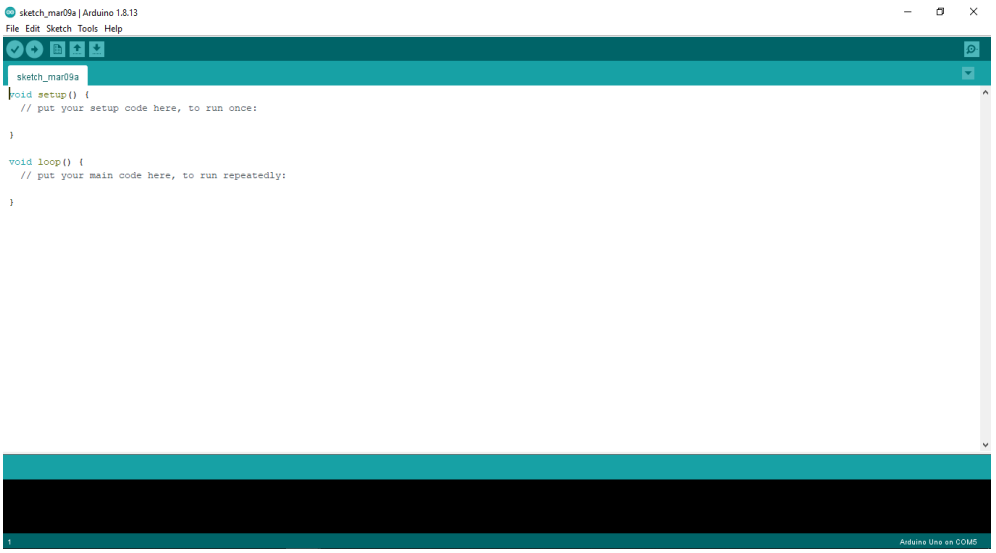


Fig-2.1.1 Arduino IDE Software.

2.1.2 ARDUINO UNO

- Arduino UNO is a microcontroller board based on an 8-bit Atmega 328p microcontroller. Arduino UNO has 14 digital input/output pins, 6 analogue input pins, a USB connection, A power barrel Jack and a rest button. When the code is compiled and uploaded into Arduino UNO, it executes the code repeatedly because of the microcontroller.

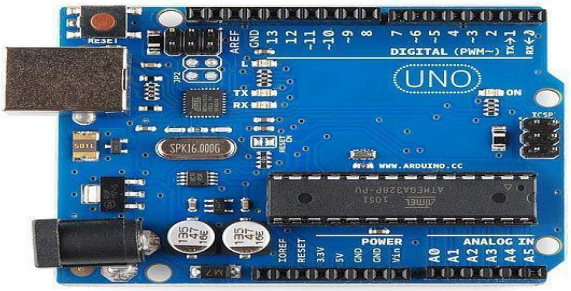


Fig-2.1.3 Arduino Uno

2.1.3 BREADBOARD AND JUMPER WIRES

- A broadband is as less device for temporary prototype with electronics and test circuits designs the purpose of the breadboard is to make quick electrical connections between components like Icds, Gps sensor, Arduino UNO, Node MCU, so that you can test your circuit before permanently soldering it together.Jumper Wires are simply wires that have connector pins at each end, allowing them to be used to connect two pints to each other without soldering. Jumper wires are typically used with breadbands and other prototype tools in order to make it easy to change a current as needed.

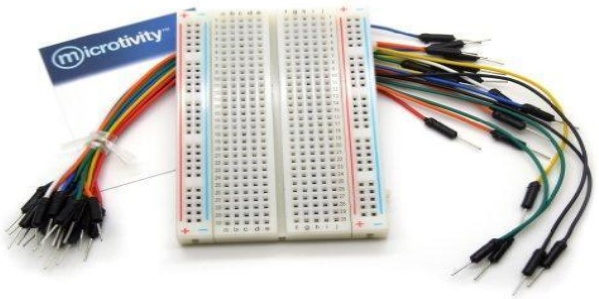


fig 2.1.4 - bread board and jumper wires

2.1.4 VIBRATION MOTOR

- A flighty turning mass vibration engine (ERM) utilizes a little unequal mass on a DC engine when it pivots it makes a power that means vibrations. ... A direct thunderous actuator (LRA) contains a little interior mass joined to a spring, which makes a power when driven .A vibratory engine is a three-stage engine that is purposefully unequal, and is otherwise called an unpredictable turning mass (ERM) or vibrating engine. Vibratory engines are utilized to vibrate strainers, box and tables, yet in addition to isolate items in a dugout or landfill pipe.

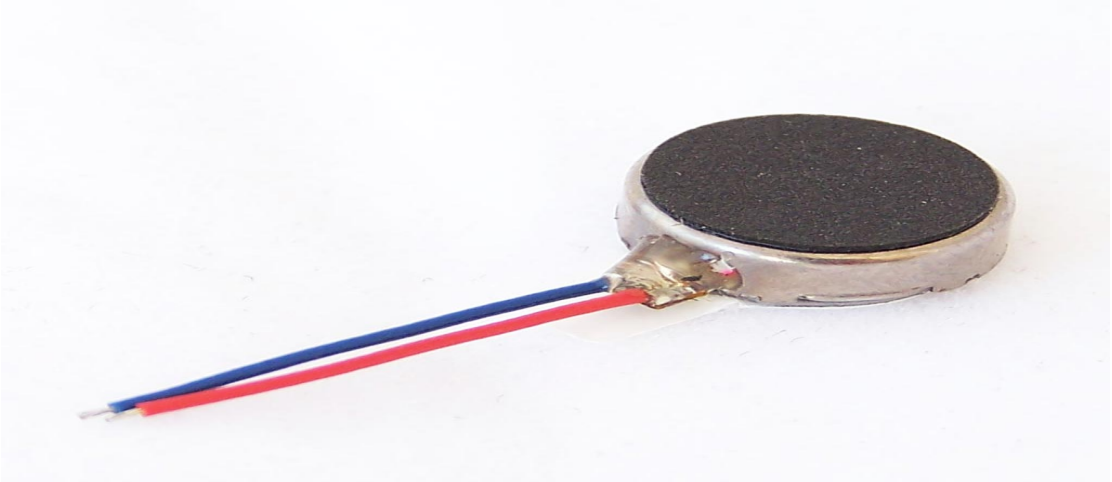


fig 2.1.5 – Vibration Motor

2.1.5 POWER SUPPLY

- Info the regulator board is given by a 9V dc connector. This 9V is utilized to drive the transfers. A controller IC 7805 is utilized to manage voltage to +5V which is required for driving the regulator and other gadgets utilized on the board.

fig 2.1.6 - Power Supply

2.1.6 ULTRASONIC SENSOR

- Ultrasonic Modules are gadgets that utilize electrical–mechanical energy change to measure good ways from the sensor to the objective item. Ultrasonic waves are longitudinal mechanical waves which travel as a grouping of compressions and rarefactions along the bearing of wave engendering through the medium. Aside from distance estimation, they are additionally utilized in ultrasonic material testing (to recognize breaks, air bubbles, and different defects in the items), Object recognition, position discovery, ultrasonic mouse, and so on Here we are examining the ultrasonic sensor utilizing the piezoelectric standard. Piezoelectric ultrasonic sensors utilize a piezoelectric material to create the ultrasonic waves. A ultrasonic sensor comprises a transmitter and recipient which are accessible as separate units or inserted all together. The above picture shows the ultrasonic transmitter and recipient.

fig 2.1.7- UltraSonic Sensor

2.1.7 POWER SOURCE

Power supply is a reference to a wellspring of electrical power. A gadget or framework that supplies electrical or different sorts of energy to a yield burden or gathering of burdens is known as a power supply unit or PSU. The term is most normally applied to electrical energy supplies, less regularly to mechanical ones, and once in a while to other people. This power supply segment is needed to change over AC sign to DC sign and furthermore to diminish the sufficiency of the sign. The accessible voltage signal from the mains is 230V/50Hz which is an AC voltage, however the required is DC voltage (no recurrence) with the abundance of +5V and +12V for different applications

Fig 2.1.8 Power Source

2.1.8 BUZZER

A piezo buzzer is pretty sweet. It's not like a regular speaker that you might think of. It uses a material that's piezoelectric, it actually changes shape when you apply electricity to it. By adhering a piezo-electric disc to a thin metal plate, and then applying electricity, we can bend the metal back and forth, which in turn creates noise.The faster you bend the material, the higher the pitch of the noise that's produced. This rate is called frequency. Again, the higher the frequency, the higher the pitch of the noise we hear.So basically, by shocking the plate over and over really fast, we can make noise.

