SMART BLIND STICK USING ARDUINO UNO FOR VISUALLY IMPAIRED PEOPLE AND DEAF PEOPLE.

ABSTRACT

The **objective of this project is used to help the blind peoples** and they are able to easily interact with the physical world by using this smart blind stick. About 285 million of peoples are usually impaired worldwide; 39 million are blind and 246 million have low vision. If we are notice, we know very well about it they can't walk without the help of other. One has to ask guidance to reach their destination. Using this smart blind stick a person can walk confidently. This stick is with ultrasonic sensor detects the object in front of the person and give instant response to the user by alarm from the buzzer and vibrating the handle cause of ERM (Eccentric Rotating Mass vibration motor) brush type coin vibration motor is fixed behind the handle of the stick. The microcontroller (Arduino Uno) to receive the sensor singles and process them to short pulses to the Arduino pins where and ERM motor are connected. This device will be the best solution to overcome their difficulties and help them to live the better life.

CHAPTER -1

INTRODUCTION

Eyes are organs of the visual system that can detect all the changes around environment. Visually impaired persons have difficulty to interact and feel their environment. They have little contact with surrounding. Physical movement is a challenge for visually impaired persons, because it can become tricky to distinguish where he is, and how to get where he wants to go from one place to another. they usually use their hearing senses for navigation assistance in their daily activities, but if they are only use the sense of hearing it will be dangerous for their safety, so it needed to develop an intelligent and smart stick to assist and alert visually impaired persons from obstacles and give information about their location. This blind stick is designed using a heart pulse sensor and various electronic modules that can be connected to the Android device of the closest relative. The use of pulse heart sensors will function as sensing the value of the pulse per minute, this aims to determine the condition of a person's body. Basically when humans are in a panic condition, the heart pulse will beat more than the normal frequency, there are several things that will happen if someone experiences anxiety, as follows :Psychological symptoms: feelings of anxiety, bad premonitions, fear of their own thoughts, irritability, tension, anxiety, and shock. Disorders of sleep frequency and tense dreams. Impaired concentration and memory Somatic symptoms: pain in muscles and bones, heart palpitations, spasms, shortness of breath, indigestion, urinary disorders, humid cold hands .The design of the device resembles as a general white cane. it is divided into 2 types, a long cane and folding cane. Long cane, designed primarily as a mobility tool used to detect objects in the path of auser. Cane length depends upon the height of a user, and traditionally extends from the floor to the user's sternum. It is the most well-known variant, though some organisations favor the use of much longer canes. Folding cane are a convenient way to take the cane anywhere to go. But, this stick type is not good, because the conductivity is less sensitive and less strong when used . Sutarsi Suhaeb was develop a smart cane for blind peoples using ultrasonic sensor, microcontroller ATMega 8535,buzzer, and Vibration DC Motor.

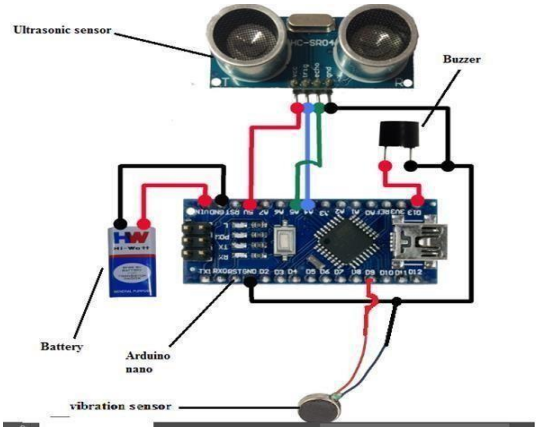
CHAPTER - 2

DESIGN METHODOLOGY

The working behind this blind stick is that it is used for special purpose as a sensing device for the blind people. The circuit provides 5V power supply for the circuit and maintains its output of the power supply at constant level. Itis used widely to detect objects using ultrasonic sensor and IR sensor. If any object is present, the ultrasonic sensor detects the object by measuring the distance between the object and the user and sends the data to the arduino UNO. To determine the distance of an object , calculate the distance between sending the signal and receiving back the signal.*Distance=speed*time .The speed of the signal travelling through air is 341m/s. The time is calculated between the sending and receiving back the signal. Since the distance travel by the signal is double, itis divided by two i.e., Distance=*Distance/2IR sensor is placed at right and left of the stick to detect the object. Since, it is very small range, it detects the closer objects. Arduino processes with this data and calculates with the command conditions. If any object is found nearer, it sends the command to the user through the speaker or microphone. The command is already stored in the voice playback module which sends alert message to the user about the object. The command condition is as follows:[1] If the distance between the objects and the person is
25cm, it will send the command as the obstacle is nearer to the person.

