GMR Institute of Technology
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Arduino based project using Ultrasonic and Flex sensors for Impaired people

A Mini Project Report Submitted for the Partial Fulfillment

of the Requirement for the Award of the Degree

BACHELOR OF TECHNOLOGY

In

ELECTRICAL AND ELECTRONICS ENGINEERING

Submitted by

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CERTIFICATE

This is to certify that the Mini project report entitled "**Arduino based project using Ultrasonic and Flex sensors for Impaired people**" submitted by

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has been carried out in partial fulfilment of the requirements for the award of degree of **Bachelor of Technology** in **Electrical and Electronics Engineering** in **GMR Institute of Technology**, An Autonomous Institute Affiliated to JNTUK, Kakinada, is a record of bonafide work carried out by her/him under my guidance & supervision.

The results embodied in this report have not been submitted to any other University or Institute for award of any degree.

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ABSTRACT

Visually impaired persons frequently require assistance in traversing their home and outside on a daily basis. Human aid is not always feasible, hence a solution is required. These GLASSES are designed for blind people. This devices helps the blind people to easily feel the obstacles in front of them and can save them from accidents. This gadget consists of a pair of glasses with an obstacle detection module installed in the middle, a processing unit, an output device (a buzzer component), and a power source. The processing unit is linked to the obstacle detecting module and the output device. The power supply provides electricity to the central processor unit. The obstacle detection module comprises primarily of an ultrasonic sensor, the processing unit of a control module, and the output unit of a buzzer. The control unit activates the ultrasonic sensors, which collect information about the barrier in front of the man and process it before sending it to the buzzer. These Ultrasonic Smart Glasses for Blind People are a portable gadget that is simple to use, low in weight, user pleasant, and inexpensive. These spectacles might readily advise blind persons and assist them in avoiding hazards.

Sign language is mostly used by deaf and dumb people as their native languages. Sign language is a combination of gestures made using hands, fingers, arms, head and facial expressions. It helps the deaf and dumb people to communicate with people around them and vice versa. Sometimes by using hand gestures, there is a problem that deaf people have a problem in communicating with people, who unable to understand the sign language. So in order to rectify this problem we use smart gloves which is made with flex sensor and accelerometer. This smart gloves transforms the hand signals to text using Arduino UNO and Bluetooth TTS app. In the same way Speech can be converted into Text using Arduino Voice Control and display the message in LC. The smart glove is a normal glove fitted with flex sensor and accelerometer. In general flex sensors are variable resistors and the resistance of flex sensor varies with sensor bends. The flex sensor converts the change in bend to electrical resistance. In flat flex sensors has an resistance $30\text{k}\Omega$ at an angle of 0^0 and it changes to $70\text{k}\Omega$ at angle of 90^0.

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INTRODUCTION

1.1.Ultrasonic glasses for blind:

Now a days technology is improving day by day in all aspects. Here we have a project for impaired people. As we know blind, deaf and dumb are not barrier for them to achieve their goals if the world has these inventions. Here we have a solution for these defects. For the visually impaired people i.e blind people we use Arduino nano in which code is programmed to get operated , a battery and an ultrasonic sensor which senses obstacle with in certain distance and gives the buzzer sound to the blind people so that they can alert and save from obstacle. This full set up on the glasses so that these blind people can wear these and save from obstacles.

This device is an innovation which helps the blind people to navigate with speed and confidence by detecting the nearby obstacles using the help of ultrasonic waves and notify them with buzzer sound or vibration. They only need to wear this device as glasses. According to WHO 39 million peoples are estimated as blind worldwide. They are suffering a lot of hardship in their daily life. The affected ones have been using the traditional white cane for many years which although being effective, still has a lot of disadvantages.

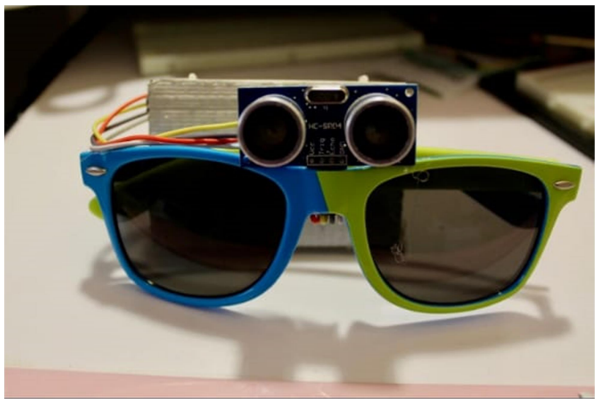


Fig 1.1 Schematic Diagram of Ultrasonic Glasses

Another way is, having a pet animal such as a dog, but it is really expensive. So the aim of the project is to develop a cheap and more efficient way to help visually impaired to navigate with greater comfort, speed and confidence. By wearing this device, the

blind people can fully avoid the use of white cane and such other devices. This device will help the blind to navigate without holding a stick which is a bit annoying for them. They can simply wear it as a glasses and it can function very accurately and they only need a very little training to use it.