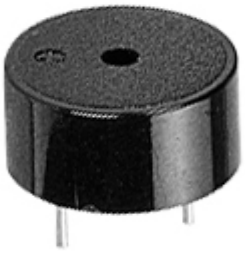


Fig : Buzzer

2.2 USER INTERFACES

SERIAL MONITORS

The Arduino IDE has a feature that can be a great help for controlling Arduino from your computer's keyboard. The serial monitor is a separate pop-up window that acts as a separate terminal that communicates by receiving and sending serial data.

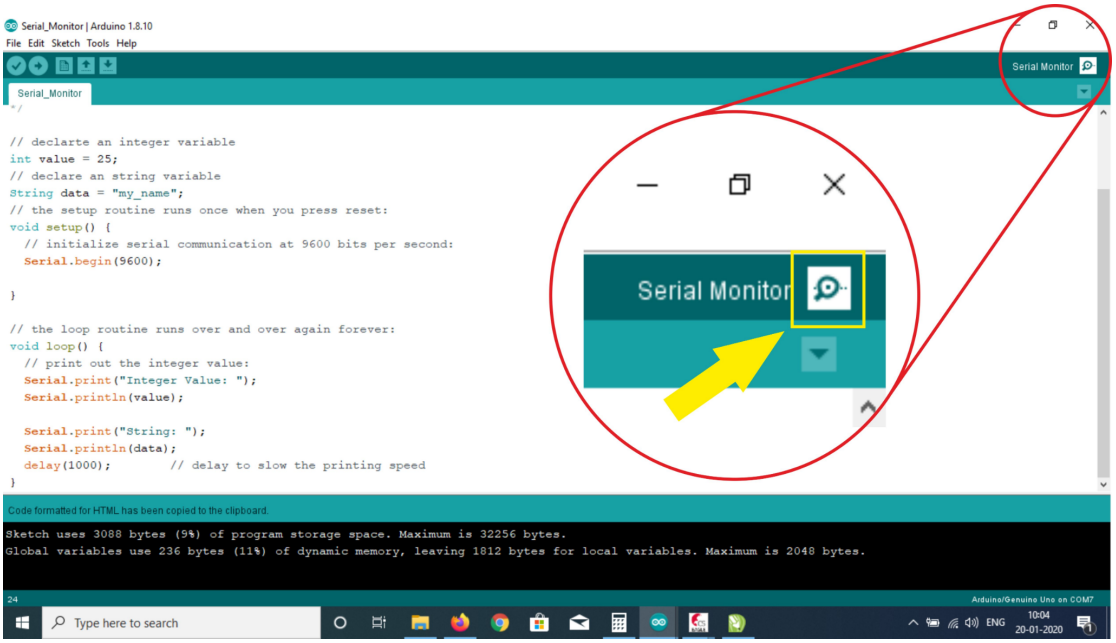
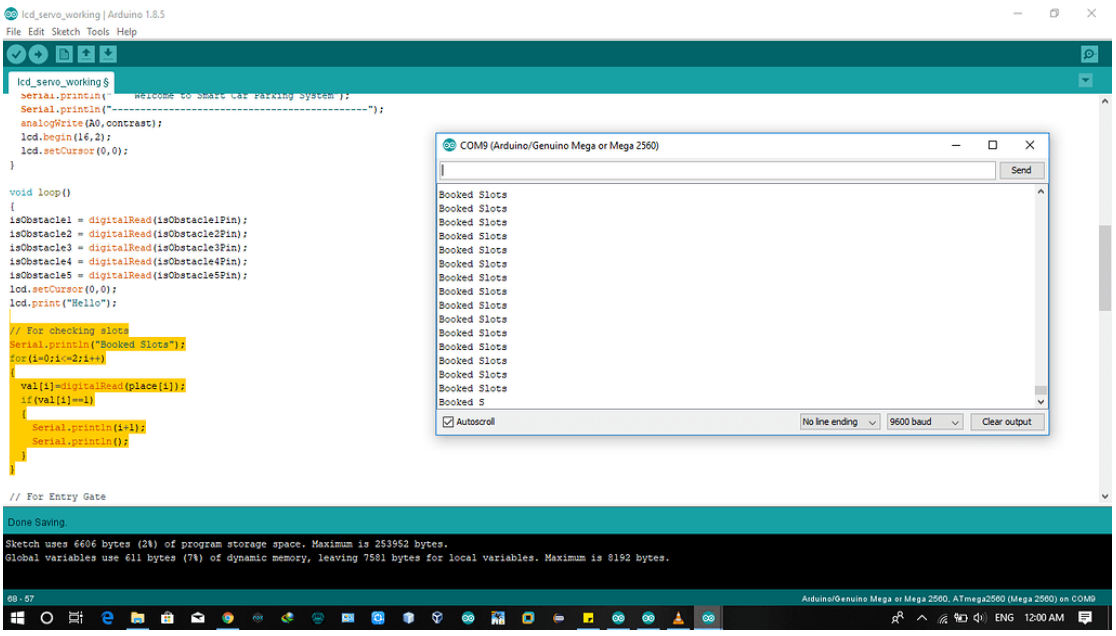


Fig : Serial Monitor



2.3 CONSTRAINTS AND PREREQUISITES

There are few constraints related to our project (Smart Shoe for Blind People).The Major constraint in our project is we totally dependent on UltraSonic Sensor , it's range is in between 3cm to 4oocm , it doesn't work if the obstacle is below 3cm and above 400cm, It treats all living and nonliving things, movable and non-movable things as obstacles.If a obstacle is detected we are using buzzer, which generates high frequency sound,If a person is physically deaf, he/she unable to hear the high frequency sound.If a person unable to react to the vibrations generated by vibration sensor, he/she will not be able to locate the obstacle. If the wires, sensor-pins are connected loosely or open-circuited will not work.If high voltage is provided to our application, it damages our application.

3. ANALYSIS

3.1 USE CASE MODEL

3.1.1 USE CASE MODEL

A use case diagram at its simplest is a representation of a user's interaction with the system that shows the relationship between the user and the different use cases in which the user is involved. A use case diagram can identify the different types of users of a system and the different use cases and will often be accompanied by other types of diagrams as well.

