



# **Internet of Things (IoT)**

## **PROJECT REPORT**

**TITLE: - THE MURDOCK DEVICE**

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# **ACKNOWLEDGEMENT**

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# **INTRODUCTION**

Blindness, low vision, visual impairment and vision loss have dramatic impacts on individuals experiencing such disabilities. These carry with them physiological, psychological, social, and economic outcomes, hence impacting the quality of life and depriving such individuals from performing many of the Activities of Daily Living (ADL), the most crucial of which is navigation and mobility. Blindness is a qualitative term that describes the clinical condition whereby individuals have no light perception as a result of total vision loss. Blindness also refers to those who have so little vision that they have to rely predominantly on other senses as vision substitution skills. On the other hand, visual impairments is a qualitative term used when the condition of vision loss is characterized by a loss of visual functions at the organ level, such as the loss of visual acuity or the loss of visual field. This project presents a prototype model and a system concept to provide a smart electronic aid for blind people. This system is intended to provide overall measures object detection, and send information related to blind people. The system consists of microcontroller, ultrasonic sensor, and Bluetooth headphone. This project aims at the development of an Electronic Travelling Aid (ETA) kit to help the blind people to find obstacle free path. This ETA is fixed to the shoe. When the object is detected near to the shoe alerts them with help of speakers or head phones that is voice command with the help of Microcontroller.