1.2. Smart gloves for deaf and dumb:

For the deaf and dumb people one who can't listen and talk. In sign language, a gesture is a particular hand movement that creates a certain hand form. Whole words are typically represented by signs in sign languages. Additionally, it can supply signs for letters to represent words for which there is no corresponding sign in that sign language .Here we use flex sensors which plays important role in which the change in resistance depends on the amount of bend. In this we suggest a Sign Language Glove that will help persons who have speech impairments of any kind communicate by gestures. Specifically, the user will produce alphabet movements using single-handed sign language. The glove will capture every gesture the user makes and translate those gestures into both visual and audible form . The Arduino UNO is used to manage all operations, while accelerometer and flex sensors are used to monitor finger and palm motion.

Fig 1.2 Schematic Diagram of Smart Gloves for deaf and dumb

1.3. Literature Survey:

S.no	Title of the paper	Year	Remarks
1.	Low cost ultrasonic smart glasses for blind	2017	In this paper, We can understand the ultrasonic glasses for blind objective and overall explanation of project
2.	Smart Glasses for the Visually Impaired People	2016	In this paper, the smart glass will help the visually challenged persons to reach their destination independently. The reason it is more reliable is because it is developed on the Android operating system and Android-based smartphones are very common and highly available almost everywhere
3.	A Unique Smart Eye Glass for Visually Impaired People	2018	In this paper, we present a unique smart glass for visually impaired people to overcome the traveling difficulties. It can detect the obstacle and measure the distance perfectly using the ultrasonic sensor and a microcontroller. After receiving information from the environment, it passes to the blind person through a headphone
4.	Design and Construction of an Obstacle-Detecting Glasses for the Visually Impaired	2019	This paper introduces a wearable eyeglass with an ultrasonic sensor to help the blind to navigate alone safely, while avoiding obstacles that may be encountered, fixed or mobile, thereby preventing any possible accident. The main component of this work is the ultrasonic sensor, which is used to measure the distance to an object using sound waves.

5.	A Smart Hand Glove that Converts Gesture into Text & Speech to Assist the Handicapped-(Handtalk)	2022	*In this paper,* Human being wants to convey their feelings by interacting with people surrounding them. But this is not a case of speech-hearing impaired people whom we call deaf-dumb. This community face lots of helplessness & discrimination. According to World Federation of the Deaf (WFD), there are approximately 70 million deaf & mute people.
6.	Implementation Smart Gloves for Deaf and Dumb Disabled	2019	*In this paper,* people with speech disabilities use sign language based on hand gestures with certain movements to represent the language in which they speak of gesture in sign language, a movement defined by hands, with across finger shape
7.	Development of Sign Language using Flex Sensors	2020	In this paper, —Sign Language is not familiar to those who are not deaf or dumb. When humans talk to each other, they convey their words through both speech and gestures. For a deaf and dumb individual, it is really difficult to lead a normal life with such a big communication barrier. This affects their social life as well as relationships. So, this framework is developed to assist them and help them in conveying their message easily

1.4. Objective:

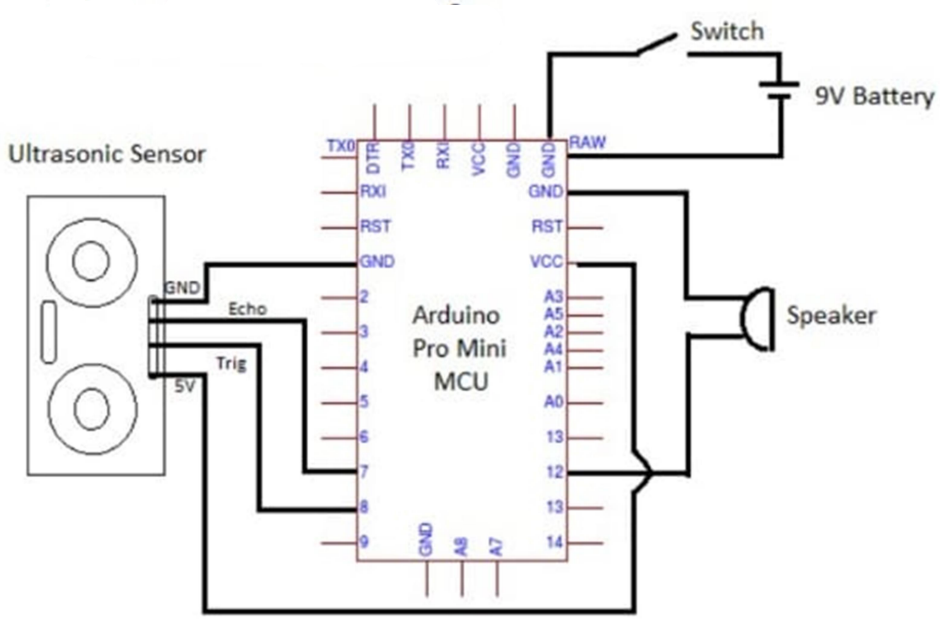
The main objective of Visually impaired persons frequently require assistance in traversing their home and outside on a daily basis. Human aid is not always feasible, hence a solution is required. These GLASSES are designed for blind people. This devices helps the blind people to easily feel the obstacles in front of them and can save them from accidents. This gadget consists of a pair of glasses with an obstacle detection module installed in the middle, a processing unit, an output device (a buzzer component), and a power source. The processing unit is linked to the obstacle detecting module and the output device. The power supply provides electricity to the central processor unit. The obstacle detection module comprises primarily of an ultrasonic sensor, the processing unit of a control module, and the output unit of a buzzer. The control unit activates the ultrasonic sensors, which collect information about the barrier in front of the man and process it before sending it to the buzzer. These Ultrasonic Smart Glasses for Blind People are a portable gadget that is simple to use, low in weight, user pleasant, and inexpensive. These spectacles might readily advise blind persons and assist them in avoiding hazards.