CHAPTER-3

CIRCUIT DIAGRAM



Please make the connections according to the given **Smart blind stick circuit diagram**.

- Attach the 5-volts and GND pins of the Arduino to the VCC and GND pins of the ultrasonic sensor.
- Connect the TRIG and ECHO pins of the ultrasonic sensor with the digital-9 and digital-10 pins of the Arduino
- Join the positive and negative wire of the buzzer with the digital-5 and GND pins of the Arduino.
- Attach the positive leg of the LED with the digital-6 pin of the Arduino and the negative leg of the LED with the GND pin of the Arduino through a 220-ohm resistor.

Attach the vibrator sensor that works on 5 volts. Positive to digital pin 5 and negative to the ground.

CHAPTER -4

COMPONENTS REQUIRED

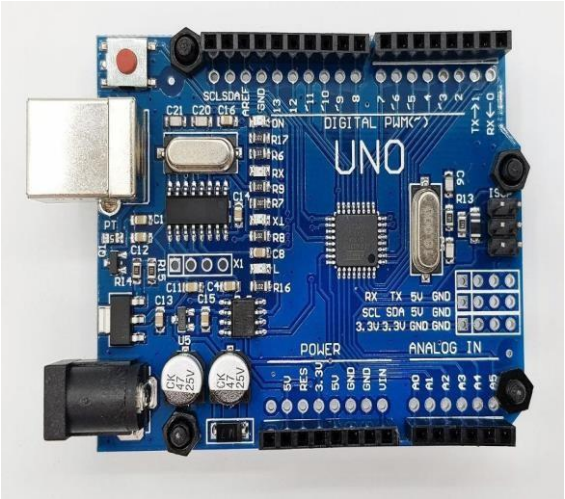
The project requires very few components and the connection is also very simple.

The components are listed below:

- Arduino UNO
- USB cable for uploading the code
- Jumper wires
- HC-SR04 ultrasonic sensor
- Buzzer
- Vibrator sensor
- DC batteries

CHAPTER 5

ARDUINO UNO



The **Arduino Uno** is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc and initially released in 2010. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.[1] The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable.[4] It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is similar to the Arduino Nano and Leonardo.[5][6] The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available.

ULTRASONIC SENSORS

Ultrasonic ranging module HC - SR04 provides 2cm - 700cm noncontact measurement function, the ranging accuracy can reach to 3mm.Ensured stable signal within 5m, gradually faded signal outside 5m till disappearing at 7m position.

The modules includes ultrasonic transmitters, receiver and control circuit. The basic principle of work:

(1) Using IO trigger for at least 10us high level signal ;

(2) The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back.

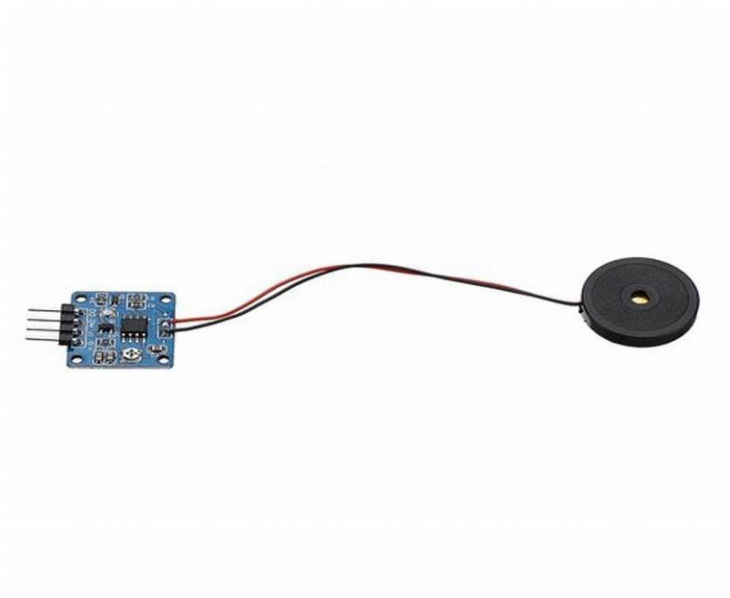
(3) IF the signal back, through high level , time of high output IO duration is the time from sending ultrasonic to returning. Test distance = (high level time×velocity of sound (340M/S) / 2.

