# THIRD EYE OF THE BLIND

A Project report submitted in the partial fulfilment of the requirements for the award of the Degree of

**BACHELOR OF TECHNOLOGY**

**IN**

**ELECTRONICS AND COMMUNICATION ENGINEERING**

Submitted By


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**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

**AVANTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY**

(Approved by A.I.C.T.E & Permanently Affiliated to JNTUGV)
Accredited by NAAC with "**B++**" Grade
Cherukupalli (V), Bhogapuram (M), Vizianagaram (Dist.), AP.


2019-2023

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# BONAFIDE CERTIFICATE

This is to certify that project work entitled "THIRD EYE OF THE BLIND" by R Purnima (19Q71A0490), P Kiran Kumar (19Q71A0478), T Bhuvan Varshit (19Q71A0498), K Rahul (19Q71A0487) under my guidance in partial fulfilment of requirements for the award of the Degree of Bachelor of Technology in Electronics and Communication Engineering from AVANTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY during 2019- 2023.

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# ACKNOWLEDGEMENT

The satisfaction and euphoria that accompany the successful completion of any task would be incomplete without the mentioning of the people whose constant guidance and encouragement made it possible. We take pleasure in presenting before you, our project, which is result of studied blend of both research and knowledge.

We offer our profuse thanks to **Sri. M Srinivasa Rao, Chairman of Avanthi Group of Colleges,** for his great support and the encouragement that he has given us in the completion of the project work.

We offer our profuse thanks to **Dr. S.N.V. Ganesh, B. Tech, M Tech, PhD** Professor, the principal of **AVANTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY** for his great support and the encouragement that he has given usin the completion of the project work.

We offer our profuse thanks to **Sri. V. Siva Bhaskar Rao, M. Tech (Ph.D.), Associate professor**, Head of the department-ECE, and our project guide, **Mrs. Shyamala K, M. Tech, (PhD), Assistant Professor** for his valuable suggestions and constant motivation that greatly helped the project work to get successfully completed.

Finally, we express our gratitude to all other members who are involved either directly or indirectly for the completion of this project.

**Thanking you all,**

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# DECLARATION

We declare that this project entitled "**THIRD EYE OF THE BLIND**", has been carried out by us and contents have been presented in the form of dissertation in partial fulfilment of the requirement for the award of Degree of Bachelor of Technology in Electronics and Communication Engineering. We further declare that this dissertation has not been submitted elsewhere for any degree.


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# ABSTRACT

## THIRD EYE OF THE BLIND


### About the Project

It is the first wearable technology for blind people which resolves all the problems of existing technologies. Nowadays there are many instruments and smart-devices for visually impaired people for navigation. Most of them have certain problems with carrying and the major drawback is those need a lot of training to use.

Our Project "**Third Eye for the Blind**" will help Navigate them through streets, etc. We have tried to keep it a budget so its affordable to everyone. It works on the **principle of SONAR**. SONAR system uses ultrasound to detect the distance of the objects. It works by sending ultrasound and then sensing the reflected rays and thus determine the distance. We have used Arduino as our Microprocessor and Buzzer for giving Feedback

Since the kit contains 4 Units of same circuit, we have made a single circuit for Demonstration. We can make 4 of them for the whole kit

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# CHAPTER-1

# INTRODUCTION

# CHAPTER 1 INTRODUCTION

With the improvement of the living standards of the people, we have become so materialistic that we have forgotten how the physically disabled people live a tough life. They undergo rigorous, apathetic, and indifferent behaviour towards them for being physically disabled. They become dependent on other people in a way for their day-to-day routine chores. Blind and impaired persons always depend on other people for their locomotion. Eye are prime sense of organ in perceiving the outside environment; dysfunction of such prime sense organ severely effects the knowledge perceiving capability of the outside environment. Therefore, going around to places in such environment is a very big challenge because the blind people cannot depend on their own eyes and thus face many difficulties. The objective of this project The Third Eye for the Blind is to design a product which is very much useful to those people who are visually impaired and those who often have to rely on others. Third eye for Blind project is an innovation which helps the visually impaired people to move around and go from one place to another with speed and confidence by knowing the nearby obstacles using the help of the wearable band which produces the ultrasonic waves which notify them with buzz sound or vibrations. It allows the user those who are visually impaired to walk freely by detecting the obstacles.

