FABRICATION OF SMART STICK FOR THE BLIND USING ARDUINO

A MINI PROJECT REPORT

SUBMITTED BY

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In partial fulfillment for the award of the degree

Of

BACHELOR OF TECHNOLOGY

IN

MECHANICAL ENGINEERING

Under the Esteemed Guidance of

B. SRINIVAS M. TECH
Associate Professor

DEPARTMENT OF MECHANICAL ENGINEERING

SWARNANDHRA
COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
(Approved by A.I.C.T.E, New Delhi, Permanent Affiliation to
J.N.T. University Kakinada. Accredited by NAAC with "A" Grade)
JNT UNIVERSITY KAKINADA, KAKINADA

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CERTIFICATE

This is to certify that the mini project report entitled "FABRICATION OF SMART STICK FOR THE BLIND BY USING ARDUINO " is a bonafide work of " KAMPATI NAGA PAVANKUMAR (19A25A0318), KADALI KUMARASWAMY (19A25A0316) , KARNATI KANAKA DURGA PRASAD(19A25A0320) ,VENDRA KUMARSANDEEP (19A25A0348)" carried out during the academic year 2019-2022 in partial fulfillment for the award of the degree "BACHELOR OF TECHNOLOGY".

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Associate Professor	Professor

INTERNAL EXAMINER	EXTERNAL EXAMINER

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ACKNOWLEDGEMENT

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With Sincere Regards

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DECLARATION

I affirm that the project work titled "**FABRICATION OF SMART STICK FOR THE BLIND USING ARDUINO**" being submitted in partial fulfillment for the award of **BACHELOR OF TECHNOLOGY** (B. Tech) is the original work carried out by me.

It has not formed the part of any other project work submitted for award of any degree or diploma either in this or any other university.

I certify that the declaration made above by the candidate is true.

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B. SRINIVAS M.TECH.
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ABSTRACT

Traditionally blind people using the conventional cane stick to guide themselves by touching/poking obstacles in their way. This causes a lot of accidents and hence is dangerous for them and others. As this is a technologically driven era, we decided to aid these differently abled people by coming up with a technology utilizing solution. We call it as the “Smart Stick”.

The main aim of this smart walking stick helps blind people to perform their work easily and comfortably. In normal stick, the detection of the obstacle is not done and normal stick is not efficient for visually impaired persons.

The proposed stick contains the ultrasonic sensor, buzzer etc. The microcontroller then processes this data and calculates if the obstacle is close enough. If the obstacle is not that close the circuit does nothing. If the obstacle is close the microcontroller sends a signal to sound a buzzer.

In smart stick, the object is detected with the help of a sensor and also it measures the distance between objects by using ultrasonic sensor. If any obstacle comes in front of blind person, he/she can know about the obstacle by hearing the sound generated by the buzzer. It also has another feature that is which detects the water-by-water sensor and it gives the signal by a vibrator. This stick is very useful for people who are visually impaired and are often need help from others.

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION: -

Nowadays, visually impaired person suffers from serious visual impairments preventing them from travelling independently. Accordingly, they need to use a wide range of tools and techniques to help them in their mobility. One of these techniques is orientation and mobility specialist who helps the visually impaired and blind people and trains them to move on their own independently and safely depending on their other remaining senses. Recently, many techniques have been developed to enhance the mobility of blind people that rely on signal processing and sensor technology. According to the literature, the mainly classified into two major aspects: sonar input (infrared signals, or ultrasonic signals). The way these devices operate just like the radar system that uses ultrasonic fascicle or sonar to detect the obstacle of fixed and moving objects. The distance between the person and the obstacles is measured by the time of the wave travel. However, all existing systems inform the blind of the presence of an object at a specific distance in front of or near to him. Information about the object characteristics can create additional knowledge to enhance space manifestation and memory of the blind. To overcome the above-mentioned limitations, this work offers a simple, efficient, configurable electronic guidance system for the blind and visually impaired persons to help them in their mobility regardless of where they are, outdoor or indoor. Hence the proposed stick is termed as “SMART STICK”. Smart stick detects obstacles in front of the blind. They can’t detect obstructions that are hidden but very dangerous for the blind such as there in walking. Usually, the feedback information comes out as either vibration or sound signals. The originality of the proposed system is that it utilizes an embedded vision system of three simple ultrasonic sensors and brings together all reflective signals in order to codify an obstacle through PIC microcontroller (Arduino nano). Hence, in addition to distance the proposed guidance system enables the determination of two main characteristics of the obstacle which are material and shape. Ultrasonic sensors and water sensors take real time data and send it to the microcontroller. After processing this data, the microcontroller activates the buzzer when the obstacle is there and the water sensor detects the water on the ground gives the vibration alert.

1.2 OBJECTIVES: -

a) To reduce the risk of injuries and lost for the visually impaired persons.
b) For to improve walking conditions for blind persons.
c) To detect obstacles on the way.
d) To develop a prototype hardware for modern blind stick.
e) Blind people can be walk without guidance of other persons.
f) To design and develop blind person smart stick.
g) In order to determine the water content on the ground (or) floor.
h) To provide a sound-based assistance to blind people.
i) To move with a same ease and confidence as a straight people.

