JEC1313 ELECTRONICS DESIGN PRACTICAL LABORATORY-1

II YEAR / III SEM

SMART GLASSES FOR VISUALLY-IMPAIRED

A MINI PROJECT REPORT

Submitted by

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NOVEMBER 2020

BONAFIDE CERTIFICATE

Certified that this project report "**SMART GLASSES FOR VISUALLY IMPAIRED"** is bonafide work of **"SARAVANA GANESH S, VAISHNAVI CAS, KEERTHANA G, VASUPRADHA E"** who carried out the project work under my supervision.

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INTERNAL EXAMINER

EXTERNAL EXAMINER

ABSTRACT

This device includes a pair of glasses and an obstacle detection module fitted in it in the centre, a processing unit, an output device i.e. a beeping component, and a power supply. The Obstacle detection module and the output device is connected to the processing unit. The power supply is used to supply power to the central processing unit. The obstacle detection module basically consists of a ultrasonic sensor, processing unit consist of a Arduino UNO and the output unit consists of a buzzer. The control unit controls the ultrasonic sensors and get the information of the obstacle present in front of the Visually Impaired man and processes the information and sends the output through the buzzer accordingly. These Smart Glasses for Visually Impaired is a portable device, easy to use, light weight, user friendly and cheap in price. These glasses could easily guide the Visually challenged people and help them avoid obstacles.

Keywords – *Arduino, Ultrasonic sensor, Buzzer*

INTRODUCTION

The number of visually impaired people is growing over the past decades. As reported by the World Health Organization (WHO), about 285 million people worldwide are estimated to be visually impaired. However, until now many schools and jobs cannot accommodate them mainly due to lack of assistive technologies and economic barriers. As a result, 90 % of them still live in low level of income. Even when the new aids or technologies become available, they are either too expensive ($3000and above), or affordable ($200) but with single or limited task functions only. Among all assistive devices, wearable devices are found to be the most useful because they are hand free or require minimum use of hands. The most popular type is head mounted device. Their main advantage is that the device points naturally at the viewing direction, thus eliminates the need of additional direction instructions, unlike other devices.

This paper presents a new design of smart glasses that can provide assistance in multiple tasks while maintaining at a low building cost. The design uses the Arduino UNO, an ultrasonic sensor, and a buzzer to convey information to the user. The block diagram of Smart Glasses for Visually-Impaired is shown in figure 1.