Physically impaired people can communicate with non-disabled people with the help of smart hand gloves. Due to his inability to talk, the Disabled person uses these smart gloves to translate his hand motions into text or voice recordings. The smart gloves have the capability of controlling home appliances from which a physically disabled person can become independent to live. The main objective is to develop a reliable easy to use light weight. This also helps normal people to understand when he is trying to say and do accordingly. System of intelligent hand gloves that can reduce hurdles for persons with disabilities. The smart glove is made of a leather glove with flex sensors on each finger to track finger bending movements. Along with hand gestures, the deaf and dumb employ hand movements.

CHAPTER-2

EXPLANATION OF BLOCK DIAGRAM

2.1. Ultrasonic glasses for blind:

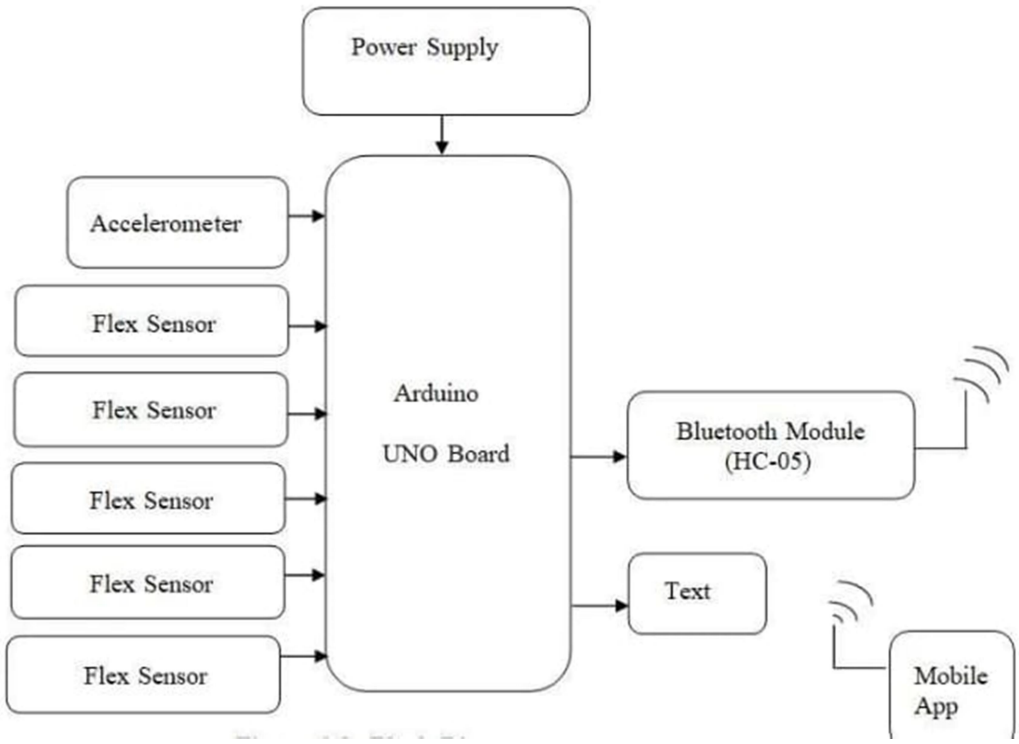


Connections:

- The connections of our project are discussed below:
- Arduino UNO which has 6 analog pins (A0-A5).
- Five flex sensors are to be taken and one terminal of each sensor is connected to 5V of Arduino UNO along with static resistance of 10KΩ resistance and another terminal of sensors to the 5 analog pins of Arduino Uno (A0 - A4).
- Accelerometer pins like SDA are connected to the A4 pin of UNO and the SCL pin of the Accelerometer is connected to the A5 pin of UNO.
- GND and VCC pins of the Accelerometer are connected to the GND and VCC pins of UNO.
- Bluetooth Module (HC-05) pins like Tx, and Rx are connected to Rx and Tx pins of Arduino UNO. And GND and VCC pins are connected to the GND and VCC pins of UNO.

