SMART CANE

PRESENTATION BY

TEAM-III

TEAM MEMBERS

- MOHAMMED FAYIZ PARAPPAN – 20IM30010
- NIKHIL GOYAL – 20IM30011
- NIKHIL SATHWIK KANDREGULA – 20IM30012
- OINDRILA MAJI – 20IM30013
- REBBA INDUSRI – 20IM30014
- RISHABH RAJ – 20IM30015
- SAI PREETHAM BEVARA – 20IM30017
- SANJANA SINGH - 20IM30018

PROBLEM DESCRIPTION:

The case that visually impaired people face great difficulty in independent mobility and thus have to depend on the use of some support.

SOLUTION WE CAME UP WITH:

The main motive of our team is to design a smart cane using Arduino and microcontroller and make it available in the market at a reasonable price. This cane senses nearby obstacles and a buzzer rings accordingly, to warn the person holding the stick.

WORKING PLAN

- **WEEK 1** PLANNING AND DECISION OF PROJECT
- **WEEK 2** IDENTIFTYING THE COMPONENTS FOR SETTING UP THE CANE AND ORDERING THEM FROM AMAZON.
- **WEEK 3** PREPARING THE CAD MODEL
- **WEEK 4-5** ASSEMBLING THE HARDWARE COMPONENTS.
- **WEEK 6-7** PREPARING PHYSICAL MODEL
- **WEEK 8** PRESENTING WORKING MODEL PHYSICALLY

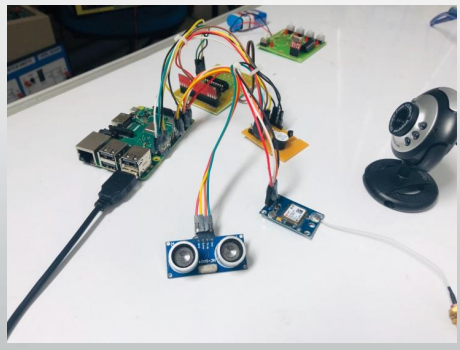
The smart cane is an electronic travel aid for persons with visual impairment. It detects obstacles within a certain range and enables users to negotiate obstacles without actually touching them, thus avoiding collisions ensures a safe travel avoiding making unwanted personal contact.

It is also easy to use.

Smart cane facilitates safe, independent mobility with dignity.

Structure and Function of the cane:

The cane has two major parts: body of the stick and the component electronic circuit. The stick also has few mechanical supports, at the end and at the top, serving as the clasp of the handle for the user to hold it. A circuit box is present below the handle, which contains all electronic components. The support at the lower end contains the ultrasonic sensor. The sensor and circuit are connected electrically using a wire. The buzzer is also present along the circuit, and an LED is attached. The LED glows when an object is detected in proximity.



This smart cane -

- Helps users to avoid collisions with over-hanging and protruding objects, such as tree branches, signboards, underside of parked vehicles, open glass windows, thereby enabling them to navigate in different social settings with safety and confidence
- Informs about presence of objects before actually touching the object with the cane and thus helps in preventing unwanted contact

SETTING UP THE CANE (COMPONENTS)

HARDWARE COMPONENTS:

1. MICROCONTROLLER:
    1.MODEL – ARDUINO UNO ATmega328P
    2.NUMBER REQUIRED – 1
2. ULTRASONIC SENSORS:
    1.SIZE – 5 to 15 cm
    2.RANGE – UPTO 11 cm
    3.FREQUENCY USED – 40 to 70 kHz
    4.NUMBER REQUIRED – 1
3. BATTERY:
    1. VOLTAGE – 9V
    2.TYPE - GENERAL PURPOSE BATTERY (ALKALINE)
    3.NUMBER REQUIRED – 1
4. BUZZER:
    1.TYPE - PIEZOELECTRIC, 3 TO 5 V
    2.INTENSITY – 85 Db
    3.NUMBER REQUIRED - 1
5. LEDS:
    1.TYPE – 5 MM ROUND STANDARD LED
    2.LUMINOUS INTENSITY – ABOUT 20 mCd
    3.NUMBER REQUIRED – 1