They only need to wear this device as a band or cloth on their body. According to WHO or the World Health Organization, 39 million people are estimated as blinds worldwide. They are suffering a lot of hardship in their daily life. The physically disabled ones have been using the traditional way that is the white cane for many years which although being effective, still has a lot of disadvantages and limitations. Another way is, having a pet animal such as a dog, but it is expensive. Thus, the aim of the project Third eye for the Bind is to develop a cheap, affordable and more efficient way to help the blind people to navigate with greater comfort, speed and confidence. This is the wearable technology for the blinds which helps resolve all the problems of the existing technologies. Now a days there are so many technologies, things, and smart devices for the visually impaired people for the navigation, but most of them have certain problems for the blind

people and the major drawbacks are that those things need a lot of training and efforts to use. One of the main peculiarities of this innovation is, it is affordable for everyone, the total cost being less than $25 or ~1500 INR. There are no such devices available in the market that can be worn like a cloth and having such a low cost and simplicity. With the use of this improvised device in a large scale, with improvements in the prototype, it will drastically benefit the community of the visually impaired or the blind people. The walking cane is a simple and purely mechanical device dedicated to detect the static or the constant obstacles on the ground, uneven surfaces, holes and steps via simple tactile-force feedback.

This device is light, portable but limited to its size and it is not used for dynamic obstacle detection. These devices operate like the radar and the system of the device uses the ultrasonic wave's fascicle to identify the height, direction and the speed of the objects. The distance between the person and the obstacle is measured by the time of the wave travel. However, all the existing systems inform the blind the presence of the object at a specific distance in front of or near to him. These details help the user or the blind people in detecting the obstacles and thus change the way and walk accordingly. Information about the objects and their place in the way of the walking like an obstacle and their characteristics can create additional knowledge to enhance the space manifestation and memory of the blind or the visually impaired people. To overcome, the above-mentioned limitations this work offers a simple, efficient, configurable virtual for the blind.

## 1.1 Existing System:

The existing system consists of the devices or the supports like white cane for helping them to detect the obstacles and travel to places, pet dogs, smart devices like vision a torch for blinds. But there were many limitations and problems in these existing systems like in the white cane, it may easily break or crack. The white cane may get stuck at the pavement cracks of the different objects. Whereas the pet dogs' cost is huge and need a lot of training.

**Disadvantages of Existing system**

- White cane - May easily crack/break, The stick may get stuck at pavement cracks of different objects.
- Pet dog - huge cost around 280000Rs & well trained
- Common Disadvantages (Including the smart devices) Cannot be carried easily, needs a lot of training to use.