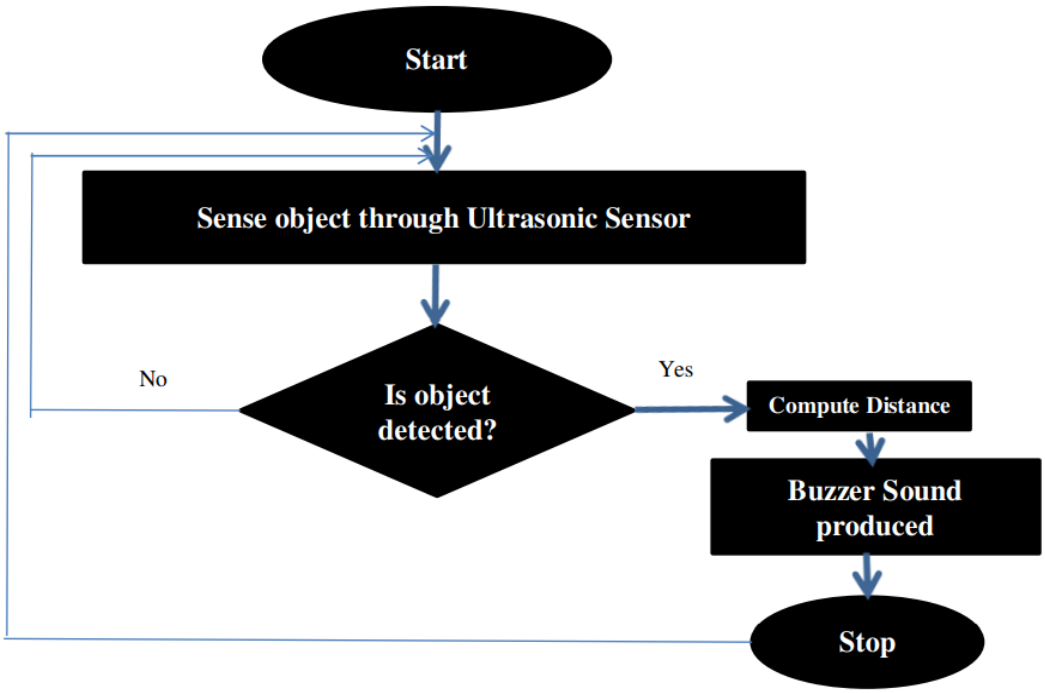
1.3 PROBLEM STATEMENT: -

a) Blind people can't easily recognize obstacles or stairs while using normal blind stick.
b) No safety features on the normal blind stick.

1.4 SIGNIFICANT OF PROJECT: -

- To prevent and reduce the risk of injuries of the visually impaired person.

1.5 TREE DIAGRAM: -



1.6 COST OF THE PROJECT: -

NAME OF THE COMPONENT	QUANTITY	COST
Arduino nano	2	980
Ultrasonic sensor	1	180
Water sensor	1	90
Buzzers	1	190
Switch	1	70
Jumper cables	1(pack)	100
Vibrator	1	80
HW battery	1	30
Pipe	1	100
TOTAL	**10**	**1820**

1.7 OVERVIEW: -

The purpose of this project is to detecting the obstacle by using ultrasonic sensor that can detect with maximum range about 1 meter. With our idea, we want to help this kind of people to live their life freely. This modern blind stick has a several feature that surely can help this blind people to detect an obstacle that surely can make their life routines easier. The user just needs to use the blind the normal blind stick, the different is, visually impaired person can detect an obstacle faster and easily and also it detects the water in contact with the stick by using the water sensor. This stick is very light weight and it also be availed at reasonable cost.

CHAPTER 2

FABRICATION OF SMART STICK

2.1 LIST OF THE COMPONENTS: -

a) Arduino board nano

b) Ultrasonic sensor

c) Water sensor.

d) Vibrator.

e) Buzzer.

f) Battery.

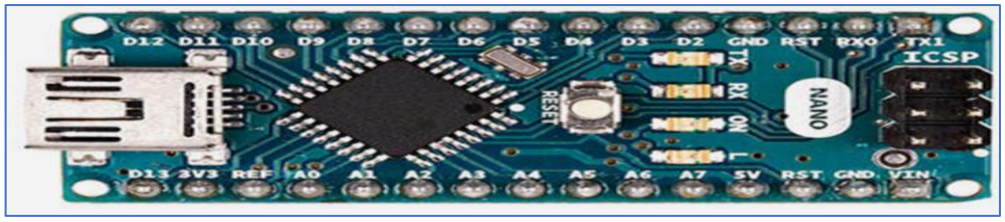
g) Switch.

h) Jumper wires.

i) Light Emitting Diode (LED)

2.2 EXPLANTION OF COMPONENTS -:

a) Arduino board nano: -



The Arduino Nano is a small Arduino board based on ATmega328P or ATmega628 Microcontroller. The connectivity is the same as the Arduino UNO board. The Nano is defined as a sustainable, small, consistent, and flexible microcontroller board. It is small in size compared to the UNO board. The Arduino Nano is organized using the Arduino (IDE), which can run on various platforms. Here, IDE stands for Integrated Development Environment.