BUZZER

Buzzer is a kind of voice device that converts audio model into sound signal. It is mainly used to prompt or alarm. According to different design and application, it can produce music sound, flute sound, buzzer, alarm sound, electric bell and other different sounds.

Typical applications include siren, alarm device, fire alarm, air defence alarm, burglar alarm, timer, etc. It is widely used in household appliances, alarm system, automatic production line, low-voltage electrical equipment, electronic toys, game machines and other products and industries.

VIBRATOR SENSOR



Vibration Sensors are vibration monitoring equipment used widely by plant maintenance teams to find insight regarding equipment or piping performance. Using vibration sensors and studying the data from these devices, engineers can predict possibilities of equipment failure and they can safeguard major equipment from breakdown by taking proper action. Vibration Sensors are also known as vibration transducers.

DC BATTERIES

An **electric battery** is a source of electric power consisting of one or more electrochemical cells with external connections for powering electrical devices.

When a battery is supplying power, its positive terminal is the cathode and its negative terminal is the anode.[2] The terminal marked negative is the source of electrons that will flow through an external electric circuit to the positive terminal. When a battery is connected to an external electric load, a redox reaction converts high-energy reactants to lower-energy products, and the free-energy difference is delivered to the external circuit as electrical energy. Historically the term "battery" specifically referred to a device composed of multiple cells; however, the usage has evolved to include devices composed of a single cell.

CHAPTER -6

WORKING

When we turn on the circuit power supply, at the same time the Ultrasonic sensors are transmitting ultrasonic sound waves from the transmitter parts. when any objects come in front of these sensors, then the ultrasonic sound waves reflect back from the object surface to the sensor receiver part, then the sensor receives this wave and generates Output. This output data goes to the Arduino nano. Then the Arduino calculates the distance between the sensor and the objects.

If one of the sensors detects the distance is less than 80 cm. Then the Arduino sends operating voltage to the Buzzer and the Vibrating motor. Now the buzzer generates sound and the motor start Vibrating. If one of the sensors detects the distance is less than 60 cm. Again the Arduino sends operating voltage to the Buzzer and the Vibrating motor. But this time buzzer generates sound and the motor start Vibrating faster.

When the sensors do not detect an object. In this condition, the buzzer and the motor are stopped.

CHAPTER-7

ARDUINO CODE

```
  Program for Smart Blind Walking Stick Using Arduino and two Ultrasonic Sensors.
* Code by ELECTRODUINO
* Website: www.electroduino.com
 */
    int trigpin1 = 8; // Defines Tirg pins of the Ultrasonic
Sensor 1
int echopin1 = 7; // Defines Echo pins of the Ultrasonic Sensor 1
    int trigpin2 = 10; // Defines Tirg pins of the Ultrasonic
Sensor 2
int echopin2 = 9; // Defines Echo pins of the Ultrasonic Sensor 2
    int BUZZpin = 3; // Defines BUZZER pins
int
Vmotor = 2; // Defines Vibrating motor pins
    void
setup()
{
 Serial.begin (9600);    pinMode(trigpin1,OUTPUT); // Sets the
trigPin1 as an Output    pinMode(echopin1,INPUT);  //
Sets the echoPin1 as an Input

 pinMode(trigpin2,OUTPUT); // Sets the trigPin1 as an Output
pinMode(echopin2,INPUT);  // Sets the echoPin1 as an Input

 pinMode(BUZZpin,OUTPUT); // Sets the BUZZER as an Output
pinMode(Vmotor,OUTPUT); // Sets the BUZZER as an Output

 }
     void
loop()
 {
  // measure distane using ultrasonic sensor 1 and Print sensor deta in serial
monitor      long duration1, distance1;      digitalWrite(trigpin1,LOW);
delayMicroseconds(2);      digitalWrite(trigpin1,HIGH);      delayMicroseconds(10);
digitalWrite(trigpin1,LOW);      duration1 = pulseIn(echopin1,HIGH);      distance1
= (duration1/2) / 29.1;
  Serial.print("distance1:");
  Serial.println(distance1); // TO Print sensor deta in serial monitor
  // delay(500); // delay for clearly shown in serial monitor
```