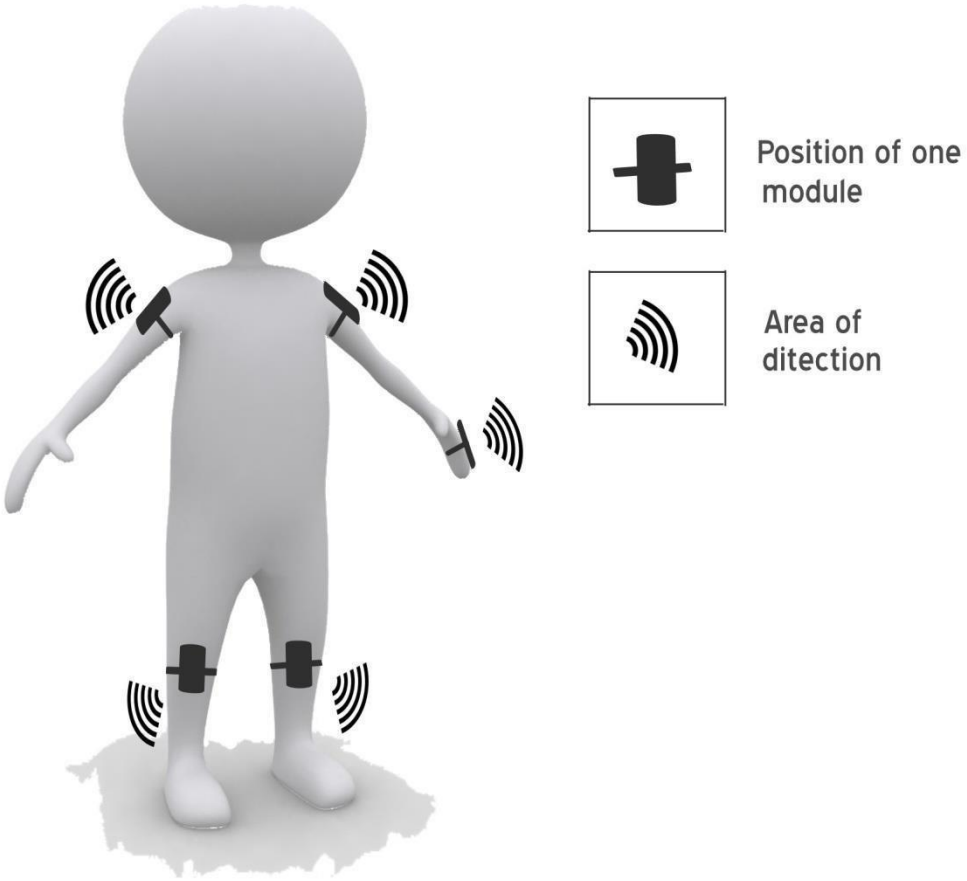
## 1.2 Proposed System:

This device will help the blind to navigate without holding a stick which is a bit annoying for them. They can simply wear it as a band or cloth and it can function very accurately and they only need a very little training to use it. we have designed a special wearable device based on the Arduino board which can be worn like a cloth for blinds. This device is equipped with five ultrasonic sensors, consisting of five modules which are connected to the different parts of the body. Blind can detect the objects in a view around them and can easily travel anywhere. When the ultrasonic sensor detects obstacle, the device will notify the user through vibrations or sound beeps. The intensity of vibration and rate of beeping increases with decrease in distance and this is a fully automated device.

The features of the Third Eye for Blind will help the visually impaired people in many ways. By wearing this device, they can fully avoid the use of the white cane and such other devices. This device will help the blind to navigate without holding a stick which is a bit annoying for them. They can wear the device as a band or like a cloth and it can function very accurately and they only need a very little training to use it as it is quite simple, efficient, and easy to operate and wear.

### 1.3 Third Eye for Blinds as a Solution

By wearing this device, they can fully avoid the use of white cane and such other devices. This device will help the blind to navigate without holding a stick which is a bit annoying for them. They can simply wear it as a band or cloth and it can function very accurately and they only need a very little training to use it.




We have designed a special wearable device based on the Arduino board which can be worn like a cloth for blinds. This device is equipped with four ultrasonic sensors, consisting of four modules which are connected to the different parts of the body. Among them, two for both shoulders, another two for both knees. Using the four ultrasonic sensors, blind can detect the objects in a four-dimensional view around them and can easily travel anywhere. When the ultrasonic sensor detects obstacle, the device will notify the user through vibrations and sound beeps. The intensity of vibration and rate of beeping increases with decrease in distance and this is a fully automated device.

# CHAPTER-2

# LITERATURE SURVEY

# CHAPTER 2 LITERATURE SURVEY

## 2.1 Principle

Sonar uses the Principle of Sending Ultrasound waves (Sound Frequency above 20,000Hz) and the Sensing the reflected waves and thereby detecting objects and their Distance.