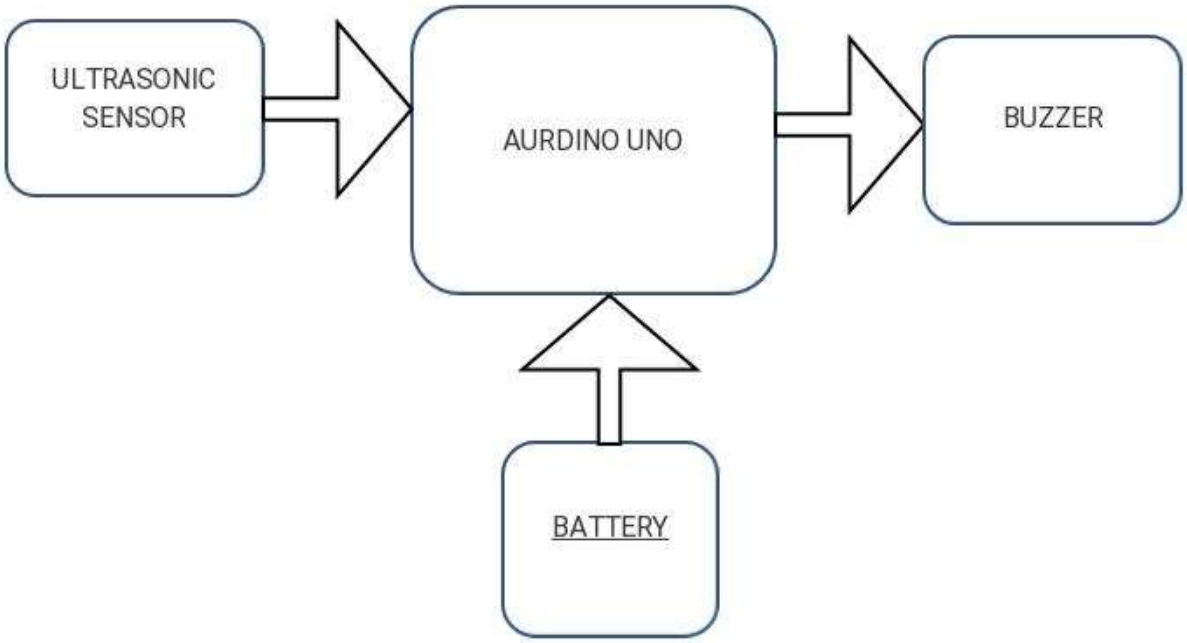

Fig. 1. Block diagram of Smart Glasses for Visually-Impaired

1. HARDWARE DESCRIPTION

ULTRASONIC SENSOR

An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves(>20kHz), and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound (i.e. the sound that humans can hear). In air at atmospheric pressure, these waves have wavelengths of 1.9 cm or less. At a frequency of 58kHz , its measurement resolution is upto 11 meters. Ultrasonic sensors have two main components: the transmitter (which emits the sound using piezoelectric crystals) and the receiver (which encounters the sound after it has travelled to and from the target). A type of Ultrasonic sensor is shown in Figure.2

Fig. 2. A type of ultrasonic sensor

BUZZER

When current is applied to the buzzer it causes the ceramic disk to contract or expand. Changing this then causes the surrounding disc to vibrate. That's the sound you hear. By changing the frequency of the buzzer, the speed of the vibrations changes, which changes the pitch of the resulting sound. A type of buzzer is shown in Figure.3

Fig.3.A type of buzzer

ARDUINO UNO

The Arduino is an open source electronics platform based on easy to use hardware and software. The open source Arduino software makes it Easy to write code and upload it to the board. It runs on Windows, Mac OS X and Linux. The environment is written in java and based on Processing and other open source software. Arduino is a single-board microcontroller meant to make the application more accessible which are interactive objects and its surroundings. The hardware features with an open-source hardware board designed around **an 8-bit *Atmel AVR***

microcontroller **or a 32-bit Atmel ARM**. Current models consists a USB interface, 6 analog input pins and 14 digital I/O pins that allows the user to attach various extension boards.

This software can be used with any Arduino board. The Arduino software IDE contains a text editor For writing code, a message area, a text console, a toolbar with buttons for common function. It connects to Arduino and Genuino hardware t+o Upload programs and communicate with them. Program written using Arduino software are called sketches. Arduino board is show in figure 4.

Fig. 4. Arduino Board

BREAD BOARD

Breadboards are one of the most fundamental pieces when learning how to build circuits. In this tutorial, you will learn a little bit about What breadboards are, why they are called breadboards, and how to use one. Once you are done you should have a basic understanding of how Breadboards work and be able to build a basic circuit on a breadboard. Figure 4 shows the bread board.

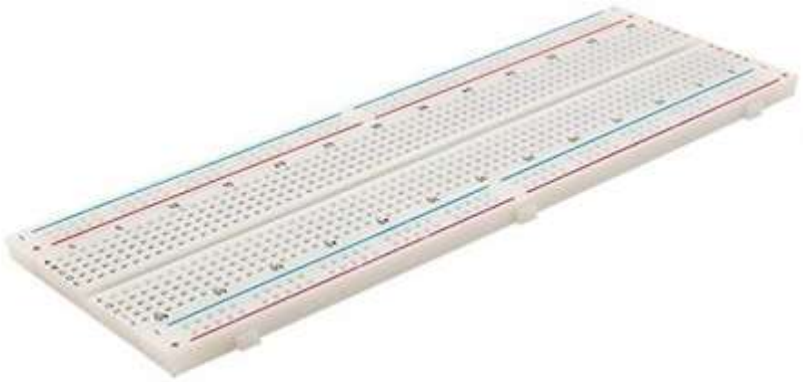

Fig. 5. Bread Board

SUNGLASSES

The most important benefit of wearing sunglasses is that they protect your eyes from ultraviolet (UV) light. UV light can have harmful effects on the eyelid, cornea, lens and retina. This can now be a supportive tool which mounts the entire circuit on it, thereby it is wearable as it is head-mounted type and guide the Visually challenged ones.

Fig.6.Sunglasses

2. SOFTWARE DESCRIPTION:

ARDUINO IDE

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

WRITING SKETCHES

Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension. ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom right hand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

Fig 7. Logo of Arduino IDE

ARDUINO PROTEUS

Proteus Design Suite includes the ultimate in support for the Arduino ecosystem. It includes both hardware and firmware design, world leading system level simulation, debug and programming of the physical hardware. It can give support for over 50 Arduino shields and breakout boards.

3. DESIGN AND IMPLEMENTATION

CIRCUIT DESIGN

An ultrasonic sensor has four pins namely VCC, trigger, echo, and ground. These are connected to respective pins in Arduino UNO board to work effectively.

VCC → 5V

Trigger → 12^{th} pin

Echo → 11^{th} pin

Ground → Ground

Then the Buzzer's positive and negative terminal are connected to 8th pin and common ground, switch and battery are connected in series and thereby connected to 3.3V and ground pin respectively.