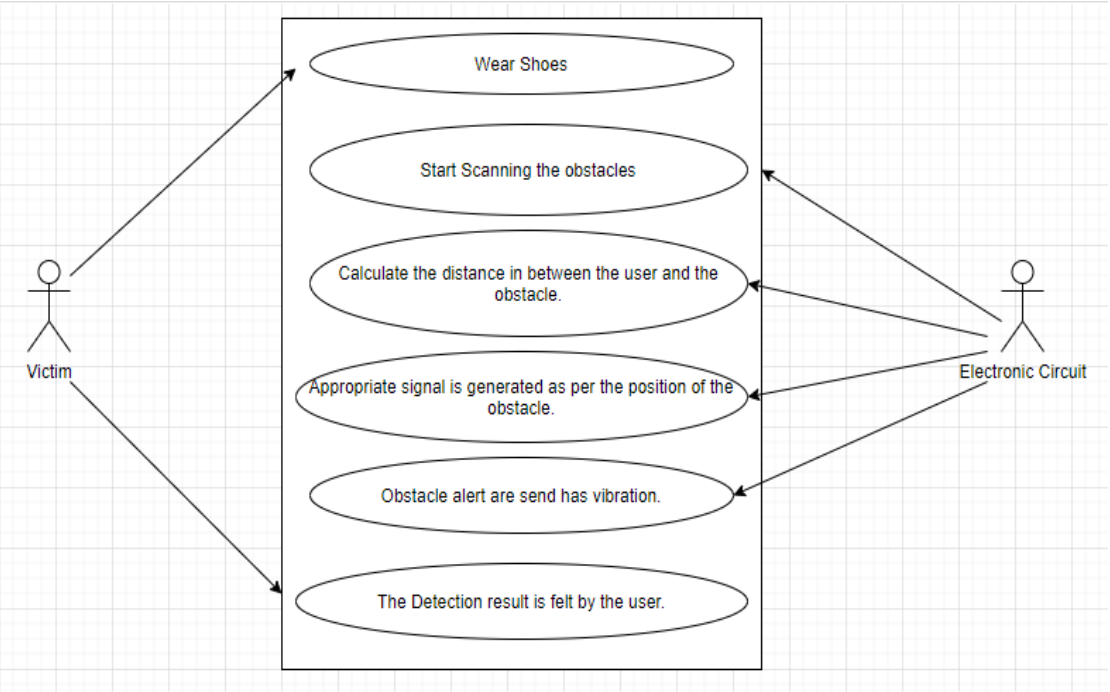


Figure 3.1.1 Use case Diagram

3.1.2 ACTIVITY DIAGRAM

Activity diagram is another important diagram in UML to describe dynamic aspects of the system, Activity diagram is basically a flowchart to represent the flow form one activity to another activity. The activity can be described as an operation of the system. So, the control flow is drawn from one operation to another.

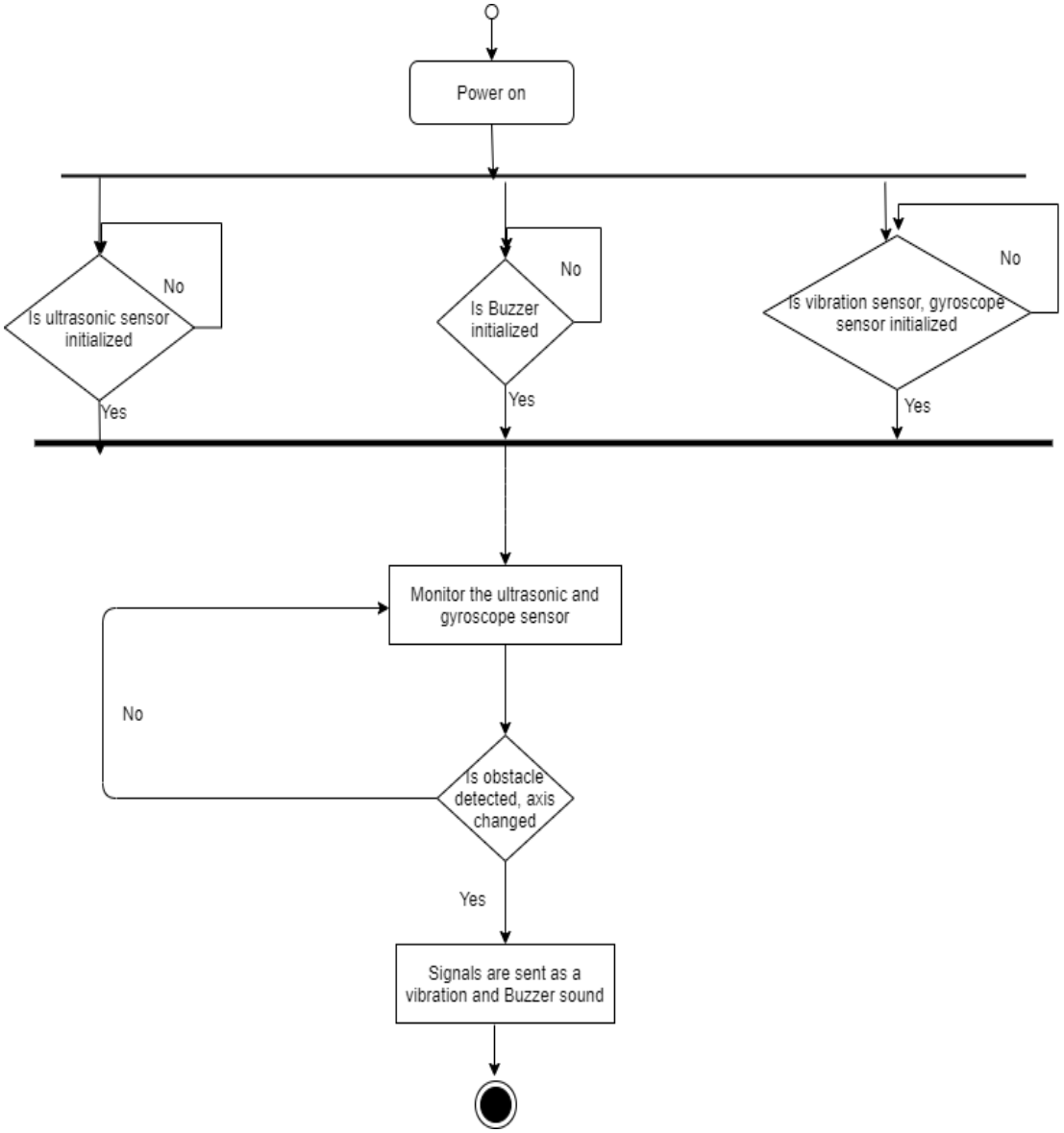


Figure 3.1.2 Activity Diagram

3.1.3 FLOW CHART

Flow Chart diagram is another important diagram in UML to describe dynamic aspects of the system, Flow Chart diagram is basically a flowchart to represent the flow form one activity to another activity. The activity can be described as an operation of the system. So, the control flow is drawn from one operation to another.