The devices required to start our projects using the Arduino Nano board are Arduino IDE

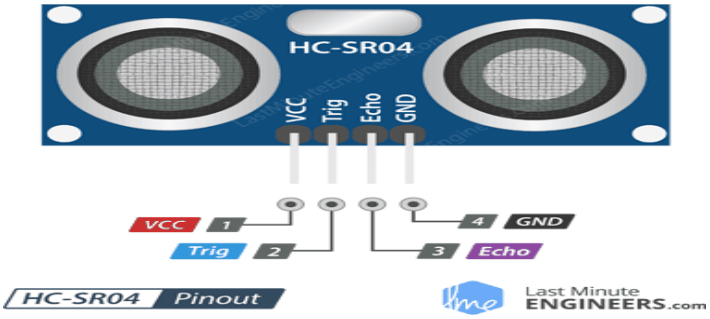
and mini-USB. Using the constant voltage, the Arduino Nano is used to produce a clock of a precise frequency. The Arduino IDE software must be installed on our respected laptop or desktop. The mini-USB transfers the code from the computer to the Arduino Nano board.

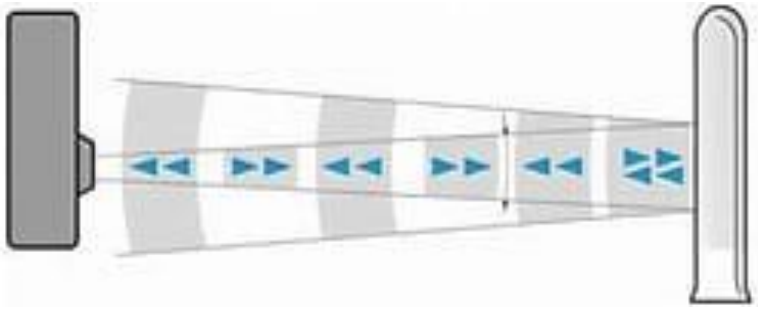
Basic Features of Arduino Nano

Here are few of its basic features which you must know if you are thinking to work on this great microcontroller board:

*It has 22 input/output pins in total.
*14 of these pins are digital pins.
*Arduino Nano has 8 analogue pins.
*It has 6 PWM pins among the digital pins.
*It has a crystal oscillator of 16MHz.
*Its operating voltage varies from 5V to 12V.
*It also supports different ways of communication, which are:
*Serial Protocol.
*I2C Protocol.
*SPI Protocol.
*It also has a mini–USB Pin which is used to upload code.
*It also has a Reset button on it.

b) Ultrasonic sensor: -



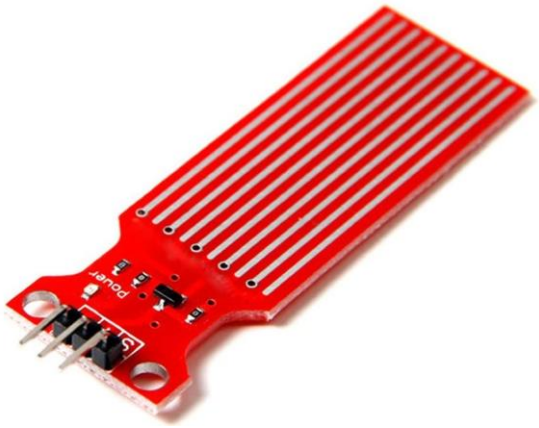


An ultrasonic sensor is as sensor which measures the distance of respective object by sending the sound wave of specific frequency. This sound wave is reflected after the

collision with respective object and this wave is received by the ultra-sonic receiver. Distance is measured by calculating sending and receiving time of this sound wave. you may also like to read distance measurement using ultrasonic sensor and arduino.

The ultrasonic sensor circuit consists of set of ultrasonic transmitter and receiver which are operated at same frequency. When anything or object comes into the area of covered circuit then its frequency sound reflected to receiver and alarm is triggered. Ultrasonic sensor circuit is very sensitive and it could be reset automatically or still in triggered until it is reset manually. This sensor consists of two NAND gates which are wired as an inverter to form the multi vibrator output for driving the transduce. It also consists of two trimmers P1 and P2. P1 is used for adjusting the amplification factor of inverting and non-inverting circuit or op-amp. P2 is used for adjusting the output frequency of transmitter and for acquiring good efficiency the output frequency should be same as resonance frequency of traducer which is in use. Transducer is used for receiving the output signal which is reflected after the collision and this signal is amplified through the resistor TR3.

c)Water sensor:



Water sensor is designed for water detection, which can be widely used in sensing water level. Connecting a water sensor to an Arduino is a great way to detect a water molecule.

The water sensor has 3 pins:

S (Signal) pin: is an analog output that will be connected to one Arduino. the analog inputs on your
+ (VCC) pin: supplies power for the sensor. It is recommended to power the sensor with between 3.3V - 5V
(GND) pin: is a ground connection.

d) Vibrator: -

Vibration motor is a DC motor in a compact size that is used to inform the users by vibrating on receiving signals grove - Vibration Motor consists of one-coin type motor which is a permanent magnet coreless DC motor. It vibrates when the input logic is high which can be used to notify the user. Integrated with Grove interface, it provides a simple way to connect with Arduino boards without soldering.

