INSTITUTE OF AERONAUTICAL ENGINEERING

ELECTRICAL AND ELECTRONICS ENGINEERING

TITLE OF THE PROJECT :

SMART BLIND STICK FOR BLIND PEOPLE

ABSTRACT :
Technologies are growing very fast, which helps people to get a better and easier life. The smart stick is a technique to help sightless people to recognize their way. Sightless people suffer from the lack of ability to do their daily activities, from walking in the street to visiting friends or relatives or any daily things. Therefore, the solution for this major problem is proposed by designing a stick that can aid the person to walk safely without having fear of hitting someone on the way or any solid objects. The electric circuit was simulated using Proteus software for designing and simulating electrical circuits. In this paper, we have used an ultrasonic sensor. The sensor has been placed in front of the stick. To detect the motion from almost every side, it has been used a vibrator and buzzer alarms to alert the person if some obstacle is detected near him.

INTRODUCTION:

Visually impaired persons have difficulty interacting and feeling their environment. They have little contact with their surroundings. Physical movement is a challenge for visually impaired persons because it can become tricky to distinguish obstacles appearing in front of them, and they are not able to move from one place to another. They depend on their families for mobility and financial support. Over the last decades, research has been conducted for new devices to design a good and reliable system for visually impaired persons to detect obstacles and warn them at dangerous places. A smart walking stick is specially designed to detect obstacles that may help the blind to move safely. The alarm will keep the user alert and considerably reduce accidents. This system presents a concept to provide a smart electronic aid for blind people, both in public and private spaces. The proposed system contains the Ultrasonic sensor and Buzzer. The Stick measures the distance between the objects and the smart walking stick by using an ultrasonic sensor. When any objects or obstacles come in a range of an ultrasonic sensor then the buzzer will alarm the user. The smart walking stick is a simple and purely mechanical device to detect obstacles on the ground.

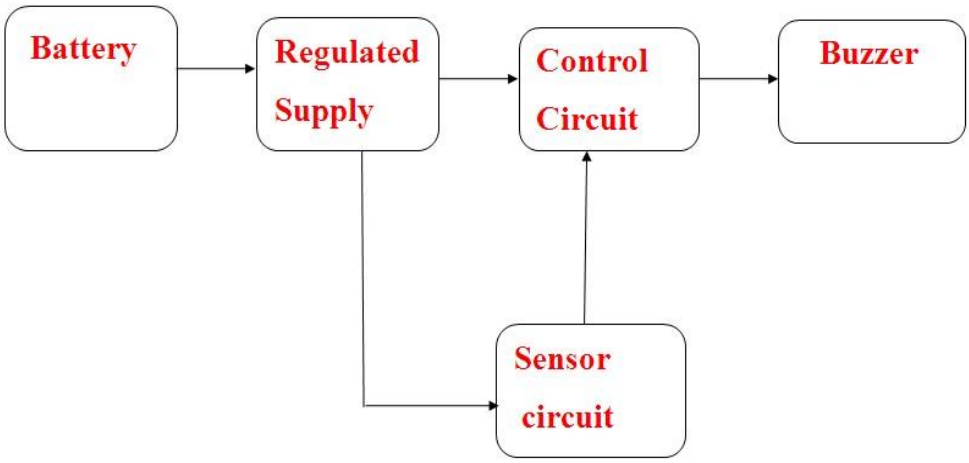
This device is light in weight and portable. But its range is limited to its size. It provides the best travel aid for the person. The blind person can move from one place to another independently without the help of the other. The main aim of the system is to provide the best environment for blind persons which gives a sense of vision by providing information about their surroundings and objects around them.

Our proposed project first uses an ultrasonic sensor to detect obstacles without touching them using ultrasonic waves.

On sensing obstacles the sensor passes this data to the microcontroller. The microcontroller then processes this data and calculates if the obstacle is close enough. If the obstacle is far the circuit does nothing but If the obstacle is closed the microcontroller sends a signal to sound a buzzer. The ultrasonic sensor is used to detect any obstacle in front of a blind person. It has a Detection Distance of 2cm-450cmso whenever there is some obstacle in this range it will alert the blind person

In this technology-controlled world, where people strive to live independently, this project proposes an ultrasonic stick for blind people to help them gain personal independence. Since this is economical and not bulky, one can make use of it easily