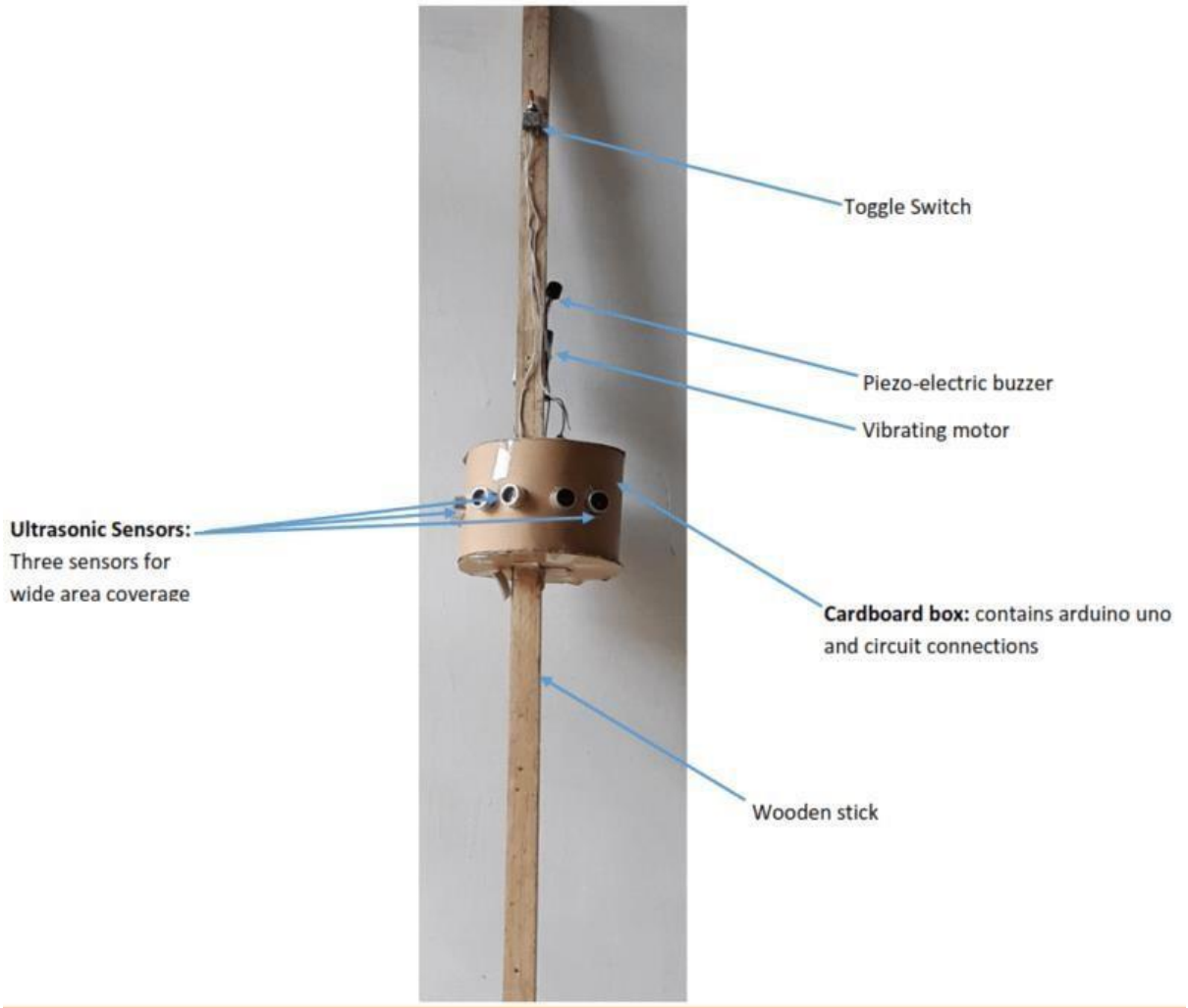
```
  // measure distane using ultrasonic sensor 2 and Print sensor deta in serial monitor
long duration2, distance2;
  digitalWrite(trigpin2,LOW);
delayMicroseconds(2);
digitalWrite(trigpin2,HIGH);
delayMicroseconds(10);
digitalWrite(trigpin2,LOW);     duration2 =
pulseIn(echopin2,HIGH);     distance2 =
(duration2/2) / 29.1;
  Serial.print("distance2:");
  Serial.println(distance2); // TO Print sensor deta in serial monitor
 // delay(500); // delay for clearly shown in serial monitor



  //if any sensor senses distance less than 80 cm then the buzzer generates sound and
the motor starts vibrating.      if(distance1 <= 80 || distance2 <= 80 )
  {
    digitalWrite(BUZZpin,HIGH);
delay(100);
    digitalWrite(BUZZpin,LOW);
delay(100);
    digitalWrite(Vmotor,HIGH);
delay(100);
    digitalWrite(Vmotor,LOW);
    delay(100);
   }

 //if any sensor senses distance less than 40 cm then the buzzer generates sound and
the motor starts vibrating faster      if(distance1 <= 40 || distance2 <= 40 )
  {
    digitalWrite(BUZZpin,HIGH);
delay(50);
    digitalWrite(BUZZpin,LOW);       delay(50);
    digitalWrite(Vmotor,HIGH);
delay(50);
    digitalWrite(Vmotor,LOW);
    delay(50);
   }
  // else the buzzer generates sound after every 3 seconds for indicating the device
is on            else
  {
```

```
    digitalWrite(BUZZpin,LOW);
digitalWrite(Vmotor,LOW);
    }
```