## 2.2 History

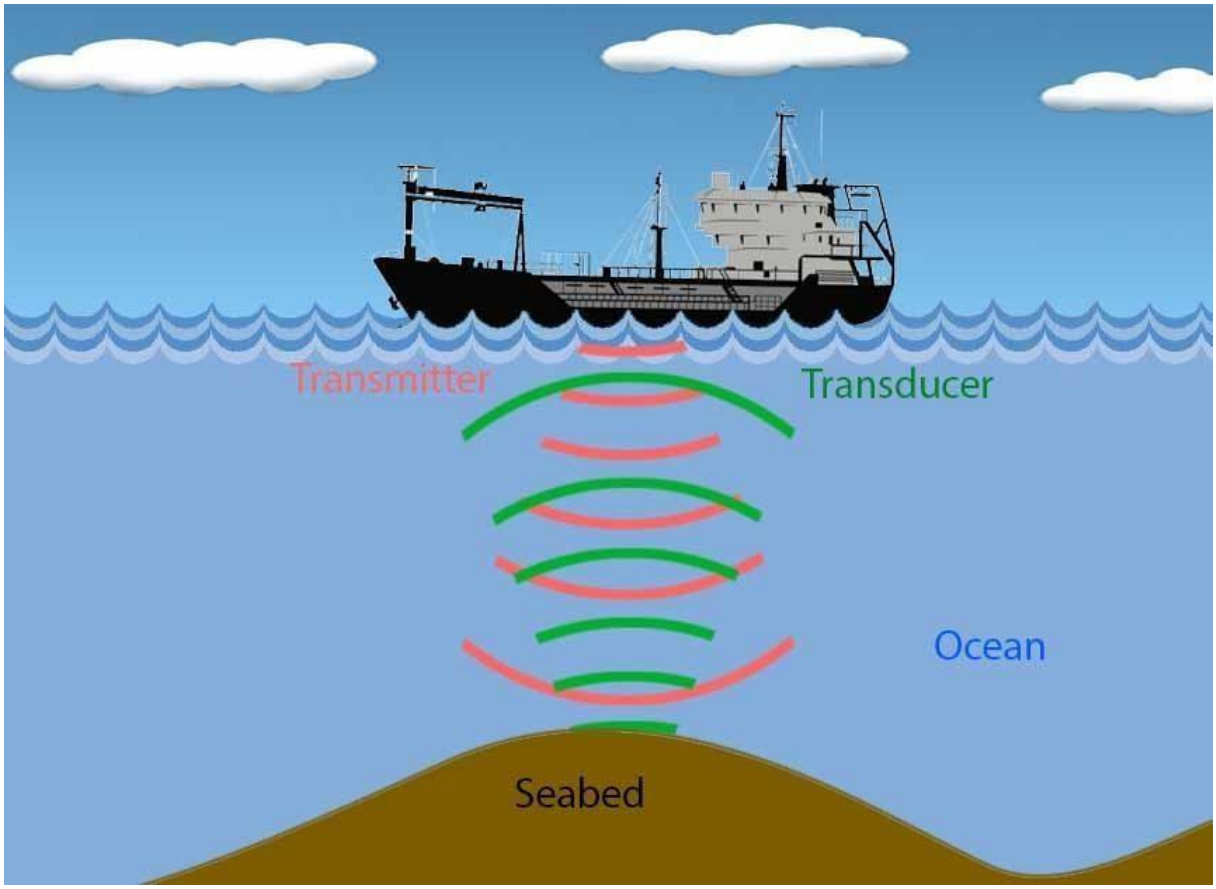
Sonar was first proposed as a means of detecting icebergs. Interest in sonar was heightened by the threat posed by submarine warfare in World War I. An early passive system, consisting of towed lines of microphones, was used to detect submarines by 1916, and by 1918 an operational active system had been built by British and U.S. scientists. Subsequent developments included the echo sounder, or depth detector, rapid-scanning sonar, sidescan sonar, and WPESS (within-pulse electronic-sector-scanning) sonar.