6.JUMPER WIRES:

1.TYPE – MALE-MALE JUMPER WIRES

2.LENGTH – 200 MM

3.NUMBER REQUIRED – STANDARD PACK (AROUND 40)

7.RESISTORS:

1.TYPE – CARBON RESISTORS

2.RESISTANCE – 5 OHM

3.NUMBER REQUIRED –

8.SOLDERING IRON FOR CUTTING:

OPERATING POWER – 25 W

9.STICK / CANE:

- LENGTH – 1.43 M
- MATERIAL – ANY PREFERABLE

10.BOX (TO CARRY CIRCUIT):

- DIMENSIONS – 16 X 8 X 5.5 cm
- TYPE – ANY TYPE (SHOULD BE STURDY)
- NUMBER REQUIRED – 1

INTEGRATING THE CANE

SETTING UP THE IDE FOR ARDUINO:

- CONNECT THE TRIG PIN OF US RAYS SENSOR TO 2TH PIN AND ECHOPIN AT 3RD PIN OF ARDUINO UNO BOARD. CONNECT THE BUZZER AT PIN 9 AND LED AT PIN 3 WITH HELP OF WIRES.
- COMPILE THE CODE AND FEED IT IN PIN 13 OF ARDUINO. CONNECT THE BATTERY TO THE POWER PORT.

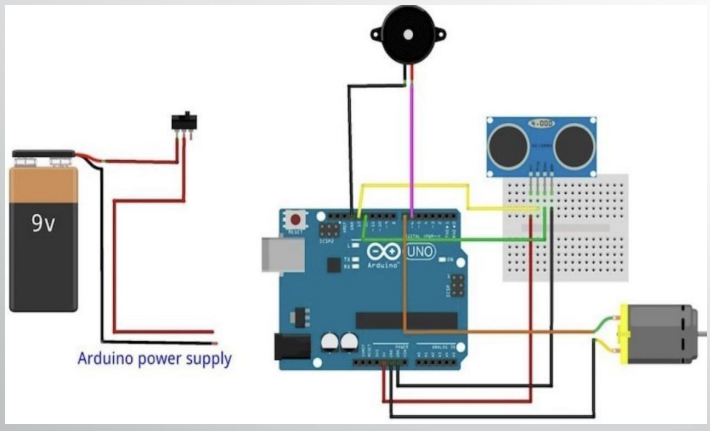
MAKING THE CANE "SMART":

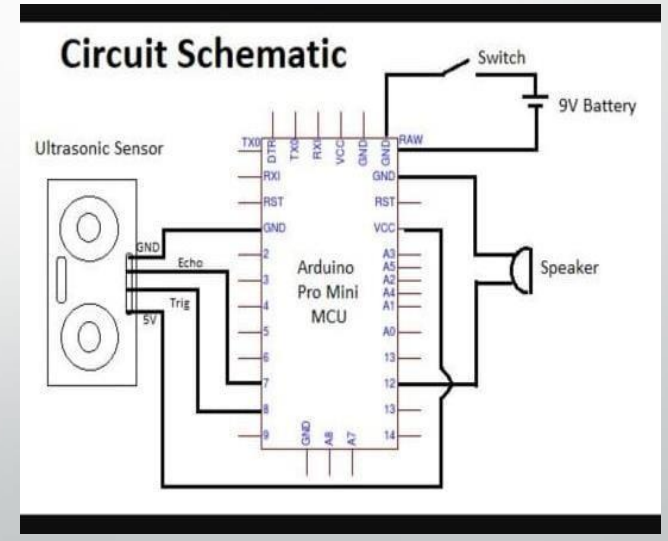
- ARRANGE THE SENSOR NEAR THE END (ABOUT 3/4TH FROM TOP HANDLE) WITH HELP OF ELECTRICAL TAPE.
- PLACE THE ARDUINO UNO BOARD AND BATTERY IN THE BOX AND KEEP IT NEAR THE TOP (1/4TH FROM TOP END).
- EITHER REMOVE THE LID AND LET THE WIRES COME OUT FROM OPEN END OR PUNCH HOLES AT THE SIDE FOR WIRES TO COME OUT (WHICHEVER WAY IS COMFORTABLE).
- SINCE THE BOX IS BULKY, EXTRA SUPPORT AND PROTECTION CAN BE GIVEN BY LAYERING A HALF CUT (HORIZONTALLY AND VERTICALLY) WITH STYROFOAM AND THENN PLACING THE BOX INSIDE IT.
- FINALLY ATTACH THE BOX (AND SUPPORT) ON THE CANE WITH ELECTRICAL TAPE. MAKE SURE TO ATTACH IT STURDILY WITH CANE.
- ATTACH THE BUZZER AND LED A LITTLE ABOVE THE BOX WITH TAPE.
- COVER THE WIRINGS AND OTHER COMPONENTS WITH TAPE TO PROVIDE FURTHER PROTECTION AND FINISHING.