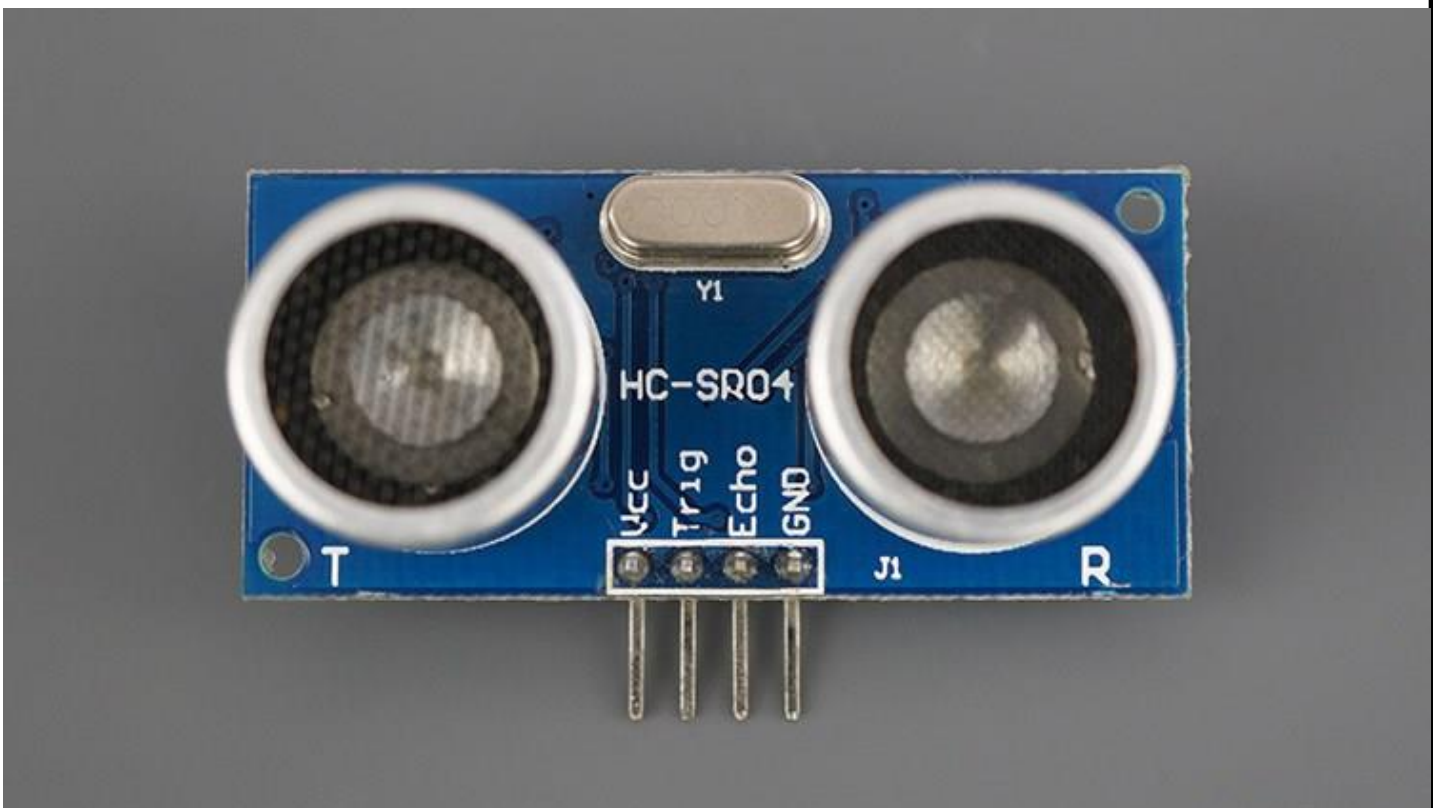
# **ABSTRACT**

IoT based Smart shoe system for the blind is a system made with the help of ultrasonic sensors paired to an Arduino UNO board. Internet of things is all about making physical objects communicate with other objects or even with humans. It is an enabling technology which has a rapid development and growth in the market. In our India there are almost 40 million blind people among which 1.6 million are children. Blind people face great difficulty to travel independently. They have to depend on others in many aspects of their life. The Major problem is when they walk on the road. With a stick in hand they cannot detect every obstacle that comes in their way. The Smart shoe design provides a longterm solution for the blind to walk on roads independently. The smart shoe will help the Blind person to reach his destination independently. It is built using IoT Technology in which the shoe will be embedded with various sensors, Microcontroller and buzzers. The shoe warns the user by making noise with the buzzer when he/she walks in front of an obstacle. To improve the efficiency, Smart glasses are designed using IoT which is also embedded with sensors and helps in detecting the objects by covering a larger area. The smart shoe and the smart glasses communicate and coordinate with each other to ensure that the user does not collide with any obstacle in his way.

# Hardware Components

## Ultrasonic Sensor

An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound (i.e. the sound that humans can hear). Ultrasonic sensors have two main components: the transmitter (which emits the sound using piezoelectric crystals) and the receiver (which encounters the sound after it has travelled to and from the target).

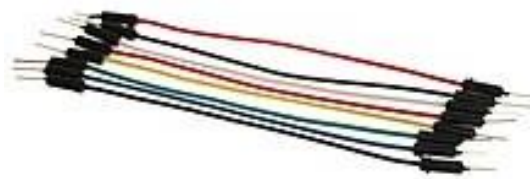


$$\text{Distance} = (\text{Time} \times \text{Sound speed in Air (340 m/s)})$$

# Jumper Wires

A jump wire (also known as jumper, jumper wire, DuPont wire) is an electrical wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them – simply "tinned"), which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.