The uses of sonar are now many. In the military field are many systems that detect, identify, and locate submarines. Sonar is also used in acoustic homing torpedoes, in acoustic mines, and in mines detection. Nonmilitary uses of sonar include fish finding, depth sounding, mapping of the sea bottom, Doppler navigation, and acoustic locating for divers.

A major step in the development of sonar systems was the invention of the acoustic transducer and the design of efficient acoustic projectors. These utilize piezoelectric crystals (e.g., quartz or tourmaline), magneto strictive materials (e.g., iron or nickel), or electro strictive crystals (e.g., barium titanate). These materials change shape when subjected to electric or magnetic fields, thus converting electrical energy to acoustic energy.

Suitably mounted in an oil-filled housing, they produce beams of acoustic energy over a wide range of frequencies.

In active systems the projector may be deployed from an air-launched sonobuoy, hull mounted on a vessel, or suspended in the sea from a helicopter. Usually, the receiving and transmitting transducers are the same. Passive systems are usually hull-mounted, deployed from sonobuoys, or towed behind a ship. Some passive systems are placed on the seabed, often in large arrays, to provide continuous surveillance.




SONAR SYSTEM

## 2.3 Literature Survey

Over the last few years or we can say over the last decades, research has been conducted for new devices and technologies to design a good and reliable and efficient system for blind or visually impaired people to detect the obstacles and warn or alert them at danger places or the obstacles. There are some systems which has some limitations and clampdown.

**Shoval et al**. in developed a Navbelt, an obstacle avoidance wearable portable computer which is only for indoor navigation. Navbelt was equipped with two modes, in the first one the system information was translated to audio in different sounds. One sound for free for travel direction and other for blocked, it was difficult for the person to differentiate the sounds. Other problem was the system would not know the user momentary position.

**D. Yuan et al.** in have discussed about the virtual white cane sensing device based on active triangulation that can measure distances at a rate of 15 measurements/second. A blind person can use this device for sensing the environment, pointing it as if it was a flash light. Beside measuring distances, this device can detect surface discontinuities, such as the foot of a wall, a step, or a drop-off. This is obtained by analyzing the range data collected as the user swings the device around, tracking planar patches and finding discontinuities.

**Benjamin et al.** in introduce a laser cane with three photo diodes and three laser diodes function as receiver making an optical triangulation. The laser cane generally detects the obstacle in three specified directions. One is 45º to the ground for overhanging obstacles, the second one is parallel to the ground and third one is for sharp deepness. The laser cane has no data or technology or we can say system for determining the location and the position of the obstacle, rather it is just like a hit and trial method.

**J. Na** proposed an interactive guide system for indoor positioning of this, which can‟t detect the obstacles and hurdles. The system is not suitable for the outdoor activities.

**Sabarish. S** in have described the development of a navigation aid in order to assist blind and visually impaired people to navigate easily, safely and to detect any obstacles. The system is based on a microcontroller with synthetic speech output. In addition to this, the device consists of two vibrators, two ultrasonic sensors which is mounted on the user's shoulders or any other body part and another one integrated into the cane.

**M.A Ungar S** has proposed methods for the visually impaired people for the urban cities. But they didn't consider about the people who cannot afford costly equipment and devices. This limitation is overcome by the device third eye for the blind.

**Ms. Pooja Sharma** has discussed that the obstacles can be detected, but it has many limitations on the angles and the distance. On contrary, this project will have a wide angle for the detection where the sensors range will be wide. In today's world of innovations, there are many innovations for the visually impaired people like the white cane with the cane with a red tip for helping the movements of the blind people. There are many different types of canes used in today's world with growing technologies such as the white cane, the smart cane and the laser cane. The cost of the trained dogs is also very high and is not affordable option.

# CHAPTER-3

# EXISTING METHOD

# EXISTING METHOD

The existing system consists of the devices or the supports like white cane for helping them to detect the obstacles and travel to places, pet dogs, smart devices like vision a torch for blinds. But there were many limitations and problems in these existing systems like in the white cane, it may easily break or crack. The white cane may get stuck at the pavement cracks of the different objects. Whereas the pet dogs' cost is huge and need a lot of training.