VOILA! OUR CANE HAS BECOME "SMART" AND IS READY TO SERVE ITS PURPOSE AND HELP THE PEOPLE.

Schematic Diagram

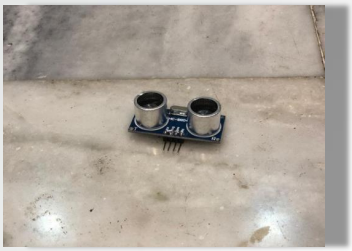
The schematic diagrams are self-explanatory: The external circuit is connected to Arduino, which in turn is connected to ultrasonic sensor and speaker.





Sample Pictures Of Some Components-

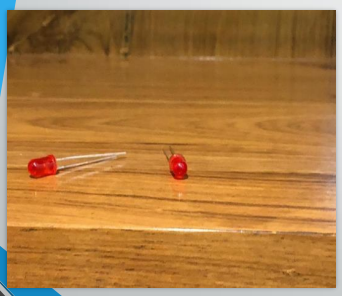
Arduino UNO Board



Ultrasonic Sensor

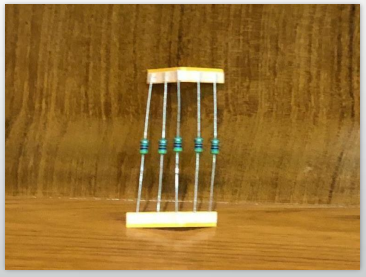
Buzzer

Servo Motor



LEDs (3v)

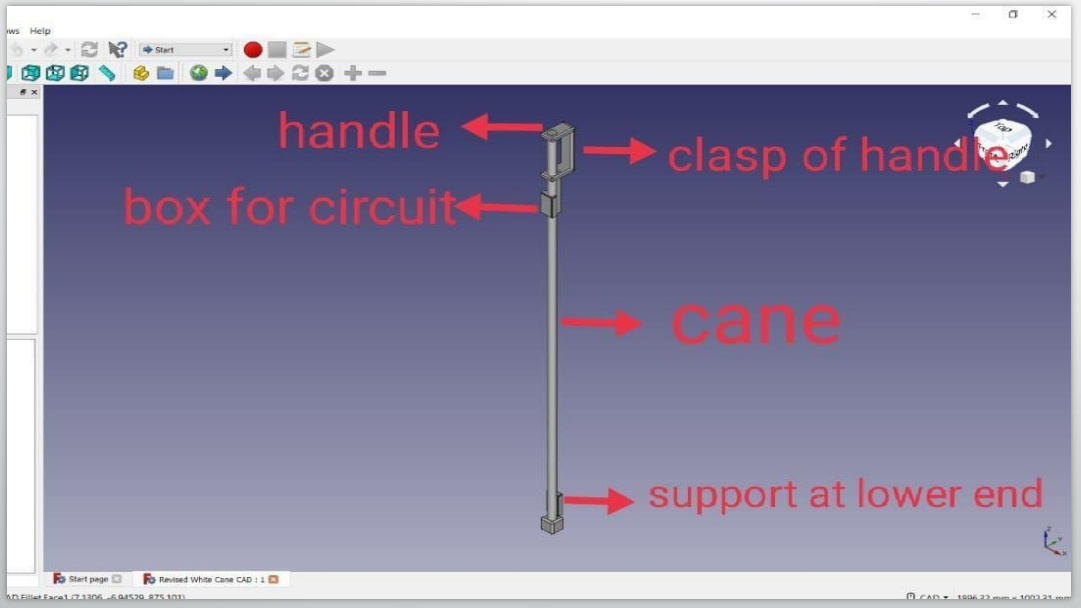
Battery (9v)