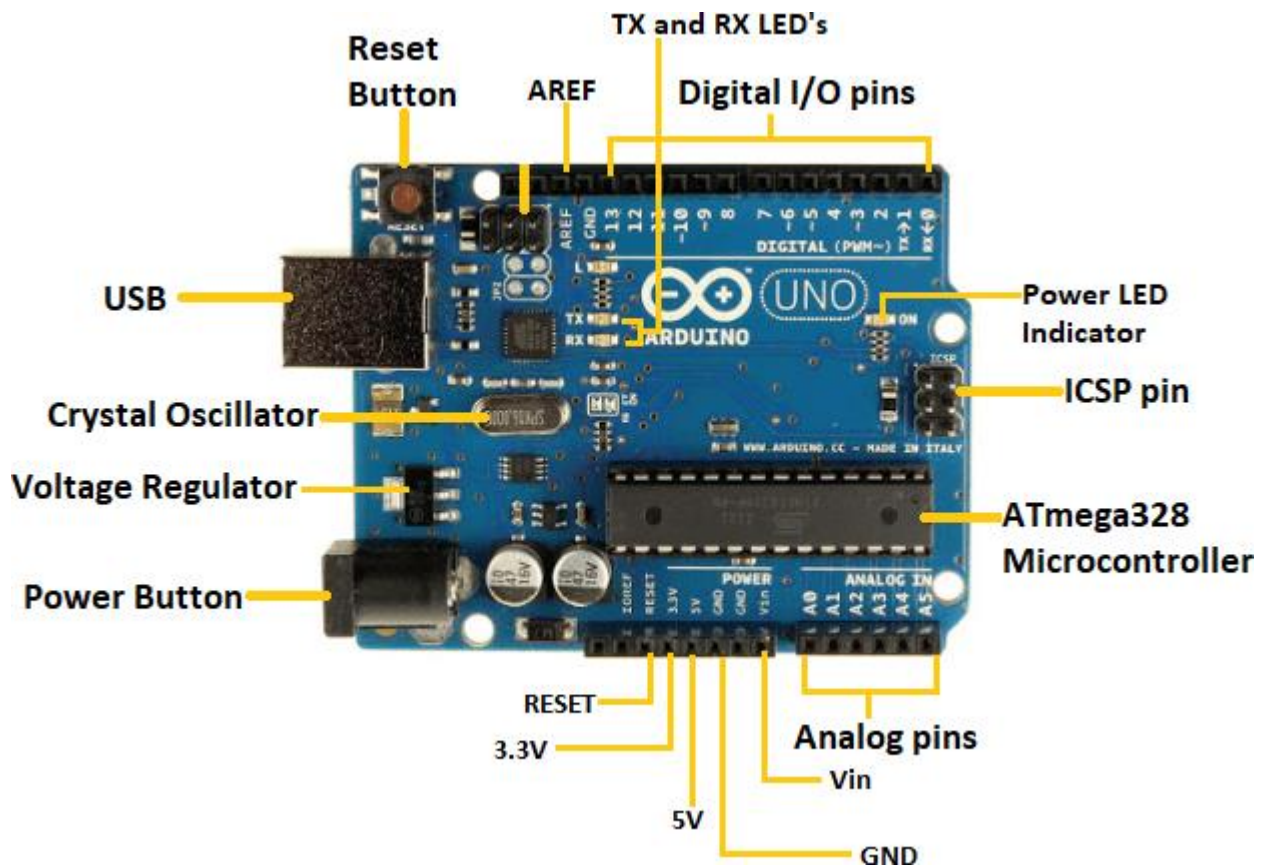
Individual jump wires are fitted by inserting their "end connectors" into the slots provided in a breadboard, the header connector of a circuit board, or a piece of test equipment.



# Arduino UNO

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards can read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.





Let's discuss each component in detail.

- **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 an 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 LEDs** – 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.

## Vibratory motor

A vibratory motor is a three-phase motor that is intentionally unbalanced, and is also known as an eccentric rotating mass (ERM) or vibrating motor. Vibratory motors are used to vibrate sieves, troughs and tables, but also to separate products in a bunker or landfill pipe. Vibratory motors ensure an efficient and continuous process with an unobstructed flow of material. They handle everything from





# Software Components

## Aurdino CC Platform

Arduino is a prototype platform (open-source) based on easy-to-use hardware and software. It consists of a circuit board, which can be programmed (referred to as a microcontroller), and a ready-made software called Arduino IDE (Integrated Development Environment), which is used to write and upload the computer code to the physical board. The source code for the Java environment is released under the GPL and the C/C++ microcontroller libraries are under the LGPL. Arduino code is referred to as **sketches**.

The key features are –

- Arduino boards can read analog or digital input signals from different sensors and turn them into an output such as activating a motor, turning LED on/off, connecting to the cloud, and many other actions.
- You can control your board functions by sending a set of instructions to the microcontroller on the board via Arduino IDE (referred to as uploading software).
- Unlike most previous programmable circuit boards, Arduino does not need an extra piece of hardware (called a programmer) to load a new code onto the board. You can simply use a USB cable.
- Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program.
- Finally, Arduino provides a standard form factor that breaks the functions of the microcontroller into a more accessible package.

## Structure

Arduino programs can be divided into three main parts: Structure, Values (variables and constants), and Functions.

### 1. Structure

Software structure consists of two main functions –

- Setup( ) function

- PURPOSE – The setup() function is called when a sketch starts. Use it to initialize the variables, pin modes, start using libraries, etc. The setup function will only run once, after each power-up or reset of the Arduino board.
- INPUT
- OUTPUT
- RETURN
- Loop( ) function
  - PURPOSE – After creating a setup() function, which initializes and sets the initial values, the loop() function does precisely what its name suggests, and loops consecutively, allowing your program to change and respond. Use it to actively control the Arduino board.
  - INPUT
  - OUTPUT
  - RETURN

## Proteus

The Proteus is an electronic circuit design software that includes schematic capture, simulation, and PCB ( Printed Circuit Board) Layout modules. But generally, nowadays Eagle CAD is highly preferred over Proteus for PCB designing because of its flexibility.