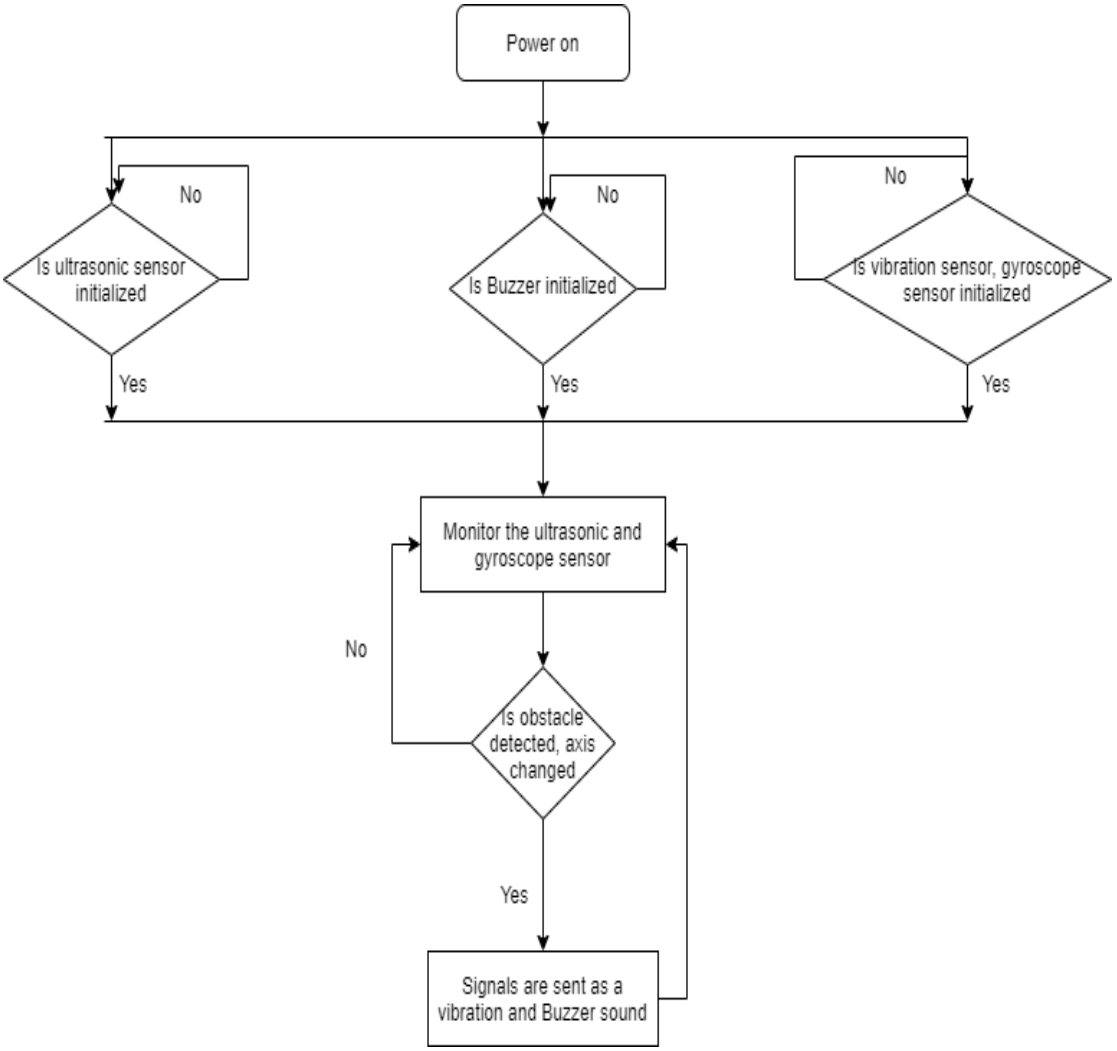


Fig : Flow Chart Diagram

4. DESIGN

4.1 BLOCK DIAGRAM

A block diagram is the conceptual model that defines the structure, behavior, and more views of a system. An architecture description is a formal description and representation of a system, organized in a way that supports reasoning about the structures and behaviors of the system.

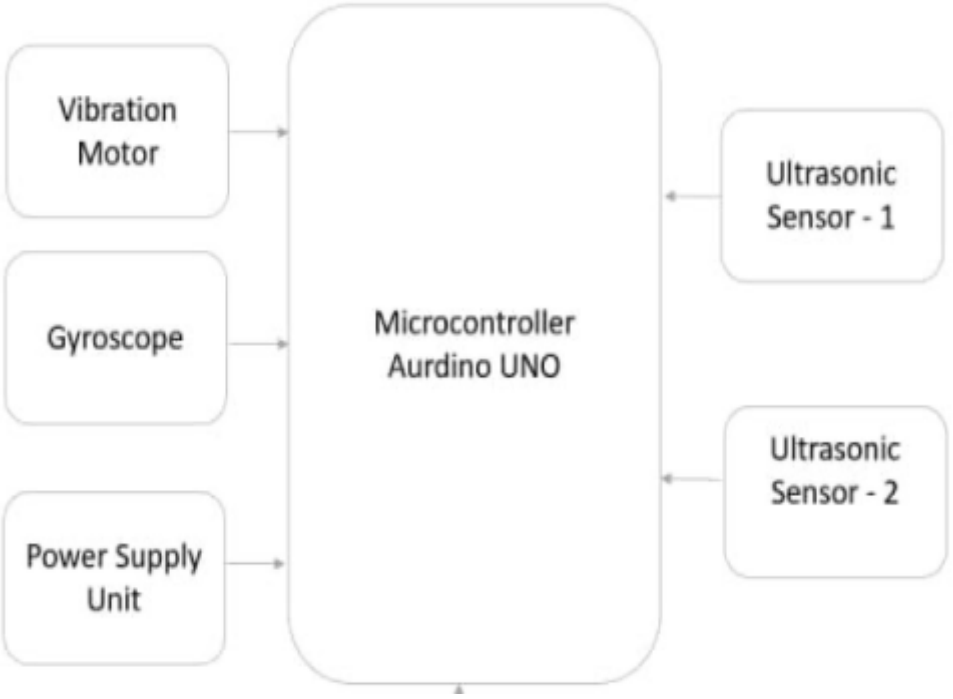


Figure 4.1 Block diagram

4.2 CIRCUIT DIAGRAM

A circuit diagram (also known as an electrical diagram, elementary diagram, or electronic schematic) is a simplified conventional graphical representation of an electrical circuit. A pictorial circuit diagram uses simple images of components, while a schematic diagram shows the components of the circuit as simplified standard symbols; both types show the connections between the devices, including power and signal connections. Arrangement of the

components interconnections on the diagram does not correspond to their physical locations in the finished device. Unlike a block diagram or layout diagram, a circuit diagram shows the actual wire connections being used. The diagram does not show the physical arrangement of components. A drawing meant to depict what the physical arrangement of the wires and the components they connect is called "artwork" or "layout" or the "physical design."

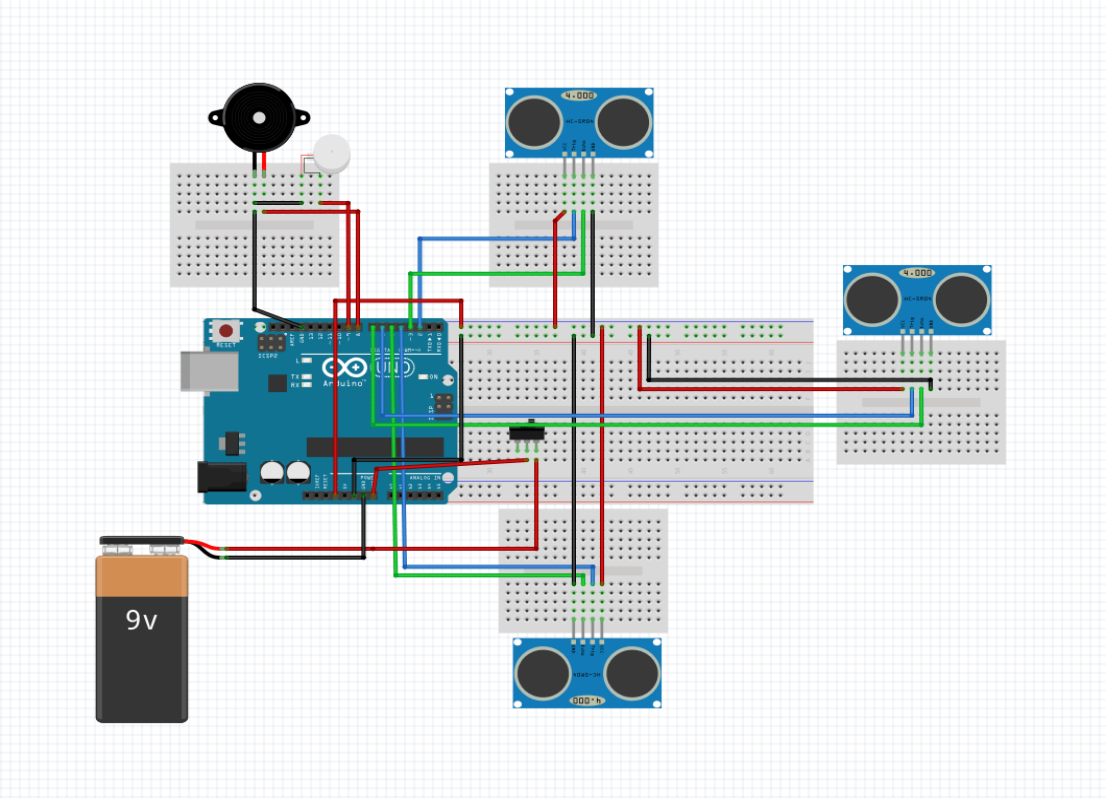


Fig : Circuit Diagram

4.3 SEQUENCE DIAGRAM

A sequence diagram is an interaction diagram that shows how objects operate with one another and in what order. It is a construct of a message sequence chart. A sequence diagram shows object interactions arranged in time sequence.