Resistors

Jump Wires

CAD Model (Using FreeCad)



BUILDING UP THE CODE:

LOGIC BEHIND THE CODE:

DEFINING ALL THE PINS USING #DEFINE

- VOID SETUP FUNCTION: DECLARING INPUT & OUTPUT PINS VIA PINMODE FUNCTION
- VOID LOOP:

  i) SPECIFYING ON AND OFF TIME OF SENSOR VIA DIGITALWRITE AND DELAY STATEMENTS

  ii) CALCULATION OF DURATION VIA PULSEIN FUNCTION

  D= (SPEED*TIME)/2

- SPECIFYING CONDITIONS FOR BUZZER BASED ON OBSTACLE DISTANCE USING IF-ELSE STATEMENTS

If the distance of the object from the cane is any less than 50 cm, the buzzer starts ringing and the LED glows. Thus, 50 cm is the limiting distance.

Code:

```
#define echoPin 2
#define trigPin 3

int buzzerPin = 9;
int led = 13;
long t;
int x;
Void setup ()
{
pinMode(led , OUTPUT );

pinMode(buzzerPin, OUTPUT);

pinMode(trigPin , OUTPUT);

pinMode(echoPin, INPUT);
```

```
    Serial. begin(9600);
    Serial.printIn("Test Run);
}
Void loop()
{
digitalWrite(trigPin , LOW);
delayMicrosecond(2);
digitalWrite (trigPin , HIGH);
delayMillisecond(10);
digitalWrite(trigPin , LOW);
//reads echoPin , returns waves  travel time in millisec//
t = pulseIn(echoPin,HIGH);
x = duration * 0.034/2;
```

```
Serial.print(“Distance : “);

Serial.print(x);

Serial.printIn(“cm”);
If (x<50 && x>4);

{
digitalWrite(led , HIGH); tone(buzzerPin , 50);
}
Else ;
{
   noTone(buzzerPin); digitalWrite(led, LOW);
}

}
```

Nature of Input and Output:

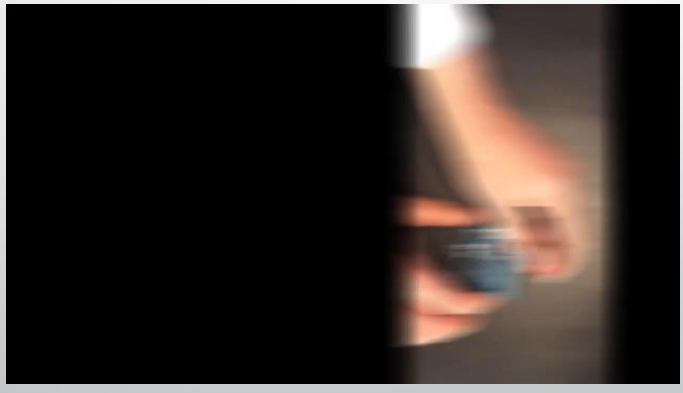
- INPUT:

  Mechanical movement of the stick towards objects.