Even though if you are not using PCB designing you can view the PCB layout of the component individually while selecting the component it helps during the soldering of components in PCB.

Proteus is ahead in simulating the circuits containing the microcontrollers where we can simulate the circuit by uploading the hex code to the Microcontroller whereas Multism can't do this.

Proteus is a bundle of two software's as follows:

1. **ISIS** – for simulation of electrical and electronics circuits. It is user-friendly and hassle-free. All types of components and instruments are available.
2. **ARIES** – For preparing PCB layouts, Gerber, pdf, and Dxf fi

# Project Code

```
#include <Arduino.h>

#define trigPin 12
#define echoPin 11
#define motor 9

void setup() {
  Serial.begin(9600);
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);
  pinMode(motor, OUTPUT);
}

void loop() {
  long duration, distance;

  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin, HIGH);      // For sending trigger signal out of the tx
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);

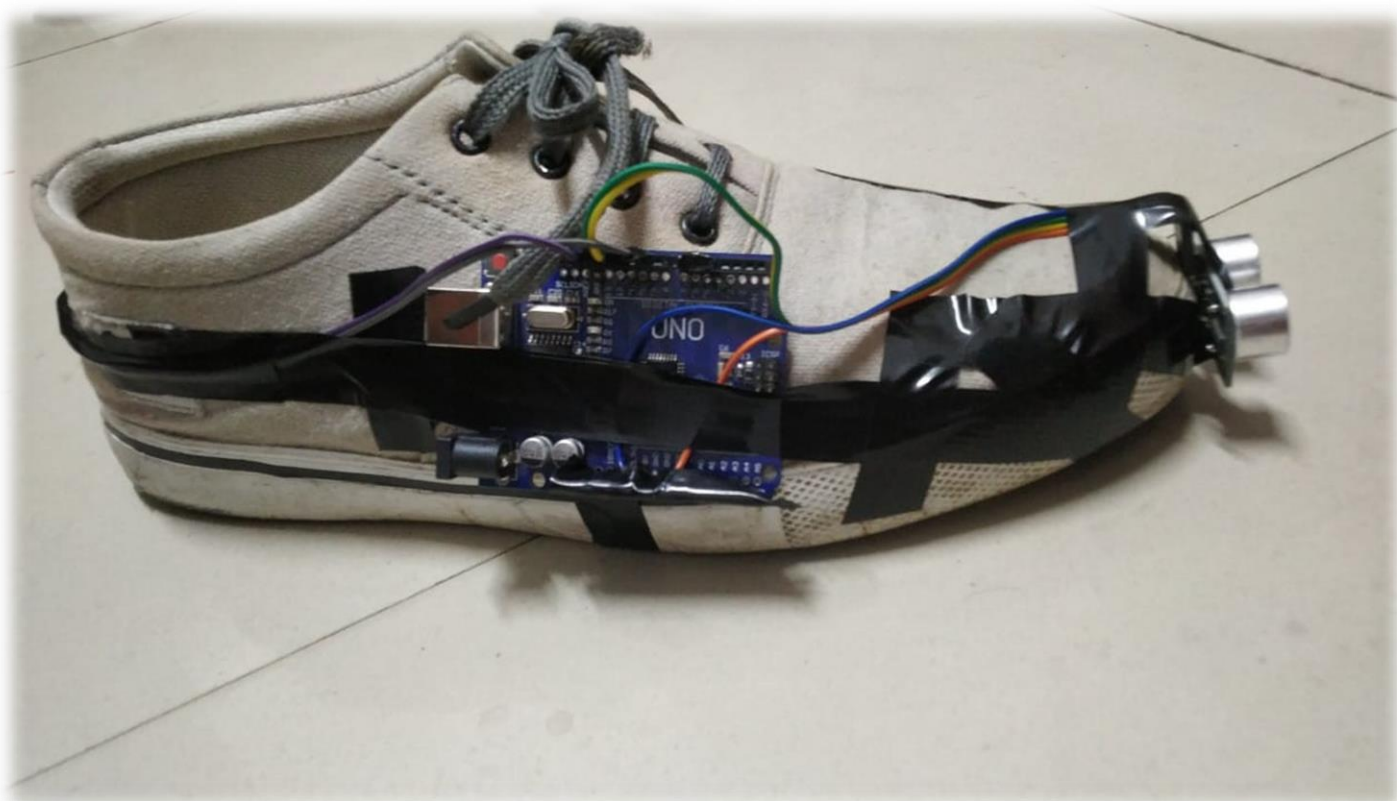
  duration = pulseIn(echoPin, HIGH);
  distance = duration * 0.0340 / 2;

  Serial.println(distance);

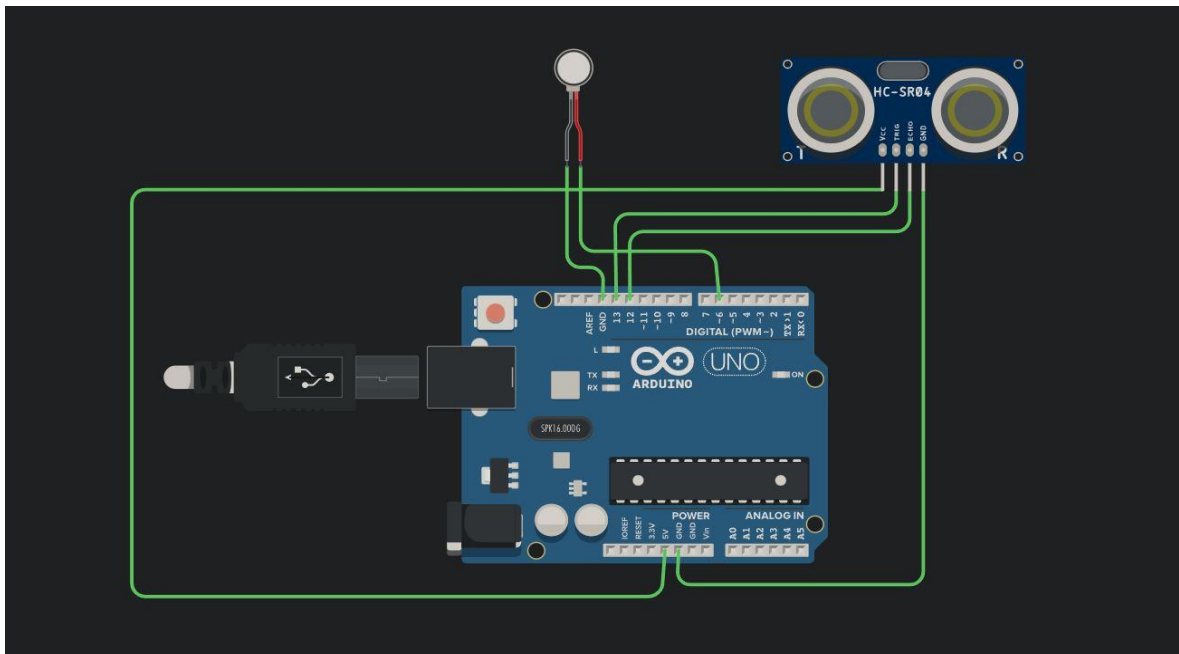
  if (distance <= 75)
  {
    analogWrite(motor, 254 - distance);
  }
  if (distance > 75)
  {
    analogWrite(motor, 0);
  }
  delay(500);
}
```

## PROJECT PICTURES





# Simulation



# **Conclusion**

We would like to conclude that the proposed system completed successfully. As we stated earlier in a problem statement, the previous problem like a less information conveyed, poor efficiency of IR sensor and dependency on stick are overcome and successfully implemented with efficiency of object detection and with clear information to a blind people for their guidelines.

Hence, it can be concluded that this project is able to play a great contribution to the state of the art and will play a great role to assist the blinds to walk easily.

# **Future Scope**

Future work will be focused on enhancing the performance of the system. It can also detect the material and shape of the object. Matching percentage has to be nearly all the time correct as there no chance for correction for a blind person if it is to be trusted and reliable one. The principles of mono pulse radar can be utilized for determining long range target objects.

The other scope may include a new concept of optimum and safe path detection based on neural networks for a blind person. New sensor should be developed to sense the obstacle efficiently and to measure the height of the obstacle and to find distance between the sensor and obstacle