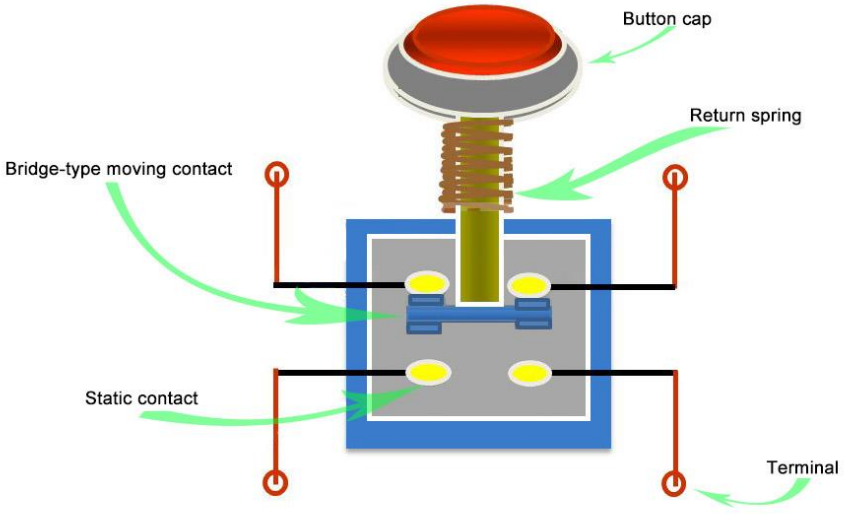
e) Buzzer: -

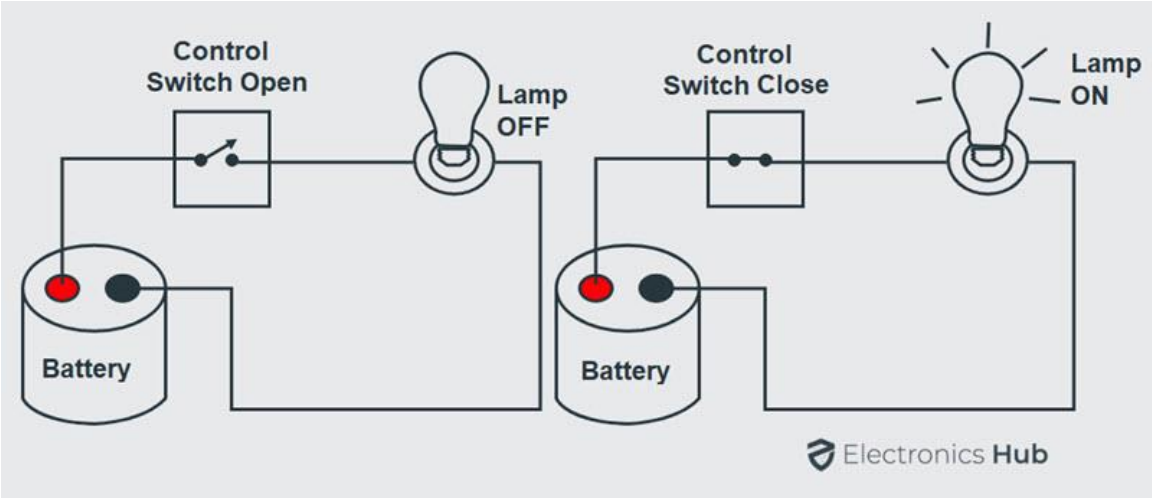
A buzzer is an efficient component to include the features of sound in our system or project. It is an extremely small & solid two-pin device thus it can be simply utilized on breadboard or PCB. So, in most applications, this component is widely used. There are two kinds of buzzers commonly available like simple and readymade. Once a simple type is power-driven then it will generate a beep sound continuously. A readymade type looks heavier & generates a Beep. Beep. Beep. This sound is because of the internal oscillating circuit within it. This buzzer uses a DC power supply that ranges from 4V – 9V. To operate this, a 9V battery is used but it is suggested to utilize a regulated +5V/+6V DC supply. Generally, it is connected through a switching circuit to switch ON/OFF the buzzer at the necessary time interval.

f) 9V Battery -:

A battery is a device that stores chemical energy and converts it to electrical energy. The chemical reactions in a battery involve the flow of electrons from one material (electrode) to another, through an external circuit. The flow of electrons provides an electric current that can be used to do work. To balance the flow of electrons, charged ions also flow through an electrolyte solution that is in contact with both electrodes. Different electrodes and electrolytes produce different chemical reactions that affect how the battery works, how much energy it can store and its voltage.

g) Switch: -





A Switch is a device which is designed to interrupt the current flow in a circuit. In simple words, a Switch can make or break an electrical circuit. Every electrical and electronics application uses at least one switch to perform ON and OFF operation of the device. So, switches are a part of the control system and without it, control operation cannot be achieved. A switch can perform two functions, namely fully ON (by closing its contacts) or fully OFF (by opening its contacts).

When the contacts of a switch are closed, the switch creates a closed path for the current to flow and hence load consumes the power from source. When the contacts of a switch are open, no power will be consumed by the load. But when the switch is not being pressed it enters a state of "Floating".

h) Jumper wires:-

Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed. Fairly simple. In fact, it doesn't get much more basic than jumper wires.

Though jumper wires come in a variety of colors, the colors don't actually mean anything. This means that a red jumper wire is technically the same as a black one. But the colors can be used to your advantage in order to differentiate between types of connections, such as ground or power.

Jumper wires typically come in three versions: male-to-male, male-to-female and female-to-female. The difference between each is in the end point of the wire. Male ends have a pin protruding and can plug into things, while female ends do not and are used to plug things into. Male-to-male jumper wires are the most common and what you likely will use most often. When connecting two ports on a breadboard, a male-to-male wire is what you'll need.

i) Light Emitting Diode (LED): -

A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. The color of the light (corresponding to the energy of the photons) is determined by the energy required for electrons to cross the band gap of the semiconductor. White light is obtained by using multiple semiconductors or a layer of light-emitting phosphor on the semiconductor device.