- LCD display pins like D4, D5, D6, D7 are connected to the 10,11,12,13 pins of Arduino UNO. RS, Enable pins are connected to 8, and 9 pins of UNO.
- LCD display units like VDD and VSS are connected to 5v and the Ground pin of Arduino UNO.

2.2. Smart gloves for deaf and dumb:



Connections:

- Vin is given to the positive terminal of the battery and the negative terminal is connected to the ground of the Arduino.
- Arduino 5v is connected to both Vcc of the sensor and the buzzer.
- Trig is connected to D12, Echo is connected to D11 of the Arduino ground is connected to both grounds of sensor and buzzer.
- I\O from the buzzer is connected to D8.

CHAPTER-3

SCOPE OF THE PROJECT

3.1. Ultrasonic glasses for blind:

In a normal day to day situation a blind person waves the glasses ahead of them in order to check for any objects or obstacles. The smart glasses helps them in this by detecting if any obstacle is blocking the path being taken by the subject. The glasses can now detect obstacles and transmit this to the blind person. The ultrasonic sensors are mounted on glasses on 2 side to act as eyes. The sensors constantly transmit and receive ultrasonic waves to receive obstacle data. The Microcontroller is constantly getting this data from the sensors. The HC-SR04 ultrasonic sensor is to determine the distance of an object just like the bats do. It offers excellent non-contact range detection with high accuracy and stable readings in an easy-to-use package from 2 cm to 400 cm or 1" to 13 feet. As these spectacles help the blind and visually disabled to better orient themselves. The direction, size, distance and space distribution of obstacles located in the field of vision up to 6 m distance are quasidiagonal displayed by vibration generators mounted on the forehead or by optoelectronic signal generators.

3.2. Smart gloves for deaf and dumb:

Smart hand gloves is to impart an easier means of communication between speech impaired people and normal people using synthesized speech. A smart glove is incorporated with flex sensors whose, resistance value changes according to the gesture specified by the user. This gesture information is processed by the Arduino Mega 2560 microcontroller and corresponding voice output is given through speaker in the desired language. In case of emergency, the location of user can be tracked through GPS and a message is sent to the guardian through GSM. Flex sensors are used as gesture input . They are placed on gloves which can be easily operated by the user by making gestures. According to the gesture made by the user the resistance values will change and sensor produces voltage correspondingly. The output voltage of flex sensors is in the analog form which is converted into digital form by using inbuilt ADC of Arduino Mega 2560. Predefined gestures with corresponding messages are stored in the database of the

microcontroller in different languages. Arduino Mega 2560 checks whether the input voltage from the flex sensors exceeds the threshold value that is stored in the database. The output from the Arduino is sent to APR33A3 and LCD. LCD displays the message that was assigned to the gesture in the database. Speech signal is produced using APR (Auto Playback Recorder) through speaker.

The user is given a choice of selecting a desired language for communication through the switches. A panic switch is also provided in case of emergency situations to track the location of the device user. When this panic switch is pressed a message is sent to the guardian as “EMERGENGY” with the location in the form of Google maps.

CHAPTER-4

PROGRAMMING PART

4.1. Ultrasonic glasses for blind:

```
#define trigPin 9

#define echoPin 10

#define buzzer 6

long duration;

float distance;

void setup()

{

Serial.begin(9600);

pinMode(trigPin, OUTPUT);

pinMode(echoPin, INPUT);

pinMode(buzzer,OUTPUT);

}

void loop()

{

digitalWrite(trigPin, LOW);

delayMicroseconds(2);

digitalWrite(trigPin, HIGH);

delayMicroseconds(10);

digitalWrite(trigPin, LOW);

duration = pulseIn(echoPin, HIGH);
```

```
distance= duration*0.034/2;
Serial.print("Distance: ");
Serial.println(distance);
if (distance < 200)     // This is where checking the distance you can change the value
{
 // When the the distance below 100cm
digitalWrite(buzzer,HIGH);
}
 else
{
  // when greater than 100cm
digitalWrite(buzzer,LOW);
}
}
```