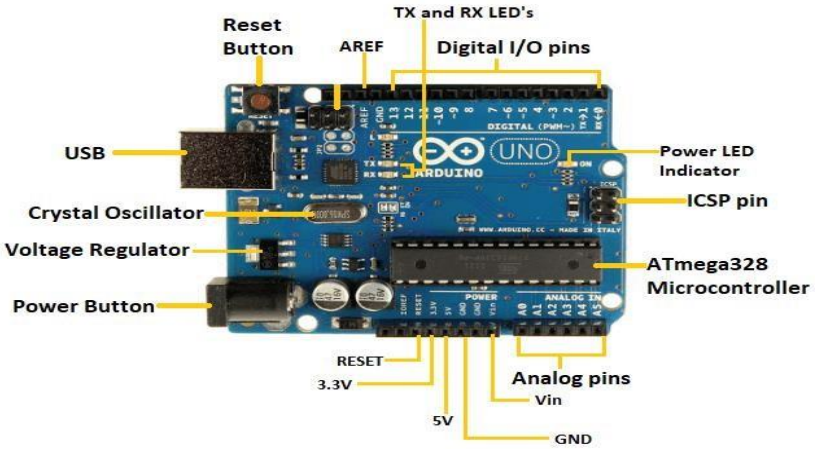
BLOCK DIAGRAM:



MATERIALS REQUIRED:

1. Aurdino UNO
2. Ultrasonic sensor HC-SR04
3. Buzzer
4. Vibrator
5. 9 Volt Battery
6. Switch

1. Aurdino UNO



The Arduino UNO is a standard board of Arduino. Here UNO means 'one' in

Italian. It was named UNO to label the first release of Arduino Software. It was also the first USB board released by Arduino. It is considered as the powerful board used in various projects. Arduino. cc developed the Arduino UNO board.

Arduino UNO is based on an ATmega328P microcontroller

. It is easy to use compared to other boards, such as the Arduino Mega board, etc. The board consists of digital and analog Input/Output pins (I/O), shields, and other circuits.

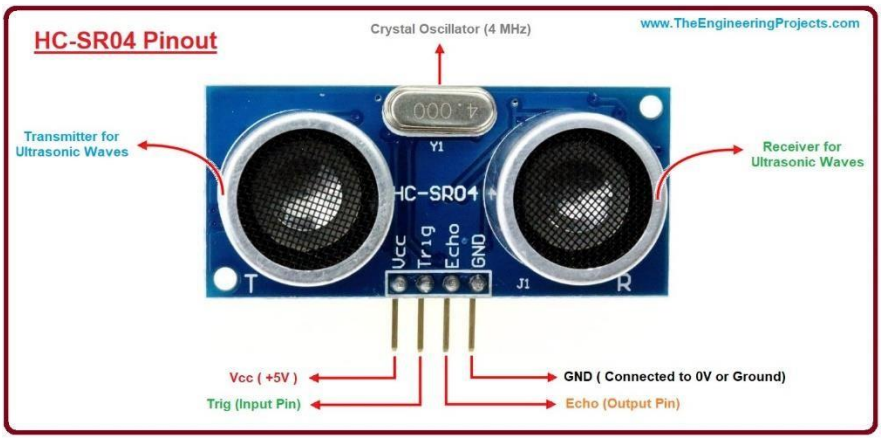
The Arduino UNO includes 6 analog pin inputs, 14 digital pins, a USB connector, a power jack, and an ICSP (In-Circuit Serial Programming) header. It is programmed based on IDE, which stands for Integrated Development Environment. It can run on both online and offline platforms.

The IDE is common to all available boards of Arduino.

- **ATmega328 Microcontroller**- It is a single chip Microcontroller of the Atmel family. The processor code inside it is 8-bit. It combines **Memory (SRAM, EEPROM, and Flash), Analog to Digital converters, SPI serial ports, I/O lines, registers, timers, external and internal interrupts, and oscillator.**
- **ICSP pin** - The In-Circuit Serial Programming pin allows the user to program using the firmware of the Arduino board.
- **Power LED Indicator**- The ON status of the LED shows the power is activated. When the power is OFF, the LED will not light up.
- **Digital I/O pins**- The digital pins have the value HIGH or LOW. The pins numbered from D0 to D13 are digital pins.
- **TX and RX LED's**- The successful flow of data is represented by the lighting of these LEDs.
- **AREF-** The Analog Reference (AREF) pin is used to feed a reference voltage to the Arduino UNO board from the external power supply.
- **Reset button**- It is used to add a Reset button to the connection.
- **USB**- It allows the board to connect to the computer. It is essential for the programming of the Arduino UNO board.