- OUTPUT:

  Sound signals and glowing of LED. Basically, light and sound energies are emitted by the circuit.

PHYSICAL MODEL OF SMART CANE:



User Interface Instructions:

- The device should be handled with care, especially the circuit box.
- It should not come into contact with wet surfaces or inflammable articles.
- General electrical safety rules also apply to this circuit.

Working Principle of the Components:

- Smart cane uses ultrasonic sensors to detect the obstacle and alert the user.

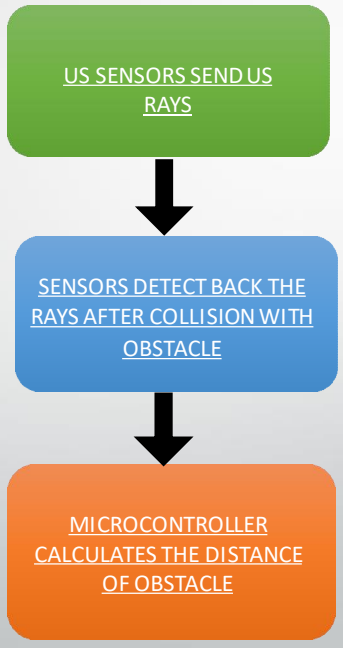
ULTRASONIC SENSOR:

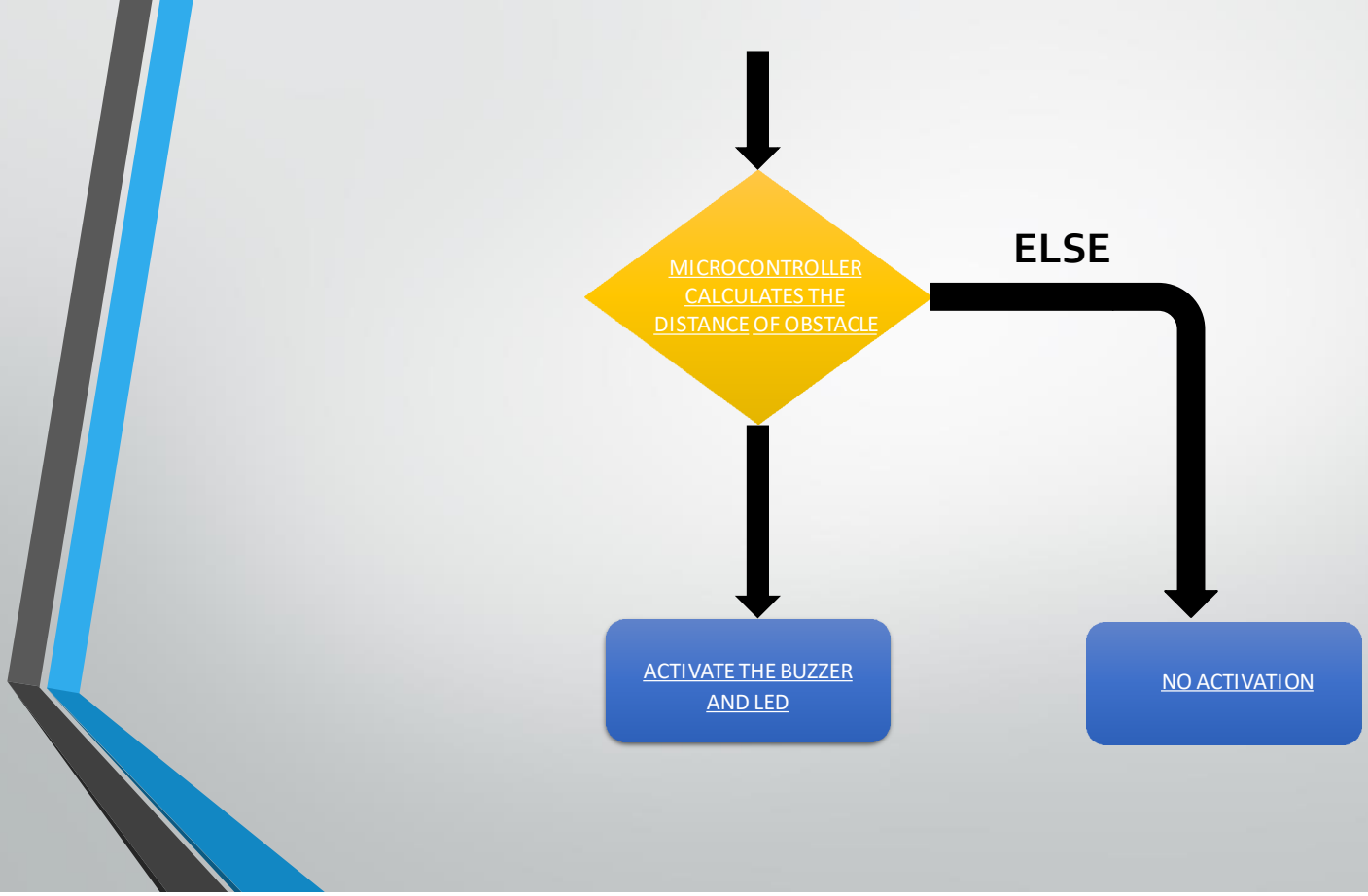
It is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves and converts the reflected waves into electric signals.