4.2. Smart gloves for deaf and dumb:

```
#include <LiquidCrystal.h>

#include <LiquidCrystal.h>

#include <Wire.h> // Library for I2C communication

#include <LiquidCrystal_I2C.h> // Library for LCD

LiquidCrystal_I2C lcd(0x27,16,2); // Change to (0x27,16,2) for 16x2 LCD.my address is (0x3F)

#include <MPU6050.h>

MPU6050 mpu;

#define adc1 A0

#define adc2 A1

#define ledd 13

int flex2=0,flex1=0,flex3=0,flex4=0;

void setup()

{

   // put your setup code here, to run once:

 lcd.init();

 lcd.backlight();

 lcd.setCursor(0,0);

 lcd.print("   WELCOME TO ");

 lcd.setCursor(3,1);

 lcd.print(" GMRIT EEE");

 delay(1500);

 Serial.begin(9600);
```

```
 Serial.println("Initialize MPU6050");
 while(!mpu.begin(MPU6050_SCALE_2000DPS, MPU6050_RANGE_2G))
 {
  Serial.println("project review started");
  delay(500);
 }
Serial.println();
 Serial.print(" * Sleep Mode:            ");
 Serial.println(mpu.getSleepEnabled() ? "Enabled" : "Disabled");
 Serial.print(" * Clock Source:          ");
 switch(mpu.getClockSource())
 {
  case MPU6050_CLOCK_KEEP_RESET:     Serial.println("Stops the clock and keeps the timing generator in reset"); break;
  case MPU6050_CLOCK_EXTERNAL_19MHZ: Serial.println("PLL with external 19.2MHz reference"); break;
  case MPU6050_CLOCK_EXTERNAL_32KHZ: Serial.println("PLL with external 32.768kHz reference"); break;
  case MPU6050_CLOCK_PLL_ZGYRO:      Serial.println("PLL with Z axis gyroscope reference"); break;
  case MPU6050_CLOCK_PLL_YGYRO:      Serial.println("PLL with Y axis gyroscope reference"); break;
  case MPU6050_CLOCK_PLL_XGYRO:      Serial.println("PLL with X axis gyroscope reference"); break;
  case MPU6050_CLOCK_INTERNAL_8MHZ:  Serial.println("Internal 8MHz oscillator"); break;
```

```
 }
 Serial.print(" * Accelerometer offsets: ");
 Serial.print(mpu.getAccelOffsetX());
 Serial.print(" / ");
 Serial.print(mpu.getAccelOffsetY());
 Serial.print(" / ");
 Serial.println(mpu.getAccelOffsetZ());
 Serial.println();
 //checkSettings();
}
/*void checkSettings()
{
 }*/
void loop()
{
  delay(10);
  Vector rawAccel = mpu.readRawAccel();
  Vector normAccel = mpu.readNormalizeAccel();
    delay(1000);
 if(flex1<180 && flex2<180)
  {
   digitalWrite(ledd,LOW);
   if(normAccel.XAxis>3)
   {
```

```
 Serial.println("FAN ON");
 delay(500);
 lcd.clear();
 lcd.setCursor(0,0);
 lcd.print("IT'S HOT");
 lcd.setCursor(0,1);
 lcd.print("TURN ON FAN");
 delay(3000);
 }
else if(normAccel.XAxis<-3)
{
 Serial.println("STUDY");
 delay(500);
 lcd.clear();
 lcd.setCursor(0,0);
 lcd.print("I WANNA STUDY");
 lcd.setCursor(3,1);
 lcd.print("GIVE ME BOOKS");
 delay(1500);
 }
else if(normAccel.YAxis>3)
{
 Serial.println("MEDICINE");
 delay(500);
```

```
    lcd.clear();
    lcd.setCursor(0,0);
    lcd.print("I AM ILL ");
    lcd.setCursor(3,1);
    lcd.print("GIVE ME MEDICINE");
    delay(1500);
    }
   else if(normAccel.YAxis<3)
   {
    Serial.println("FOOD");
     delay(500);
      lcd.clear();
    lcd.setCursor(0,0);
    lcd.print("I AM HUNGRY");
    lcd.setCursor(3,1);
    lcd.print("GIVE ME FOOD");
    delay(1500);
   }
  }
}
```

CHAPTER-5

EXPLANATION OF COMPONENTS

5.1. Arduino Nano:

The working nature of the Arduino Nano involves the following steps :

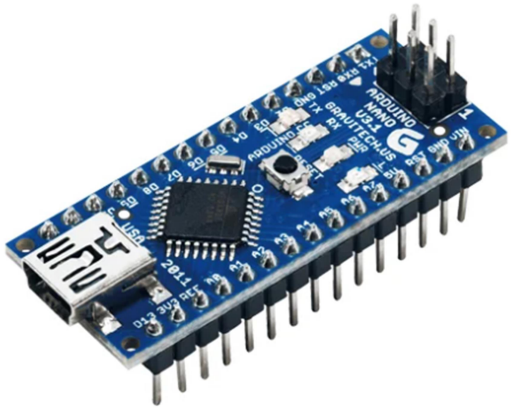


Fig 5.1 Arduino NANO

5.1.1. Powering up: The Arduino Nano can be powered up by connecting it to a USB port or a 7-12V DC power source.

5.1.2. Programming: The Arduino Nano can be programmed using the Arduino IDE. You can write code in the Arduino IDE, upload it to the board, and the board will execute the program.

5.1.3. Input and output: The Arduino Nano has a variety of input and output pins that allow you to connect sensors, actuators, and other devices to the board. You can use the digital and analog pins to read inputs from sensors and control outputs to actuators.

5.1.4. Communication: The Arduino Nano can communicate with other devices using various communication protocols such as Serial, SPI, and I2C. This allows you to control and monitor the board remotely.