- **Crystal Oscillator**- The Crystal oscillator has a frequency of 16MHz, which makes the Arduino UNO a powerful board.
- **Voltage Regulator**- The voltage regulator converts the input voltage to 5V. ○ **GND**- Ground pins. The ground pin acts as a pin with zero voltage. ○ **Vin**- It is the input voltage.
- **Analog Pins**- The pins numbered from A0 to A5 are analog pins. The function of Analog pins is to read the analog sensor used in the connection. It can also act as GPIO (General Purpose Input Output) pins.

2. Ultrasonic sensor HC-SR04



It is an ultrasonic sensor, also known as an ultrasonic transducer that is based on a transmitter and receiver and is mainly used to determine the distance from the target object.

The amount of time it takes to send and receive waves will determine how far the object is placed from the sensor. It mainly depends on the sound waves working on "non-contact" technology. The required distance of the target object is measured without any damage, giving you accurate and precise details.

This sensor comes with a range between 2cm to 400cm and is used in a wide range of applications including speed and direction measurement, wireless charging, humidifiers, medical ultrasonography, sonar, burglar alarms, and non-destructive testing.

HC-SR04 is an ultrasonic sensor mainly used to determine the distance of the target object.

It measures accurate distance using a non-contact technology – A technology that involves no physical contact between sensor and object.

- Transmitter and receiver are two main parts of the sensor where the former converts an electrical signal to ultrasonic waves while later converts that ultrasonic signals back to electrical signals.
- These ultrasonic waves are nothing but sound signals that can be measured and displayed at the receiving end.
- The Following table shows the main features of this ultrasonic sensor.

Parameter	Value
Main Parts	Transmitter & Receiver
Technology Used	Non-Contact Technology
Operating Voltage	5 V
Operating Frequency	4 MHz
Detection Range	2cm to 400cm
Measuring Angle	30°
Resolution	3mm
Operating Current	<15mA
Sensor Dimensions	45mm x 20mm x 15mm

It gives precise measurement details and comes with accuracy (resolution) around 3mm, terming there might be a slight difference in the calculated distance from the object and the actual distance.

No.	Pin Name	Pin Description
1	VCC	The power supply pin of the sensor that mainly operates at 5V DC.
2	Trig Pin	It plays a vital role to initialize measurement for sending ultrasonic waves. It should be kept high for 10us for triggering the measurement.
3	Echo Pin	This pin remains high for short period based on the time taken by the ultrasonic waves to bounce back to the receiving end.
4	Ground	This pin is connected to ground.

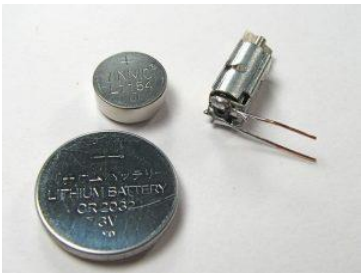
The HC-SR04 Ultrasonic (US) sensor is an ultrasonic transducer that comes with a 4 pin interface named Vcc, Trigger, Echo, and Ground. It is very useful for accurate distance measurement of the target object and mainly works on sound waves.

As we connect the module to 5V and initialize the input pin, it starts transmitting the sound waves which then travel through the air and hit the required object. These waves hit and bounce back from the object and are then collected by the receiver of the module