COMPONENTS:

1. TRANSMITTER: emits sound using piezoelectric crystals.
2. RECIEVER: encounters sound after it has travelled to and from the target.

FLOWCHART:




MICROCONTROLLER CALCULATES THE DISTANCE OF OBSTACLE
ELSE
ACTIVATE THE BUZZER AND LED
NO ACTIVATION

COST ANALYSIS

- MATERIAL COST

1. Stick – Rs 50
2. Arduino UNO Mega 328P – Rs 410
3. Ultrasonic sensor (Freq 40-70 kHz) – Rs 60
4. 9V Battery - Rs 50
5. Buzzer – Rs 80
6. Jumper wires – Rs 60

Assembly cost

LED

Fevicol

Thermocol

Bottle weight

Tape

} Rs. 50

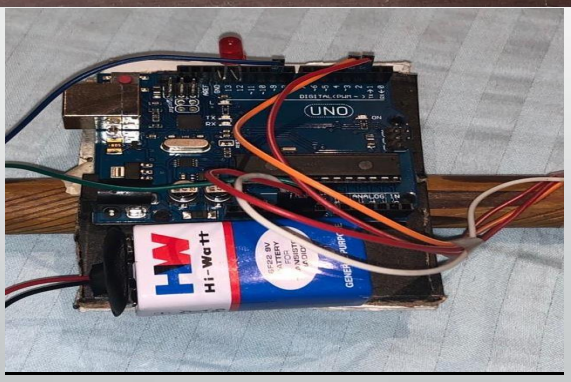
- Transportation cost- Rs 50

Thus, the total cost amounts to – Rs 710+Rs 50+Rs 50=Rs 810

- If we use US-100 sensors having max range of 450 cm then the cost of the sensor becomes Rs 330

In this case, the total cost will become Rs 1080

FINAL PICTURE OF THE FINISHED PRODUCT AND THE ASSEMBLED CIRCUIT:



Demonstration video

Without smart cane : Crashes into obstacles

With smart cane : Moves aside

People use SmartCane for:

i)Detecting parked vehicles, animals, open windows, etc. and avoid collisions with them.
ii)Avoiding making unwanted personal contact. Maintaining a safe distance from people walking ahead.
iii)Following a queue during security checks or purchasing tickets at airports and metro stations,etc. and in many more cases.

THANK YOU