2.3 WORKING OF SMART STICK: -

The proposed stick contains the ultrasonic sensor, buzzer etc. The microcontroller then processes this data and calculates if the obstacle is close enough. If the obstacle is not

that close the circuit does nothing. If the obstacle is close the microcontroller sends a signal to sound a buzzer.

In smart stick, the object is detected with the help of a sensor and also it measures the distance between objects by using ultrasonic sensor. If any obstacle comes in front of blind person, he/she can know about the obstacle by hearing the sound generated by the buzzer. It also has another feature that is which detects the water-by-water sensor and it gives the signal by a vibrator. This stick is very useful for people who are visually impaired and are often need help from others.

CHAPTER 3

PROPOSED WORK

3.1 BACKGROUND: -

The methodology is the general research strategy that outlines the way in which research is to be undertaken and among other things, identifies the methods to be used in it. These methods, described in the methodology, define the means or modes of data collection or, sometimes how a specific result is to be calculated. For our project the information about the visually impaired people has been collected throughout every source that leads to our project. Hence, in addition to distance the proposed guidance system enables the determination of two main characteristics of the obstacle which are material and shape. All of this information has been used to do our project which is Modern Blind Stick.

3.2 PLANNING OF PROJECT FOR MODERN BLIND STICK: -

In ensuring the Modern Blind Stick can be done appropriately, a project planning by using Gantt charts has been prepared. In this Gantt chart, schedule of plan and subsequently report progress within the project environment has been stated clearly. Initially, this modern blind stick has a several feature that surely can help this blind people to detect an obstacle that surely can make their life routines easier. The user just needs to use the blind the normal blind stick, the different is, visually impaired person can detect an obstacle faster and easily and also it detects the water in contact with the stick by using the water sensor. the scope is defined with the appropriate methods for completing the project are determined.

3.3 PROGRAM FOR ULTRASONIC SENSOR: -

```
#define pingPin 2       //trig pin of sr04

#define echoPin 3
```

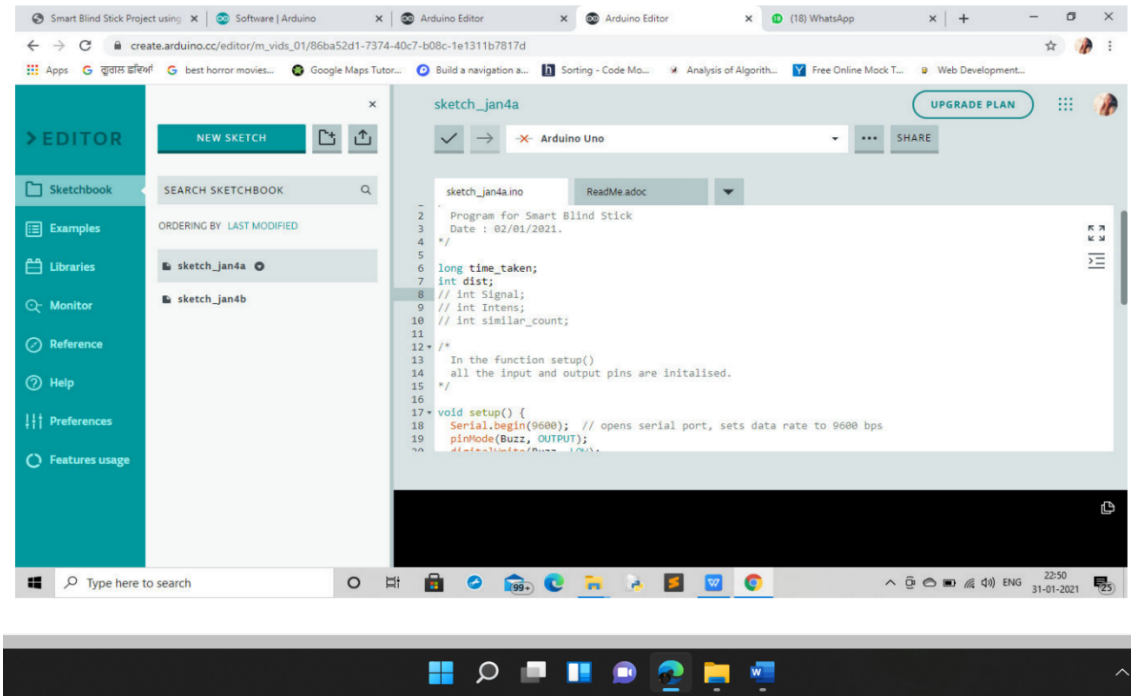
```
void setup () {
Serial.begin(9600); // Starting Serial Terminal
pinMode(pingPin,OUTPUT);
pinMode (echo Pin, INPUT);
pin Mode (12, OUTPUT); //pin12 is used as GND pin for buzzer since arduino nano
has
only two GND pins
pinMode(A3, OUTPUT);   //pin A3 provides the output on buzzer
}
void loop () {
long duration, cm;
digitalWrite(12, LOW);   //Buzzer GND is always low
//send a signal at ping pin at an interval of 0.002 seconds to check for an
objectdigitalWrite(pingPin, LOW);
delayMicroseconds(2);
digitalWrite(pingPin, HIGH);
delayMicroseconds(10);
digitalWrite(pingPin, LOW);
duration = pulseIn(echoPin, HIGH);  //check time using pulseIn function
cm = microsecondsToCentimeters(duration);   //functin call to find distance
/* Serial.print(cm);
Serial.print("cm");
Serial.println();
delay (100);
for debugging
```