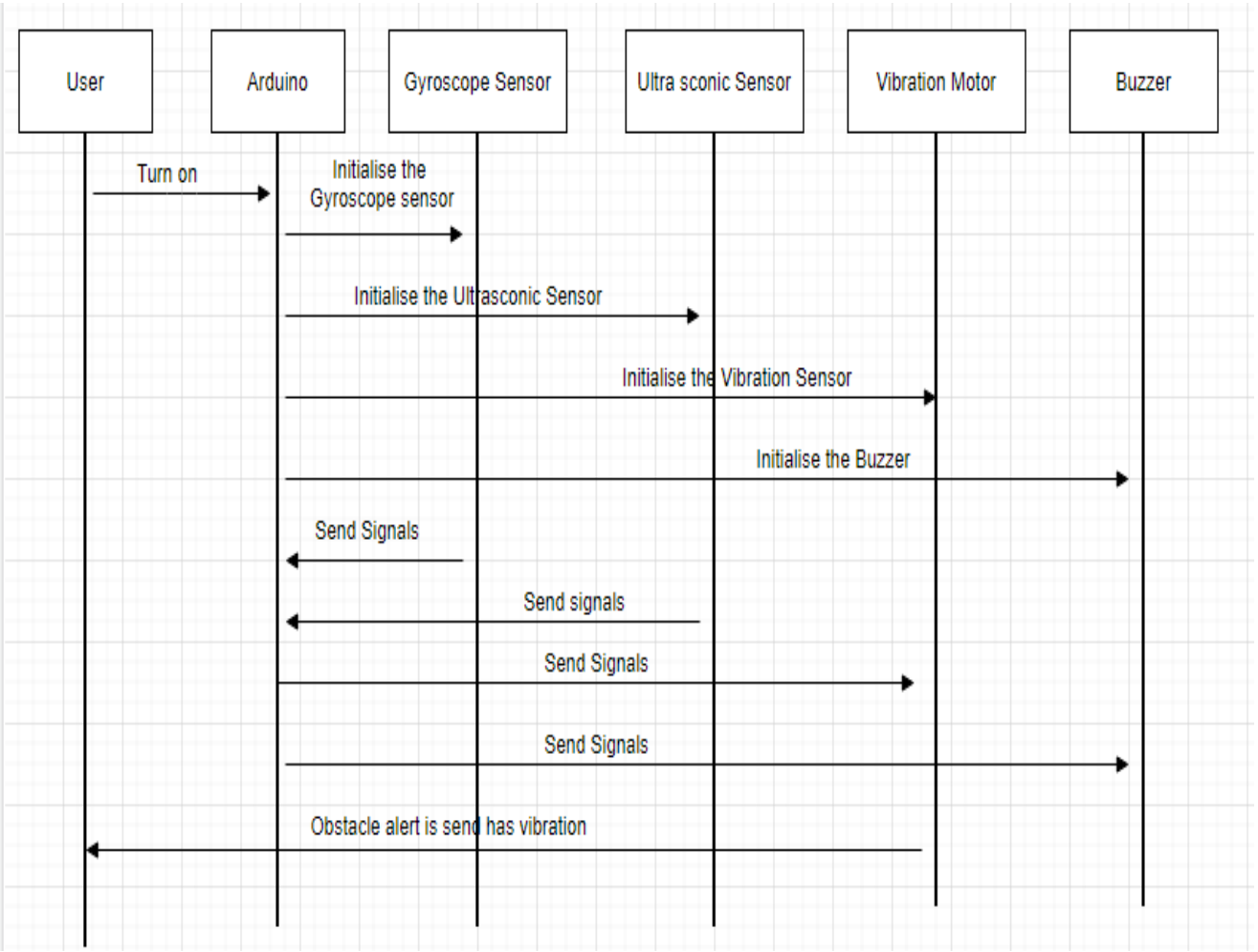


Figure 4.3 Sequence diagram

5. IMPLEMENTATION

Arduino is used for controlling the whole process with a UltraSonic Sensor, Vibration Motor and Buzzer. UltraSonic Sensor is used for detecting any obstacles in its range (3cm to 400cm). Once the obstacle is detected by UltraSonic Sensor, Vibration Motor generates high frequency vibrations to alert the persons ahead of obstacles and Buzzer generates high frequency sound to alert the persons ahead of obstacles. When we are ready with our hardware-connections after uploading the program into Arduino, we can install it in our shoes and power it up. Now whenever there is an obstacles, The shoes will detect the nearby objects or obstacles and simultaneously send a message to the receiver in audio/vibration form. So it helps the visually impaired person to acquire the extra knowledge about the obstacles around them without any help or any guidance.

5.1 CODE SNIPPETS

5.1.1 MULTIPLE ULTRASONIC SENSORS

```
#define trigPin1 3
#define echoPin1 2
#define trigPin2 4
#define echoPin2 5
long duration, distance,
RightSensor,BackSensor,FrontSensor,LeftSensor,vibration-motor-value;
void setup()
{
Serial.begin (9600);
```

```
pinMode(trigPin1, OUTPUT);
pinMode(echoPin1, INPUT);
pinMode(trigPin2, OUTPUT);
pinMode(echoPin2, INPUT);
pinMode(buzzer-pin,OUTPUT);
}
void loop() {
SonarSensor(trigPin1, echoPin1);
RightSensor = distance;
SonarSensor(trigPin2, echoPin2);
LeftSensor = distance;
Serial.print("front-ultrasonic-sensor  =  ");
Serial.println(LeftSensor);
Serial.print("right-ultrasonic-sensor  =  ");
Serial.println(RightSensor);
}
void SonarSensor(int trigPin,int echoPin)
{
digitalWrite(trigPin, LOW);
delayMicroseconds(2);
digitalWrite(trigPin, HIGH);
delayMicroseconds(10);
digitalWrite(trigPin, LOW);
duration = pulseIn(echoPin, HIGH);
distance= duration*0.034/2;
```

```
}
```

5.1.2 PIEZOELECTRIC BUZZER

```
//Buzzer with tone().

void setup() {

pinMode(11,OUTPUT);

}

void loop() {

tone(11,500);  //Syntax : tone(pin_number, frequency)

delay(500);

noTone(11);

 delay(500);  //Syntax : noTone(pin_number)

}
```

5.1.3 VIBRATION MOTOR

```
int mvm = 6; // micro vibration motor is connected with pin number 5 which is the
pwm pin.
int data = 0;
void setup() {
pinMode(mvm, OUTPUT);
 data = 200;
}


void loop() {
  // put your main code here, to run repeatedly:
   analogWrite(mvm, data);
   data = 0;
   delay(2000);
   data = 200;
}
```

6.WORKING

6.1 OBSTACLES DETECTION BY ULTRASONIC SENSOR

Arduino is used for controlling the whole process with a UltraSonic Sensor, Vibration Motor and Buzzer. UltraSonic Sensor is used for detecting any obstacles in its range (3cm to 400cm). Once the obstacle is detected by UltraSonic Sensor, Vibration Motor generates high frequency vibrations to alert the persons ahead of obstacles and Buzzer generates high frequency sound to alert the persons ahead of obstacles. When we are ready with our hardware-connections after uploading the program into Arduino, we can install it in our shoes and power it up. Now whenever there is an obstacles, The shoes will detect the nearby objects or obstacles and simultaneously send a message to the receiver in audio/vibration form. So it helps the visually impaired person to acquire the extra knowledge about the obstacles around them without any help or any guidance.