Output image of smart blind stick

CHAPTER -8

ADVANTAGES :-

We have many reasons to design smart stick for blind; firstly, the blind to feel free, isn't surrounded by wires as in belt and its content.

Secondly, is easy to use because it is familiar and affordable. Thirdly, to be able to detect obstacles that exist on the ground (this is not available in glasses), which he walks indoor and outdoor is faced by obstacles such as puddles and sidewalks.

It also helps blind and as well as deaf people who are facing problem.

DISADVANTAGES :-

They can’t detect obstructions that are hidden but very dangerous for the blind such as downward stairs, holes etc. Usually, the feedback information comes out as either vibration or sound signals. Consequently, training is then necessary to help the user understand the signals and to react to them in real time. The information is transmitted as a sound it may be embarrassing for the blind person in public.

CHAPTER -9

APPLICATIONS :-

Obstacle detection is one of the major concerns for a fully or a partially blind person (e.g. person suffering from night-blindness and hard hearing (deafness), cataracts, glaucoma, albinism or injury). Presented here is a smart stick using Arduino Uno. The stick uses Ultrasonic sensors for obstacle detection. The main aim of this project is to detect nearby obstacle and notify the user of the direction of that obstacle, thereby enabling the user to determine the corrective direction to head.

CONCLUSION

Humans are not disabled. A person can never be broken. Our built environment, our technologies, is broken and disabled. We the people need not accept our limitations, but can transfer disability through technological innovation.

This system offers a low-cost, reliable, portable, low-power consumption and robust solution for navigation with obvious short response time. Though the system is hard-wired with sensors and other components, it's light in weight. Further aspects of this system can be improved via wireless connectivity between the system components, thus, increasing the range of the ultrasonic sensor and implementing a technology for determine the speed of approaching obstacles. While developing such an empowering solution, visually impaired and blind people in all developing countries were on top of our priorities

CHAPTER – 10

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2. A. Agarwal, D. Kumar and A. Bhardwaj (2015). Ultrasonic Stick for Blind, International journal of engineering and computer science, 4(4), 11375-11378, Available at; file:///C:/ProgramData/BlueStacks/UserData/Library/My%20Apps/Downloads/1934-Article%20Text-3483-1-10-20180101.pdf.

3. G. Gayathri, M. Vishnupriya, R. Nandhini and M. Banupriya (2014). Smart Walking Stick for Visually Impaired, International Journal of Engineering and Computer Science, 3(3), 4057-4061, DOI:10.21817/ijet/2017/v9i5/170905302.

4. R. Radhika, P. G. Pai, S. Rakshitha and R. Srinath (2016). Implementation of Smart Stick for Obstacle Detection and Navigation, International Journal of Latest Research in Engineering and Technology, 2(5), 45-50, Available at: http://www.ijlret.com/Papers/Vol-2-issue-5/8-B2016247.pdf.