5.2. Ultrasonic Sensor:

The ultrasonic sensor used in the ultrasonic glasses for blind project is a type of sensor that uses sound waves to detect the distance between the sensor and an object. The sensor emits high-frequency sound waves and then listens for the echo that bounces back from the object. By measuring the time it takes for the sound wave to travel to the object and back, the sensor can calculate the distance to the object.

The ultrasonic sensor used in the project is typically a small module that contains both the ultrasonic transmitter and receiver. The sensor is connected to a microcontroller, such as an Arduino, which processes the distance data and sends signals to a set of vibrating motors attached to the glasses. The motors vibrate at different intensities depending on the distance to the object, providing haptic feedback to the blind user.

Fig 5.2 Ultrasonic Sensor

The ultrasonic glasses for blind project aim to help visually impaired individuals navigate their surroundings more easily. By using ultrasonic sensors to detect obstacles in their path, the glasses can provide tactile feedback to help the user avoid collisions and navigate more safely.

5.3. Buzzer:

The buzzer is a crucial component of the ultrasonic glasses for blind project. The ultrasonic sensor detect the distance between the user and any obstacle present in their path, and this information is conveyed to the user through audio feedback.

The buzzer is responsible for providing this audio feedback to the user. When the sensors detect an obstacle, the buzzer produces a beep sound at a specific frequency, which increases in intensity and frequency as the user gets closer to

the obstacle. This audio feedback helps the user determine the distance and location of the obstacle, enabling them to navigate around it safely.

Fig 5.3 Buzzer

Therefore, the buzzer plays a crucial role in providing audio feedback to the user, making the ultrasonic glasses for blind project an effective solution for visually impaired people to navigate their surroundings safely and independently.

5.4. Battery:

The 5V battery in the ultrasonic glasses for blind project serves as a power source to power the electronic components of the device. The project uses an ultrasonic sensor module, a microcontroller, and a buzzer to detect obstacles and provide audio feedback to the user.

The ultrasonic sensor module requires a power supply to operate, and the 5V battery provides the necessary power to run the sensor. The microcontroller, which processes the signals received from the sensor and controls the buzzer, also requires a power source, which is provided by the same battery.

Using a 5V battery ensures that the electronic components receive the required voltage and current to operate efficiently. Additionally, a 5V battery is small and compact, making it easy to integrate into the design of the glasses without adding too much weight or bulk.

Fig 5.4 Battery 5V

In summary, the 5V battery serves as a power source to power the electronic components of the ultrasonic glasses for blind project, enabling it to detect obstacles and provide audio feedback to the user.

5.5. Flux Sensor:

A flux sensor is a type of sensor that can be used in the smart gloves project for deaf and dumb people to detect and interpret hand movements. The project aims to develop gloves that can translate hand gestures into spoken or written language, enabling people with hearing or speech impairments to communicate more effectively.

The flux sensor is used in the smart gloves project to detect the orientation of the hand and provide feedback to the user. The sensor detects the magnetic field generated by a small magnet attached to the glove, which changes as the hand moves. The sensor then provides an output signal that can be used to determine the orientation of the hand in real-time.

Fig 5.5 Flux Sensor

The flux sensor is a crucial component of the smart gloves project, as it enables the gloves to accurately detect and interpret hand movements, making it an effective solution for deaf and dumb people to communicate more easily and independently.

5.6. Bluetooth module:

The Bluetooth module is used in the smart gloves project to transmit the data collected by the gloves to a mobile device, such as a smartphone or tablet. The mobile device then uses software to interpret the data and translate the hand gestures into spoken or written language.

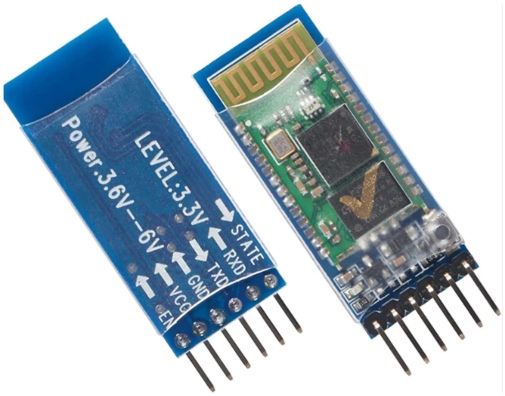


Fig 5.6 Bluetooth Module

By using a Bluetooth module, the smart gloves can communicate wirelessly with the mobile device, enabling the user to move around freely while wearing the gloves. The Bluetooth technology is also widely available and easy to use, making it an ideal choice for this type of project.

5.7. MPU Accelerometer:

The MPU accelerometer is used in the smart gloves project to detect the orientation and movement of the hand. The sensor detects changes in acceleration and tilt in three-dimensional space and provides output signals that can be used to determine the orientation and movement of the hand in real-time.

By using an MPU accelerometer in the smart gloves, the gloves can accurately detect the hand movements, enabling the translation software to interpret the gestures and translate them into spoken or written language.