6.1.1.ACTIVATION OF BUZZER AND VIBRATION MOTOR

Arduino is used for controlling the whole process with a UltraSonic Sensor, Vibration Motor and Buzzer. UltraSonic Sensor is used for detecting any obstacles in its range (3cm to 400cm). Once the obstacle is detected by UltraSonic Sensor, Vibration Motor generates high frequency vibrations to alert the persons ahead of obstacles and Buzzer generates high frequency sound to alert the persons ahead of obstacles. When we are ready with our hardware-connections after uploading the program into Arduino, we can install it in our shoes and power it up. Now whenever there is an obstacles, The shoes will detect the nearby objects or obstacles and simultaneously send a message to the receiver in audio/vibration form. So it helps the visually impaired person to acquire the extra knowledge about the obstacles around them without any help or any guidance.

With Arduino we can connect upto 15 Ultrasonic Sensors. But our requirement in our application in 2 Ultrasonic Sensors.UltraSonic has 4 pins-GROUND PIN,VCC PIN,TRIG PIN,ECHO PIN these pins of

Ultrasonic sensor are connect to GROUND PIN,5V PIN and DIGITAL PINS 2,3,4,5 of Arduino Uno MicroController.We have used Buzzer in our application, It has 2 pins - GROUND PIN, VCC PIN , these pins connected to the GROUND PIN of Arduino Uno and DIGITAL PIN 11 of Arduino Uno . We have used Vibration Motor in our application, It has 2 pins - GROUND PIN, VCC PIN, these pins are connected to the GROUND PIN of Arduino Uno and DIGITAL PIN 6 of Arduino Uno.

As soon as obstacles are detected by Ultrasonic sensors, It triggers the Buzzer to generate high frequency sound and VibrationMotor to vibrate at high frequency to send a message to the receiver (victim) in audio/vibration form. So it helps the visually impaired person to acquire the extra knowledge about the obstacles around them without any help or any guidance.

```
#define trigPin1 3
#define echoPin1 2
#define trigPin2 4
#define echoPin2 5
#define buzzerpin 11
#define vibration motor pin 6
Long-duration,distance,
RightSensor,BackSensor,FrontSensor,LeftSensor,vibration motorvalue;

void setup()
{
Serial.begin (9600);
pinMode(trigPin1, OUTPUT);
pinMode(echoPin1, INPUT);
pinMode(trigPin2, OUTPUT);
pinMode(echoPin2, INPUT);
pinMode(buzzer pin,OUTPUT);
pinMode(vibration motor pin,OUTPUT);
vibration motor value = 0;
}
```

```
void loop() {
SonarSensor(trigPin1, echoPin1);
RightSensor = distance;
SonarSensor(trigPin2, echoPin2);
LeftSensor = distance;
Serial.print("front-ultrasonic-sensor  =  ");
Serial.println(LeftSensor);
Serial.print("right-ultrasonic-sensor  =  ");
Serial.println(RightSensor);
if(RightSensor <= 78 || LeftSensor <= 78){
   Serial.println(" obstacle detected");
   vibration motor value = 200;
   ActivateBuzzer();
 }else{
   noTone(buzzerpin);
   vibration motor value = 0;
   analogWrite(vibration motor pin, vibration motor value);
 }
}

void SonarSensor(int trigPin,int echoPin)
{
digitalWrite(trigPin, LOW);
delayMicroseconds(2);
digitalWrite(trigPin, HIGH);
delayMicroseconds(10);
digitalWrite(trigPin, LOW);
duration = pulseIn(echoPin, HIGH);
distance= duration*0.034/2;
}

void ActivateBuzzer(){
 tone(buzzerpin,250);
```

```
delay(100);
noTone(buzzerpin);
analogWrite(vibration motor pin, vibration motor value);
 //delay(100);
}
```

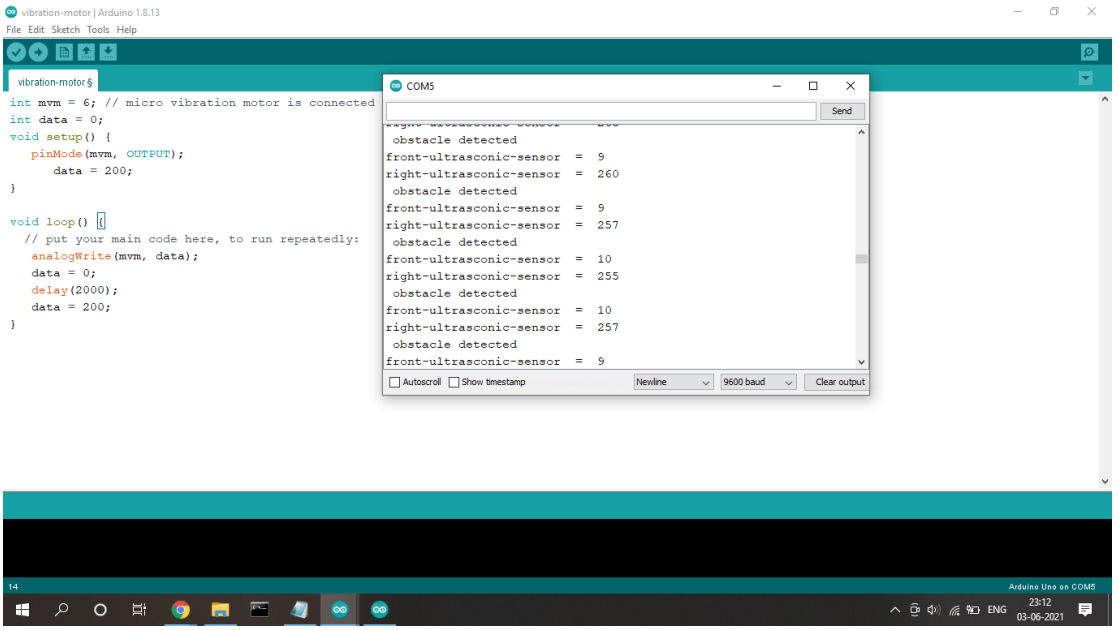


Fig-6.1.1 Obstacles are detected by UltraSonic Sensor

7. USER SCREENS

7.1 SERIAL MONITOR SCREEN

The Arduino IDE has a feature that can be a great help for controlling Arduino from your computer's keyboard. The serial monitor is a separate pop-up window that acts as a separate terminal that communicates by receiving and sending serial data.