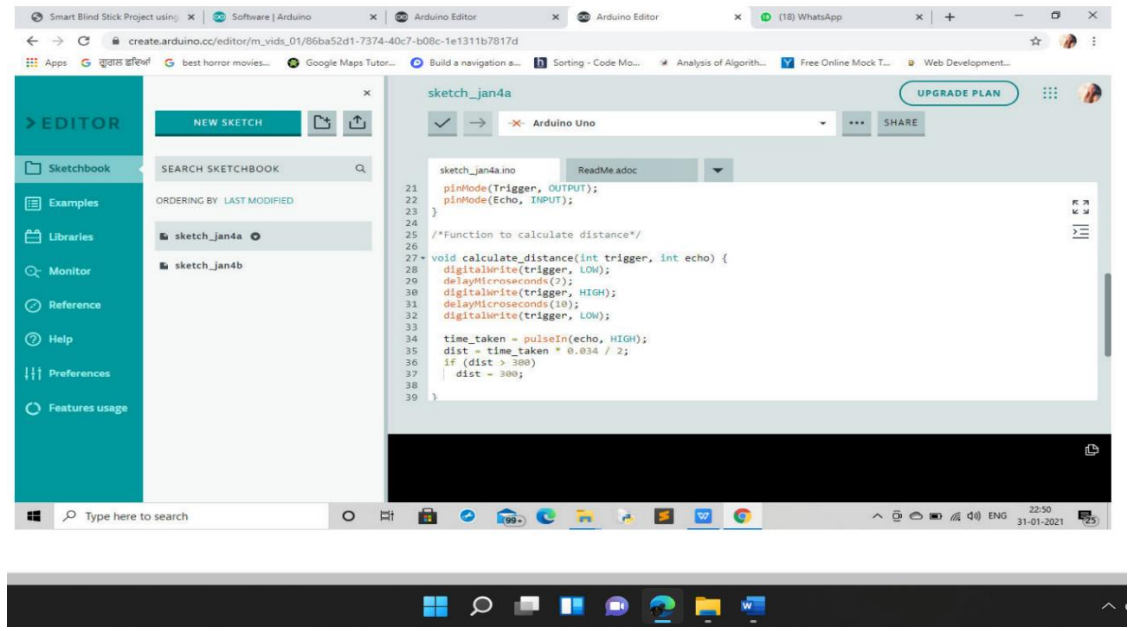
```
*/
if (cm<30&&cm>20)
{analogWrite(A3,255);
delay (1000);
analogWrite(A3,0);

delay (1000); }    //sound buzzer every second if obstacle distance is between 20-
30CM
else if (cm<20&&cm>10) {analog Write(A3,255);
delay (500);
aalogWrite(A3,0);
delay(500); }   //sound buzzer every 0.5 seconds if obstacle distance is between 10-
20CM.
else if (cm<10&&cm>0)  {analog Write(A3,255);
delay (100);
analogWrite(A3,0);
delay (100);} //sound buzzer every 0.1 seconds if obstacle distance is between 0-
10CM
else analogWrite(A3,0); //do not sound the buzzer
}
//function to return distance in cm from microseconds
long microsecondsToCentimeters (long microseconds) {
return microseconds / 29 / 2;
}
```

3.4 PROGRAM FOR WATER SENSOR: -

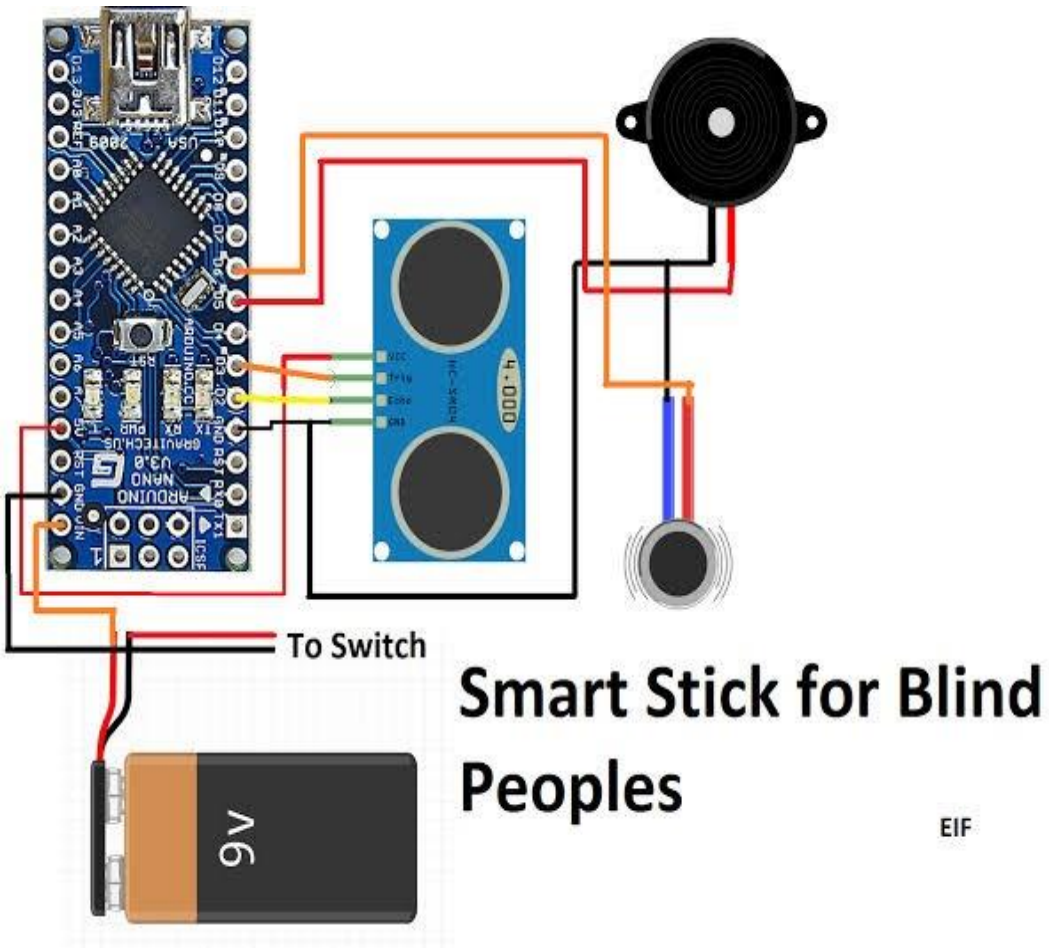
```
int waterSensor = A0;//define water sensor to pin A0int buzzerled = 5;//define
  buzzer and led to pin 5
  int SensorValue;//create sensor data variable
  void setup() {


 pinMode(buzzerled,OUTPUT);//set buzzer and led as an output
 pinMode(waterSensor,INPUT); //set water sensor as an input
 }
void loop() {
int sensorValue = analogRead(waterSensor);//read the water sensor value
 if (sensorValue >= 150) {
tone(buzzerled, 1000, 800);
delay(200);
tone(buzzerled, 1000, 800);
}
```