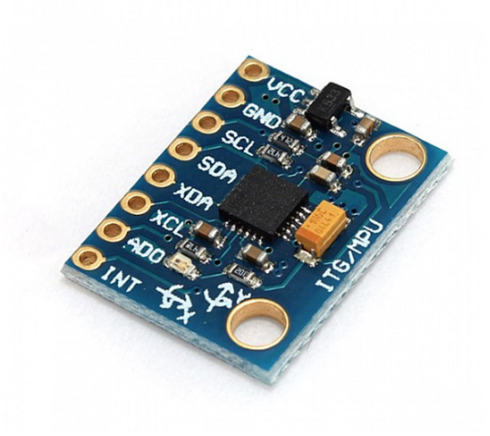


Fig 5.7 MPU-6050 Accelerometer

The MPU accelerometer is a key component of the smart gloves project, as it enables the gloves to accurately detect and interpret hand movements, making it an effective solution for deaf and dumb people to communicate more easily and independently.

5.8. Arduino UNO:

The Arduino Uno is a microcontroller board that is often used in various electronic projects due to its flexibility and ease of use. In the case of a smart gloves project for deaf and dumb people, the Arduino Uno can be used to control and process the data from the sensors in the gloves.

The smart gloves project for deaf and dumb people involves embedding sensors in the gloves that can detect hand movements and convert them into text or speech. For example, the sensors can detect finger movements to form different sign language gestures, which can then be translated into text or speech using software running on a computer or mobile device.

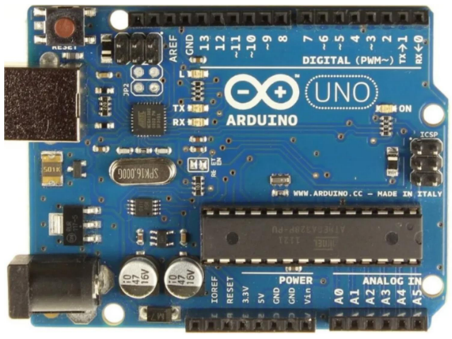


Fig 5.8 Arduino UNO

The Arduino Uno can be used to interface with these sensors, collect the data they generate, and then send it to the computer or mobile device for processing. The board can also be used to control other components of the smart gloves, such as vibration motors or LED lights, which can provide feedback to the wearer.

5.9. Jumper Wires:

A jumper wire is an electric wire that connects remote electric circuits used for printed circuit boards. By attaching a jumper wire on the circuit, it can be short-circuited and short-cut (jump) to the electric circuit.

Fig 5.9 Jumper Wires

By placing the jumper wire on the circuit, it becomes possible to control the electricity, stop the operation of the circuit, and operate a circuit that does not operate with ordinary wiring.

CHAPTER-6

WORKING OF THE PROJECTS

6.1. Ultrasonic glasses for blind

6.1.1. Hardware setup: An Arduino board, an ultrasonic sensor module (usually HC-SR04), and some jumper wires are required. VCC, GND, Trig, and Echo are the four pins on the ultrasonic sensor. VCC and GND are linked to the Arduino's 5V and GND pins, respectively. Trig and Echo are linked to two Arduino digital pins, one for transmitting the trigger signal and the other for receiving the echo signal.

6.1.2. Triggering the sensor: In your Arduino code, first set the Trig pin to output and the Echo pin to input. To activate the sensor, set the Trig pin to HIGH for a brief period of time (usually 10 microseconds) and then back to LOW. The ultrasonic sensor responds by emitting a burst of sound waves.

6.1.3. Receiving the Echo: When the ultrasonic waves generated by the sensor collide with an item, they bounce back and are received by the Echo pin. The Arduino measures the time that the Echo pin remains HIGH, which corresponds to the time it takes for sound waves to travel to and from the item**.**

6.1.4. Calculating distance: Using the duration of the echo signal, you can calculate the distance to the object using the formula: distance = (duration * speed of sound) / 2. The speed of sound is approximately 343 meters per second at room temperature.

6.1.5. Processing the data: You may utilise the computed distance in your Arduino code to conduct a variety of actions dependent on the needs of your project. It can be used to regulate the movement of a robot, to sound an alarm when an item gets too close, or to show the distance on an LCD screen.

6.1.6. Looping and continuous measurement: Typically, you would include the triggering and distance measuring code within your Arduino code's loop() method, so that the distance is continually measured and updated as long as the Arduino is switched on.

6.2. Smart gloves for deaf and dumb:

6.2.1. Hardware setup: You would need an Arduino Nano, an accelerometer or gyroscope sensor (such as MPU6050), a Bluetooth module (such as HC-05), flex sensors (to detect finger movements), and some basic electronic components like resistors and wires. The accelerometer or gyroscope sensor is typically used to detect the orientation and movement of the hand, and the flex sensors are used to detect the bending of fingers.