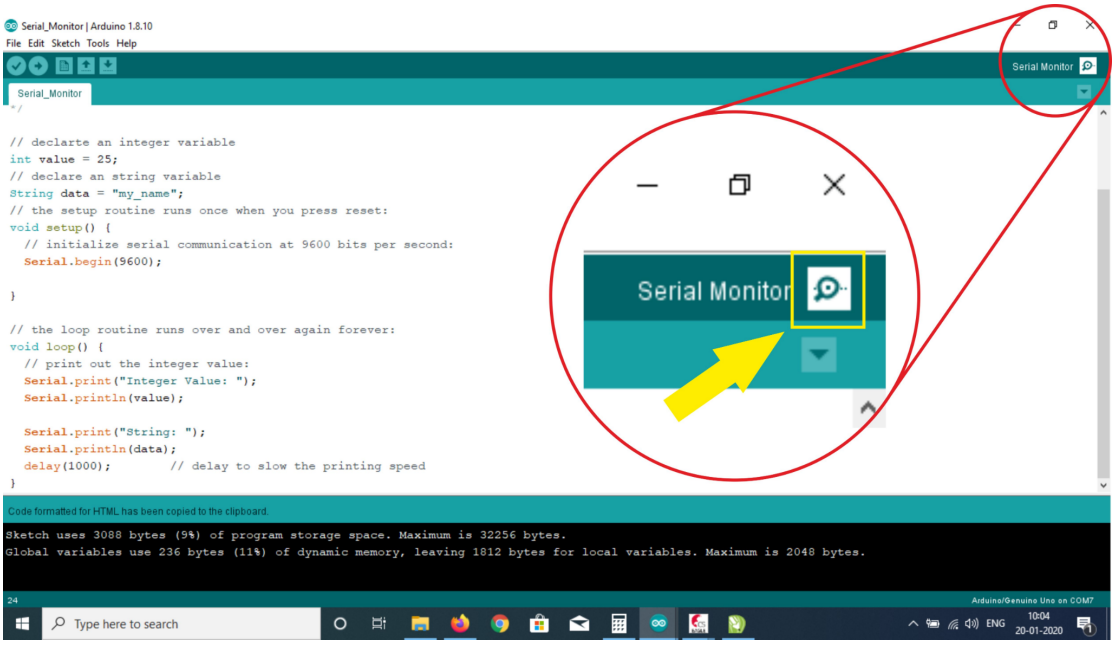


Fig : Serial Monitor

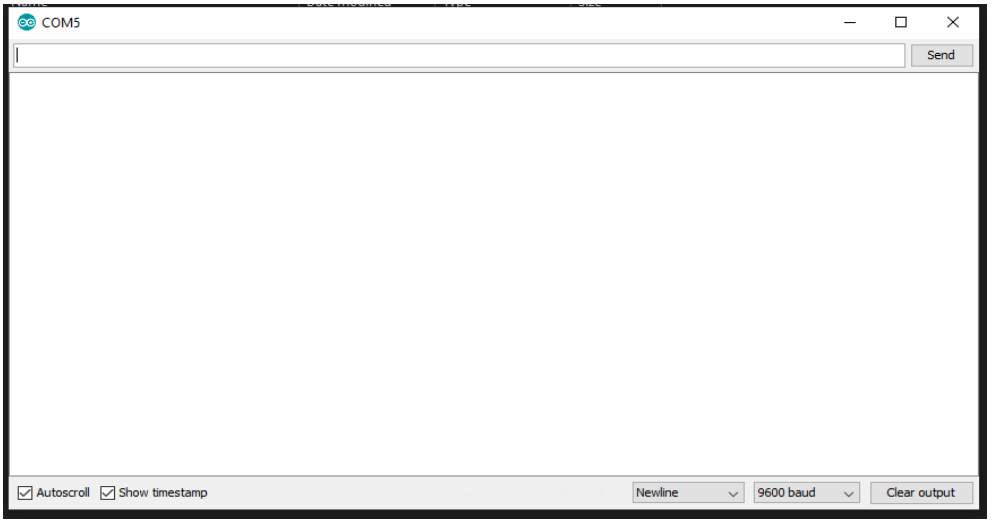


Figure 7.2 Serial monitor screen

8. TESTING

8.1 UNIT TESTING

Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program inputs produce valid outputs. All decision b$_r$anches and internal code flow should be validated. It is the testing of individual o$_w$= units of the application . It is done after the completion of an individual unit before integration. This is a structural testing, that relies on knowledge of its construction and is invasive. Unit tests perform basic tests at component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business process performs accurately to the documented specifications and contains clearly defined inputs and expected results.

8.1.1 ULTRASONIC SENSOR

1. Solder the header pins as needed to the UltraSonic Sensor.
2. Connect the Trigger pin,Echo pin, Gnd pin and Vin pin to the Arduino uno Digital Pins, Gnd pins and 5V pin by using Jumper wires.
3. Connect the Usb-cable to your computer and arduino uno microcontroller.
4. Upload the code to arduino uno microcontroller.
5. To make sure your’re receiving some sort of signal, open with the Arduino IDE and set it to 9600 baud rate. If the UltraSonic Sensor is receiving or outputting a serial signal. You will see some sort of “ proof of life” indication.
6. You will notice the distance of obstacles in centimeter(cm) with respect to the UltraSonic Sensor.

8.1.2 ULTRASONIC SENSOR CODE OUTPUT

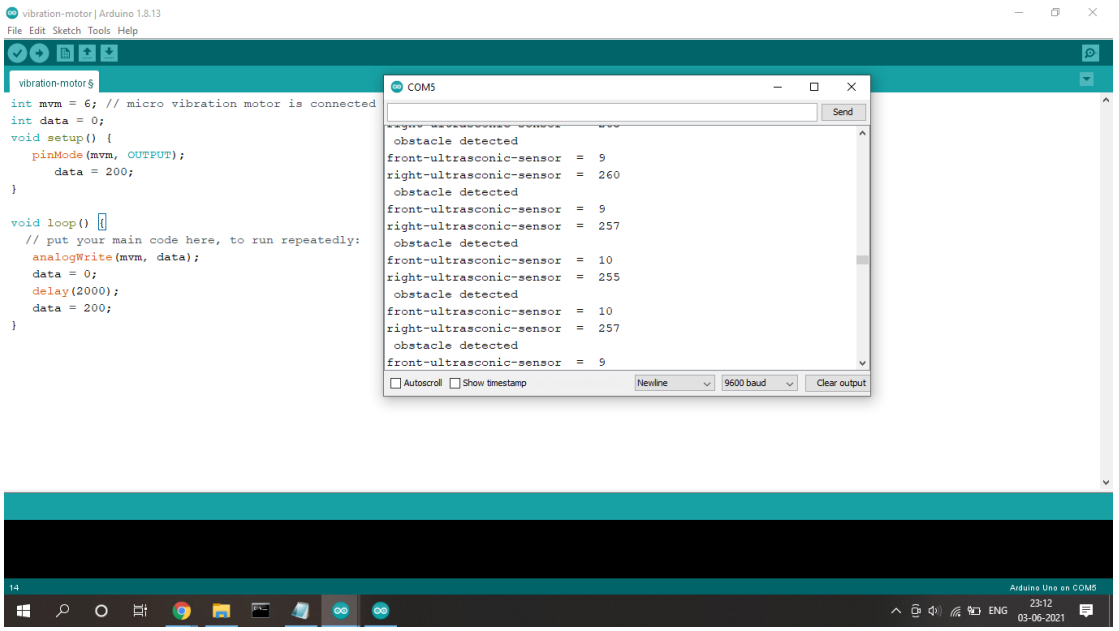


Fig 8.1.2 UltraSonic output

8.2.1 PIEZOELECTRIC BUZZER

1. Solder header pins as needed to the Buzzer.
2. Connect Ground pin, Vcc pin of Buzzer to the Arduino uno Digital pins, Gnd pins by using Jumper wires.
3. Connect the usb-cable to your computer and arduino uno microcontroller.
4. Upload the code to Arduino uno microcontroller.
5. To make sure you're receiving some sort of signal, open with the Arduino IDE and set it to 9600 baud rate. If the Buzzer is receiving or outputting a serial signal. You will see some sort of " proof of life" indication.
6. If there are no errors within the code, Buzzer starts generating high frequency sound as soon as you uploaded the code into arduino uno and connected the buzzer to arduino uno.