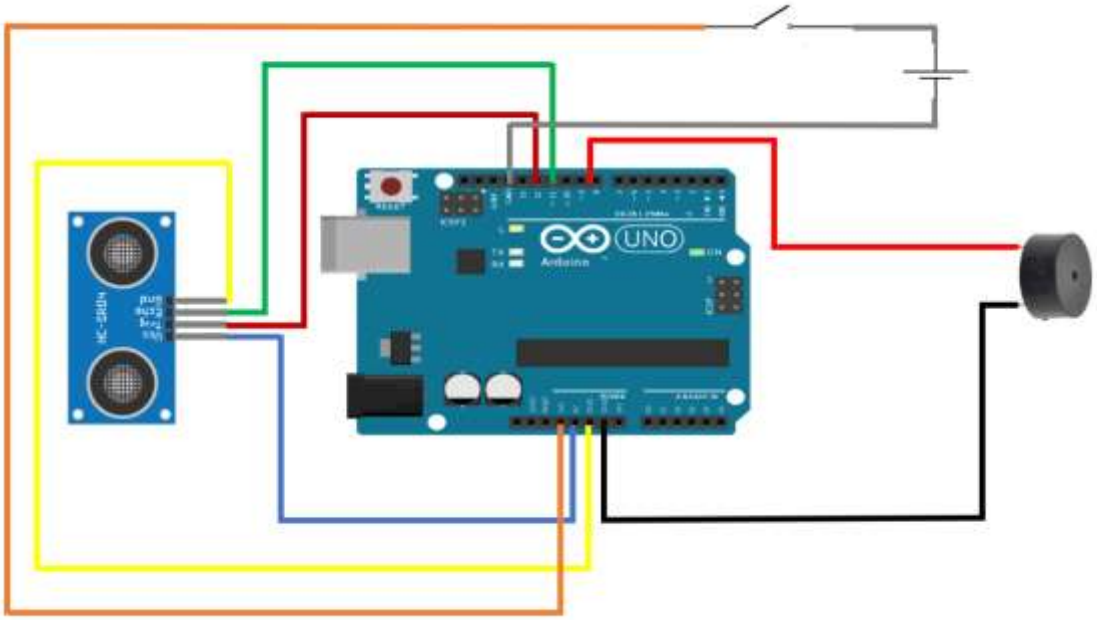

Fig. 8. Circuit diagram of Smart Glasses for Visually Impaired

WORKING PROCEDURE

Smart glasses design procedure depends mainly on the processing unit which is the Arduino UNO in this case. The main hardware ultrasonic sensor, mounted on the top middle of the glasses, senses the objects and where Arduino UNO accepts the signals from the sensor. If the distance is >=1m (approx.100cm), buzzer beeps once and if its <= 70 cm, beeps loudly and continuously.