3. Buzzer

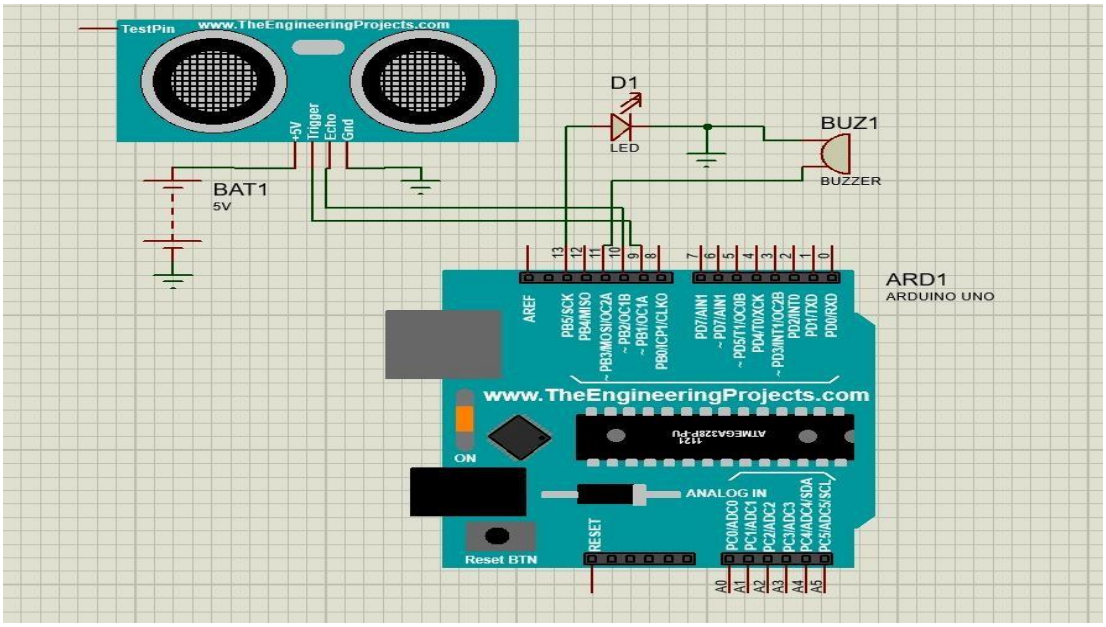
A **buzzer** is a small yet efficient component to add sound features to our project/system. It is a very small and compact 2-pin structure hence can be easily used on Breadboard and even on PCBs which makes this a widely used component in most electronic applications.

4. Vibrator motor



Vibrator Motors are the mechanical devices used to develop vibrations. The generation of vibration has happened with the support of an electric motor having an inequitable mass on its driveshaft. It is a miniature-sized DC motor that lets the user know the sound through vibrations.

CIRCUIT DIAGRAM (WORKING):



The main objective of this project is to help blind people to walk with ease and to be warned whenever their walking path is obstructed with obstacles. As a warning signal via buzzer, whose frequency of beep changes according to the distance of the object.

The closer the distance of obstruction, the more will be the buzzer beep frequency. The main component used for this device is the Ultrasonic Sensor HCSR04. The ultrasonic sensor transmits a high-frequency sound pulse and then calculates the time to receive the signal of the sound echo to reflect. HC-SR04 has a transmitter & receiver surface. One of them acts as the transmitter and transmits the

ultrasonic waves. The other one acts as a receiver and receives the echoed sound signal.

The sensor is calibrated according to the speed of the sound in the air. The speed of sound is 341 meters per second in the air, and the distance between the sensor and object is equal to time multiplied by the speed of sound divided by two.

After the distance measurement, Arduino makes a beep format using a buzzer, when the distance is high, the frequency of beep is decreased and beep frequency is increased when the distance is low.

SOURCE CODE/PROGRAM:

```
// defines pins numbers
const int trigPin = 9; const
int echoPin = 10; const int
buzzer = 11;
const int ledPin = 13;

// defines variables
long duration; int
distance;
int safety distance;


void setup() { pinMode(trigPin, OUTPUT); // Sets the
trigPin as an Output pinMode(echoPin, INPUT); // Sets the
echoPin as an Input
pinMode(buzzer, OUTPUT); pinMode(ledPin,
OUTPUT);
Serial.begin(9600); // Starts the serial communication
}


void loop() { // Clears the
trigPin digitalWrite(trigPin,
LOW);
delayMicroseconds(2);

// Sets the trigPin on HIGH state for 10 micro seconds
digitalWrite(trigPin, HIGH); delayMicroseconds(10);
digitalWrite(trigPin, LOW);
```

```
// Reads the echoPin, returns the sound wave travel time in microseconds duration
= pulseIn(echoPin, HIGH);

// Calculating the distance
distance= duration*0.034/2;

safetyDistance = distance; if
(safetyDistance <= 15){
digitalWrite(buzzer, HIGH);
digitalWrite(ledPin, HIGH);
} else{   digitalWrite(buzzer,
LOW);   digitalWrite(ledPin,
LOW);
}

// Prints the distance on the Serial Monitor
Serial.print("Distance: ");
Serial.println(distance);
}
```

CONCLUSION:

Blind people face a lot of difficulties while traveling from one place to another. To help the blind, their difficulties, the smart blind stick is proposed. The system consists of an LDR sensor to detect day and night and an ultrasonic sensor for obstacle detection. The proposed system takes the blind person to reach the destination without any struggle in their path. After testing, the system proposed in this paper helps users walk in a relatively safe environment reliably, such