8.2.2 PIEZOELECTRIC BUZZER OUTPUT

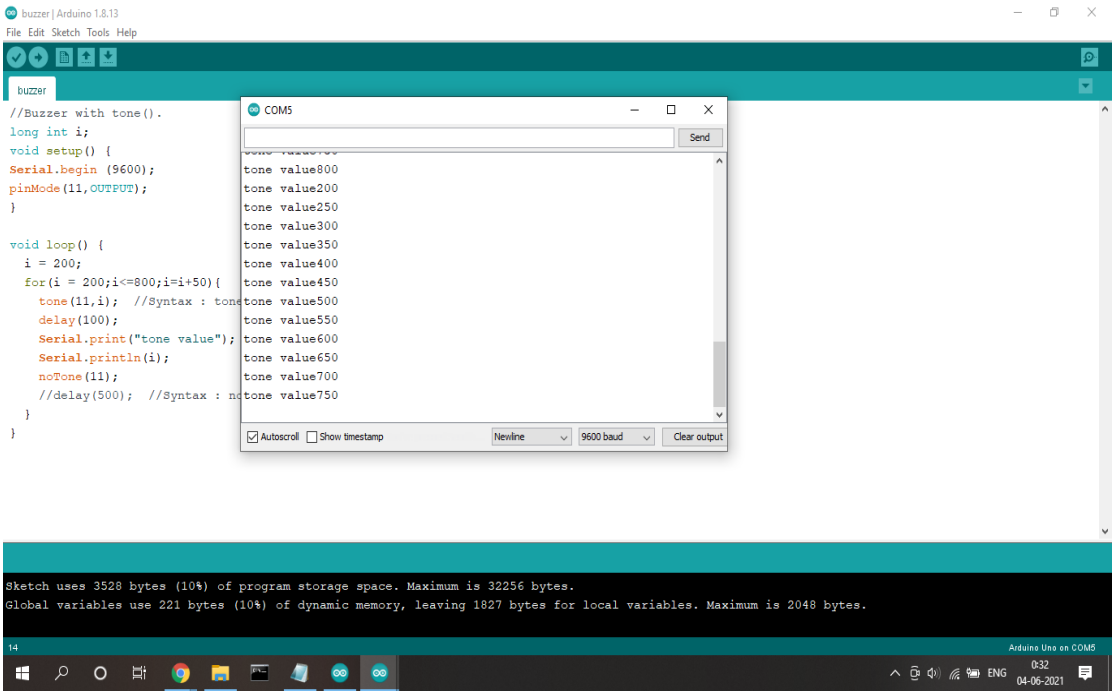


Fig 8.2.2 Piezoelectric Buzzer Output

8.3.1 VIBRATION MOTOR

1. Solder header pins as needed to the Vibration Motor sensor.
2. Connect Gnd pin and Vin of VibrationMotor Sensor to Arduino uno Digital pins, GND pins and 5V pins by Jumper wires.
3. Connect the USB-cable to your computer and arduino uno microcontroller.
4. Upload the code to arduino uno microcontroller.
5. To make sure your’re receiving some sort of signal,open the port and set it to 9600 baud rate.If the VibrationMotor Sensor is outputting a serial signal, you will see sort of “proof of life” indication.
6. If there are no errors within the code, VibrationMotor starts generating high frequency vibrations as soon as you uploaded the code into arduino uno and connected the VibrationMotor to arduino uno.

8.3.2 VIBRATION MOTOR OUTPUT

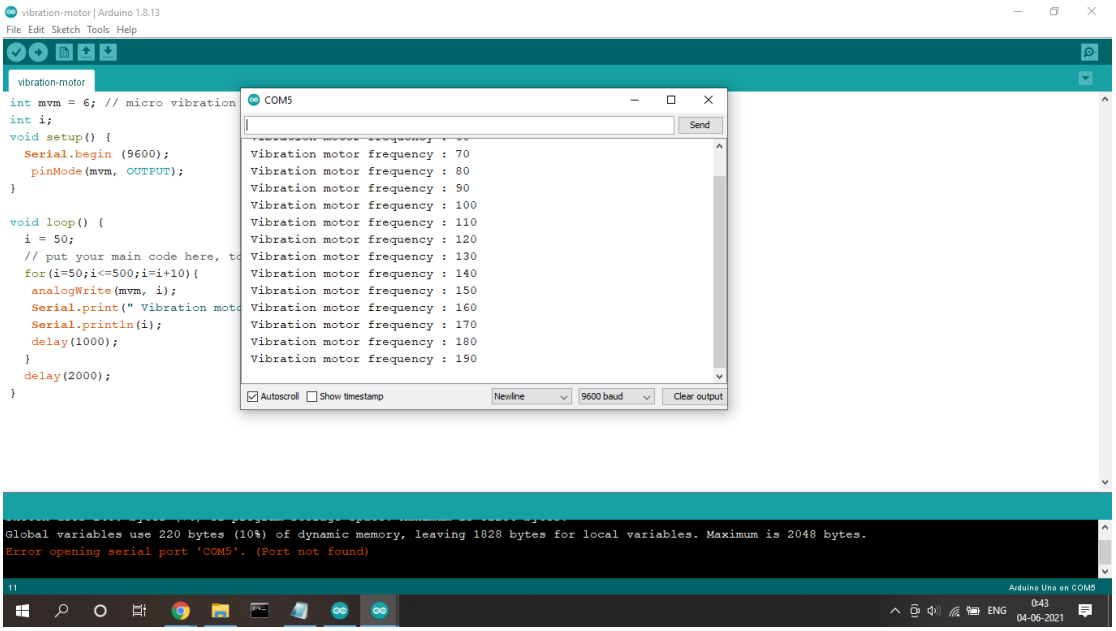


Fig 8.3.2 Vibration Motor Output

8.2 INTEGRATION TESTING

Integration tests are designed to test integrated software components to determine if they actually run as one program. Testing is event driven and is more concerned with the basic outcome of screens or fields. Integration tests demonstrate that although the components were individually satisfied, as shown by successfully unit testing, the combination of components is correct and consistent. Integration testing is specifically aimed at exposing the problems that arise from the combination of components.

8.3 TEST CASE SCENARIOS

SNO	Testcase Name	Input	Expected	Actual Output
1	UltraSonic Sensor Testing-obstacle Beyond the range of UltraSonic Sensor (>400cm)	UltraSonic Sensor connected to Arduino	No obstacles are detected	No obstacles are detected
2	UltraSonic Sensor Testing-obstacle within the range of UltraSonic Sensor (>3cm -<400cm)	UltraSonic Sensor connected to Arduino	Obstacle is detected	Obstacle is detected
3	UltraSonic Sensor Testing-obstacle Beyond the range of UltraSonic Sensor (<3cm)	UltraSonic Sensor connected to Arduino	No obstacles are detected	No obstacles are detected
4	Piezoelectric Buzzer testing	Piezoelectric Buzzer connected to Arduino	High frequency sound is generated	High frequency sound is generated
5	Vibration Motor testing	Vibration Motor connected to Arduino	High Frequency vibrations is generated	High Frequency vibrations is generated
6	Obstacle beyond the range of UltraSonic Sensor (> 75cm)	UltraSonic Sensor,Piezoelectric Buzzer,Vibration Motor connected to Arduino	High frequency sound and vibrations are not generated	High frequency sound and vibrations are not generated
7	Obstacle within the range of UltraSonic Sensor (>3cm - < 75cm)	UltraSonic Sensor,Piezoelectric Buzzer,Vibration Motor connected to Arduino	High frequency sound and vibrations is generated	High frequency sound and vibrations is generated
8	Obstacle beyond the range of UltraSonic Sensor	UltraSonic Sensor,Piezoelectric Buzzer,Vibration	High frequency sound and	High frequency sound and

	(< 3cm)	Motor connected to Arduino	vibrations are not generated	vibrations are not generated
9	9V Power Supply testing	9V power supply connected to Arduino	Working as Expected	Working as Expected

9. FUTURE ENHANCEMENTS

Future work will be focused on enhancing the performance of the system and reducing the load on the user by adding the camera to guide the blind exactly. Images acquired by using web cameras and NI-smart cameras helps in identification of objects as well as scans the entire instances for the presence of a number of objects in the path of the blind person. It can also detect the material and shape of the object. Matching percentage has to be nearly all the time correct as there is no chance for correction for a blind person if it is to be trusted and reliable. The principles of mono pulse radar can be utilized for determining long range target objects. The other scope may include a new concept of optimum and safe path detection based on neural networks for a blind person.

10. CONCLUSION

In India most of the people are facing the problem of visual impairment which are preventing them from becoming independent. The smart shoes help the visually impaired to get rid of cane and travel independently. It is accurate in detecting the obstacle and alerting the visually impaired person to find their way by passing every obstacle that comes on their way to the destination. The shoes are designed such that it is comfortable and user friendly. The shoes can further be improved by adding piezoelectric material to the sole of the shoe such that when the person walks energy is generated which can be used for the working of the shoe thus eliminating the use of battery.

11. REFERENCES

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