6.2.2. Sensor data acquisition: The Arduino Nano is programmed to read data from the accelerometer/gyroscope and flex sensors to capture the hand movements and finger gestures of the user. The accelerometer/gyroscope can provide information about the hand's orientation, tilt, and movement, while the flex sensors can detect the bending of fingers.

6.2.3. Gesture recognition: Using appropriate algorithms in your Arduino code, you can process the sensor data to recognize specific sign language gestures. For example, you can define a set of hand orientations or finger bend angles that correspond to different sign language letters or words, and then use the sensor data to match against these predefined gestures to recognize the intended communication.

6.2.4. Data transmission: Once a gesture is recognized, the Arduino Nano can send the corresponding data, such as the recognized letter or word, to a connected Bluetooth module for wireless transmission. The Bluetooth module can be paired with a smartphone, tablet, or other devices equipped with a Bluetooth receiver.

6.2.5. Data processing and output: On the receiving device (e.g., a smartphone), a companion application or software can process the received data and convert it into spoken words or text. This can be achieved using text-to-speech (TTS) or speech recognition algorithms. The converted spoken words or text can then be displayed on the screen or played through speakers, allowing the communication partner to understand the intended sign language message.

6.2.6. User feedback: Optionally, you can provide feedback to the user wearing the smart gloves to confirm successful gesture recognition, such as through LED indicators or haptic feedback (e.g., vibrations) on the gloves themselves.

6.2.7. Power management: Depending on your project requirements, you may need to consider power management techniques, such as using sleep modes or low-power components, to extend the battery life of the smart gloves and ensure optimal operation.

CHAPTER-7
CONCLUSION

This study introduces a novel smart device that enables visually impaired persons to move about at any time while avoiding various obstacles in both indoor and outdoor environments. The purpose of this smart glass is to alert a blind person who cannot see anything about an accident. In the future, it might be used as an image recognition system where a sensor informs the user about an object. Our design is more cost-effective and comfy. This device is compact, light in weight, and consumes little power, making it user-friendly. Ultrasonic sensors are employed in it. Future research work will include making the system wireless and implementing image recognition to get the information of obstacle.

It is actually highly beneficial to improve communication between a normal person and a deaf/dumb person by creating a glove-based Sign Language translator. A thorough analysis of numerous earlier studies illustrates the difficulties, restrictions, advantages, and suggestions for creating a gesture-based communication system. The main benefit is that the output is provided in a matter of seconds and the sensors directly provide the bend value to the glove. Additionally, the programming can add an increasing number of movements to create a variety of words. The project's accuracy and output-delivery capacity can be improved by using machine learning and artificial intelligence. In such situation, instead of classifying the new movements as improper, the programme begins to learn them. The only two main components of the suggested framework are an android phone and a microcontroller, making it a universal system. A deaf or dumb person can communicate without the need of a pen or piece of paper. This framework offers an extremely straightforward and uncomplicated method of communication. In future, similar projects should take into consideration the weight and size of the system, to make them easy to wear and that they do not involve any interference from a PC or any similar big system. Also, movement of eyes and lips can be incorporated by using various other sensors. The purpose of this particular project was to check the feasibility of recognizing the gestures of various sign languages using sensory gloves. Apart from that, the accuracy of translation can be increased by increasing the number of sensors.

Fig 7.1 Image of Ultrasonic Glasses for the Blind

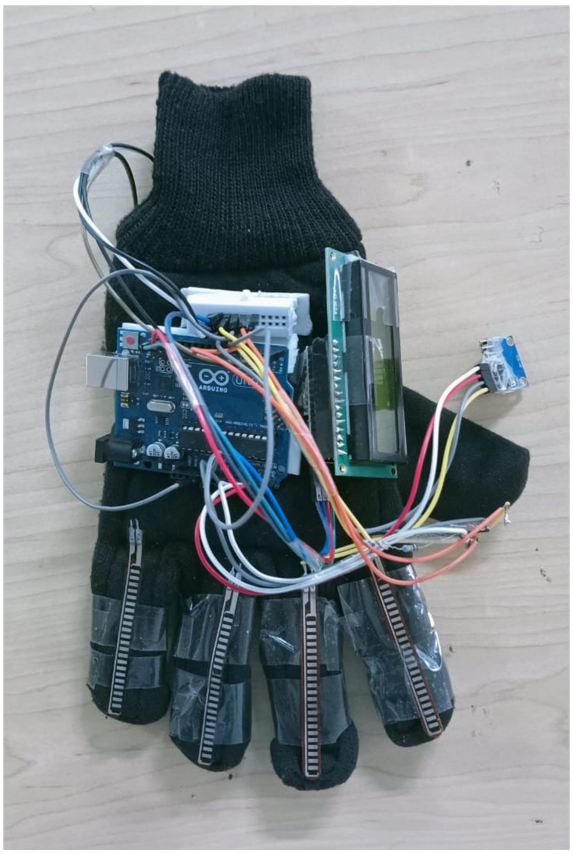


Fig 7.2 Smart Gloves for Impaired people

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