3.5 CODE SNIPPETS: -

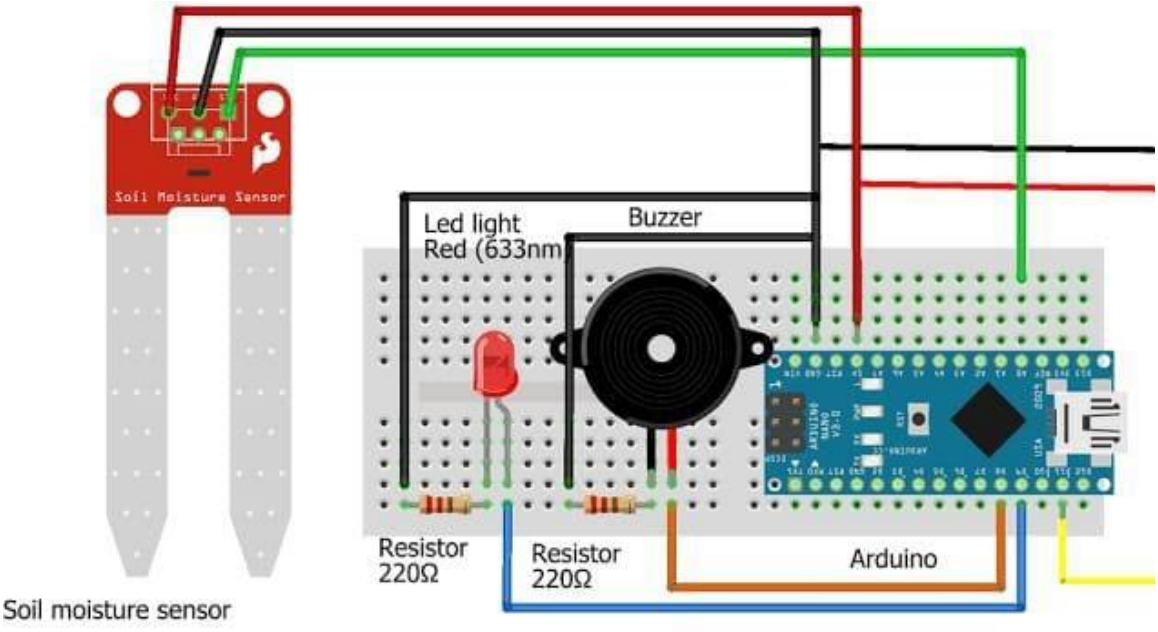




3.6 CIRCUIT DIAGRAM OF ARDUINO (ULTRASONIC SENSOR): -

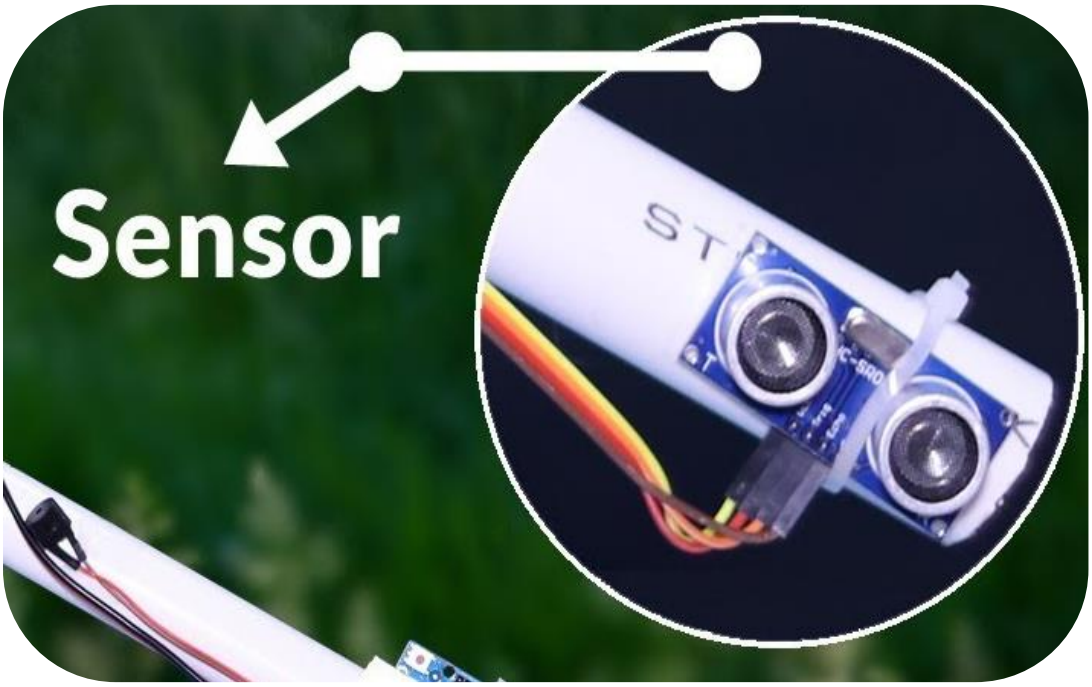


3.7 CIRCUIT DIAGRAM OF ARDUINO (WATER SENSOR): -

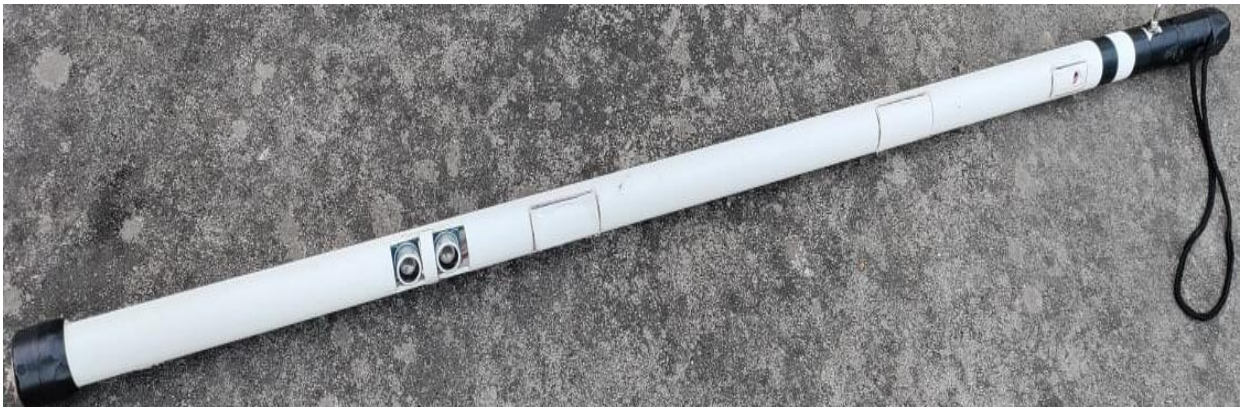


3.8 OVERALL SYSTEM: -

1)ultrasonic sensor:-



2)switch:-



3)front view: -

CHAPTER 4

CONCLUSION

4.1 CONCLUSION: -

In the end of our project, we can reduce the number of risk and injuries for the visually impaired person when walking at public. Nowadays, even at young age experience the visually impairment. This thing cannot be taken so lightly as they know how much risk could it be. If the number of risk and injuries increasing rapidly, the kid or the person will lose their spirit to walk independently. The Modern Blind Stick acts as a basic platform for the coming generation of more aiding devices to help the visually impaired to navigate safely both indoor and outdoor. It is effective and affordable. It leads to good results in detecting the obstacles on the path of the user in a range of two meters. 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 determining the speed of approaching obstacles.

4.2 RECOMMENDATION: -

In the future, we hope that our project can be commercialize as there are many benefits such as to reduce the number of risk and injuries for the visually impaired people. Our life is very priceless and cannot be replace. Because we all just live only once, so seize our life with positive vibes. We hope we can improvise our project if there is a thing that can make our product more quality than before.

4.3 ADVANTAGES: -

*Having feature to give you indicate right path auto detection.
* Less accidents will be occurred form the blind persons.
*Low-cost design.
*Low power consumption.
*Guides blind people.

4.4 LIMITATIONS: -

*Limited and fixed route to follow daily routine.
*Little sensor supports in this feel.

4.5 APPLICATIONS: -

*Help blind people to easily walk to destination.
*Blind people for obstacle detection.
*Robotic barriers.
*Auto detection.
*Automotive parking sensors and obstacle warning sensors.

4.6 FUTURE SCOPE: -

In future, we will be modifying the proposed model in better way. Initiating with the addition of Bluetooth module for proper on and off functioning. Integration of GPS module for detecting location of user, in case of an emergency. GPS module will be integrated in combination of Bluetooth Module of Arduino UNO connecting it to the mobile phone for better and smooth location detection. Besides, soil moisture detector can be implemented for detecting the amount of moisture in the soil, providing the safer access of the path to the user. At last, in order to improve the sound notification, we are planning to implement sound module which will give instruction in voice form. The stick system presented in the paper uses artificial intelligence along with various sensors in real time to help the visually disabled people to navigate their environment independently. Image recognition, collision detection and obstacle detection are the three tasks performed by the system.

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