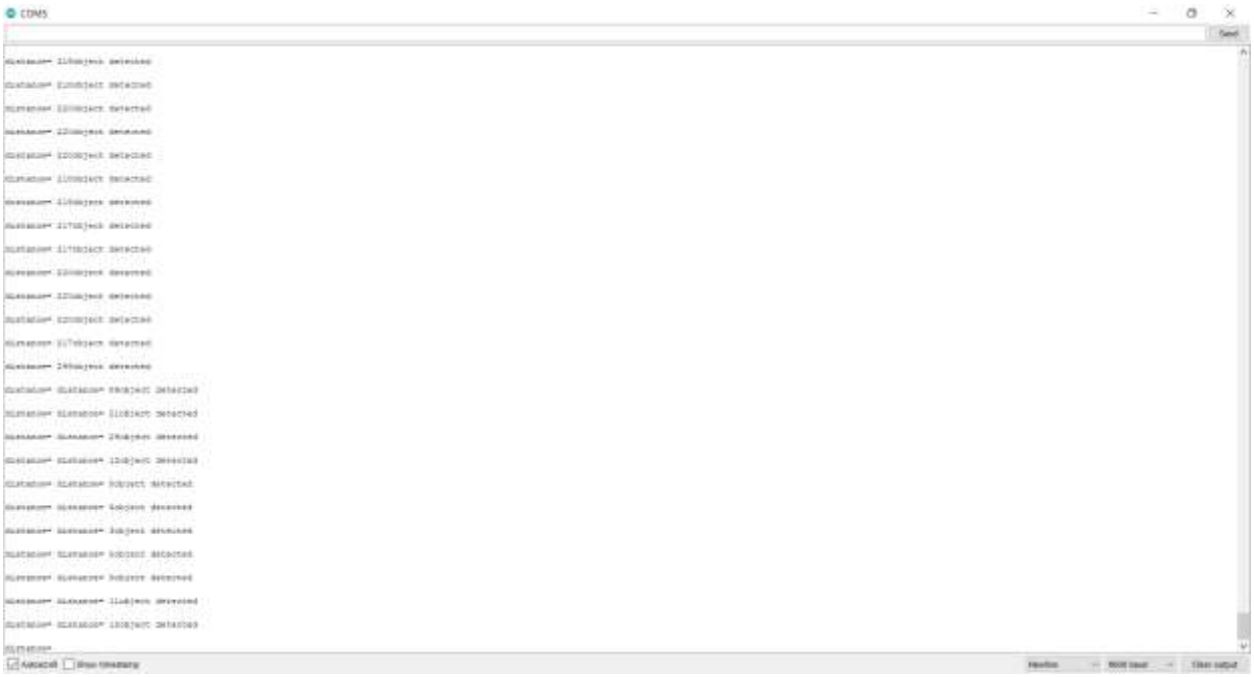

Fig.9. Detected object distance (in cm)

4. SOFTWARE CODING

Coding used to implement the project is given below:

```
/* Arduino code used for the Smart Glasses for Visually Impaired
Third Semester Mini Project for ELECTRONICS DESIGN PRACTICAL LABORATORY1 */
#define trigPin 12 // These lines assign names to values
#define echoPin 11 // so they can be easily identified.
int Buzzer = 8;  // These are set before the code
int duration, distance;

void setup() {
      Serial.begin (9600);

      pinMode(trigPin, OUTPUT);
      pinMode(echoPin, INPUT);
      pinMode(Buzzer, OUTPUT);
```

```
}

void loop() {

   digitalWrite(trigPin, HIGH);
   delayMicroseconds(1000);
   digitalWrite(trigPin, LOW);
   duration = pulseIn(echoPin, HIGH);
   distance = (duration/2) / 29.1;

  if (distance <= 100 && distance >= 70)
       {
        Serial.println("object detected \n");
       Serial.print("distance= ");
       analogWrite(Buzzer,0);
       delay (10000) ;
       analogWrite(Buzzer,255);
       delay (20000) ;




       }

        else if (distance <= 80 && distance >= 50)
       {
        Serial.println("object detected \n");
       Serial.print("distance= ");
```

```
analogWrite(Buzzer,0);
delay (5000) ;
analogWrite(Buzzer,255);
delay (5000) ;




}

 else if (distance <= 50 && distance >= 30)
{
 Serial.println("object detected \n");
Serial.print("distance= ");
analogWrite(Buzzer,0);
delay (4500) ;
analogWrite(Buzzer,255);
delay (4500) ;




}
   else if (distance <= 30 && distance >= 20)
{
 Serial.println("object detected \n");
Serial.print("distance= ");
analogWrite(Buzzer,0);
delay (4000) ;
analogWrite(Buzzer,255);
```

```
delay (4000) ;

}

    else if (distance <= 20 && distance >= 10)
{
 Serial.println("object detected \n");
Serial.print("distance= ");
analogWrite(Buzzer,0);
delay (3000) ;
analogWrite(Buzzer,255);
delay (3000) ;




}

else if (distance <= 10 && distance > 5)
{
 Serial.println("object detected \n");
Serial.print("distance= ");
analogWrite(Buzzer,0);
delay (20) ;
analogWrite(Buzzer,255);
delay (20) ;
```

```
      }


      else if (distance <= 5 && distance >= 1)
      {
       Serial.println("object detected \n");
      Serial.print("distance= ");
      analogWrite(Buzzer,0);
      delay (5) ;
      analogWrite(Buzzer,255);
      delay (5) ;




      }



  else
     Serial.println("object detected \n");
      Serial.print("distance= ");
      Serial.print(distance);
      analogWrite(Buzzer,255);
  {
}
}
```

Depending on our convenience we can change the code.

5. APPLICATIONS

SMART GLASSES FOR VISUALLY IMPAIRED is an obstacle-detection system which uses ultrasonic waves to determine the distance of the object. This principle is used under mines, oceans to find depths and distance of submarines incase of oceans.

6. CONCLUSION AND FUTURE ENHANCEMENT

This paper presents a unique smart device for visually impaired users, which can help them to travel anytime avoiding any kind of obstacle in indoor and outdoor environment. Our propose device is more comfortable and less expensive. The ultrasonic sensors used in this device are small, light in weight, and consume less power. Thus, it is user friendly. Although our proposed model responds quickly, it cannot detect the ground level object and this serves to be a limitation.

Future research work will include:

(I) Making the system wireless and

(II) Implementing image recognition to get the information of

obstacle.

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