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# CHAPTER-4

# PROPOSED METHOD

# CHAPTER - 4

# PROPOSED METHOD

- The first wearable technology for people who are blind
- Using ultrasonic waves to detect the obstacles
- Notifying the user through buzzer sound

Third eye for people who are blind is an innovation which helps the blind people to navigate with speed and confidence by detecting the nearby obstacles using the help of ultrasonic waves and notify them with buzzer sound or vibration. They only need to wear this device as a band or cloth.

According to WHO 39 million peoples are estimated as blind worldwide. They are suffering a lot of hardship in their daily life. The affected ones have been using the traditional white cane for many years which although being effective, still has a lot of disadvantages. Another way is, having a pet animal such as a dog, but it is really expensive. So the aim of the project is to develop a cheap and more efficient way to help visually impaired to navigate with greater comfort, speed and confidence.

We have designed a special wearable device based on the Arduino board which can be worn like a cloth for blinds. This device is equipped with five ultrasonic sensors, consisting of five modules which are connected to the different parts of the body. Among them, two for both shoulders, another two for both knees and one for the hand. Using the five ultrasonic sensors, blind people can detect the objects in a five-dimensional view around them and can easily travel anywhere. When the ultrasonic sensor detects obstacle, the device will notify the user through vibrations and sound beeps. The intensity of vibration and rate of beeping increases with decrease in distance and this is a fully automated device.

**Software Environment**

The Arduino Web Editor allows you to write the code and upload sketches to any Arduino and Genuino board from your Web Browser (Chrome, Firefox, Safari, and Edge) after installing a plug-in. It works with any official Arduino & Genuino board.

This IDE (Integrated Development Environment) is a part of Arduino Create, which is an online platform that enables the makers to write the code, access tutorials, configure boards, and share the projects. Designed to provide users with a continuous Workflow, Arduino Create connects the dots between each part of a maker's journey from inspiration to implementation, which means, you now have an ability to manage every aspect of your project right from a single dashboard.

Arduino Web Editor is hosted online. Therefore, it will always be up-to-date with the latest features and support for new boards.

This IDE lets you write the code and save it to Cloud, always backing it up and making it accessible from any device. It automatically recognizes any Arduino and Genuino board connected to your PC and configures itself accordingly

**Wiring instruction.**

- Ground of LED and buzzer to GND of Arduino
- +ve of Buzzer to pin 3
- +ve of LED to pin 2

**Ultrasonic sensor**

- Ultrasonic sensor pin VCC - Arduino pin VCC
- Ultrasonic sensor pin GND - Arduino pin GND
- Ultrasonic sensor pin Trig - Arduino pin 12
- Ultrasonic sensor pin Echo - Arduino PIN 12

# CHAPTER-5

# SYSTEM ANALYSIS

# CHAPTER - 5

# SYSTEM ANALYSIS

## 5.1 Functional Requirements:

- This system uses IoT for Blind people.
- Simple to deploy
- Less cost efficient.
- Wireless Sensor network

## 5.2 Non-Functional Requirements:

### 5.2.1 Software Quality Attributes

- **Scalability:** The application can be extended to individual to multiple vehicles.
- **Reliability**: The ability of the system to behave consistently in a user acceptable manner when operating safety for which the system was intended.
- **Usability:** This project has faster response.

### 5.2.2 Safety Requirements

- Arduino UNO encloses to protect the microcontroller.
- Soldering the jumper wires

## 5.3 Hardware Requirements:

- Arduino Nano
- Ultrasonic sensor
- Jumper Wires
- Breadboard
- 5 volts power supply

## 5.4 Software Requirements:

- Arduino Web Editor.

# CHAPTER-6

# SYSTEM DESIGN

## CHAPTER – 6 SYSTEM DESIGN

### 6.1 System Architecture:

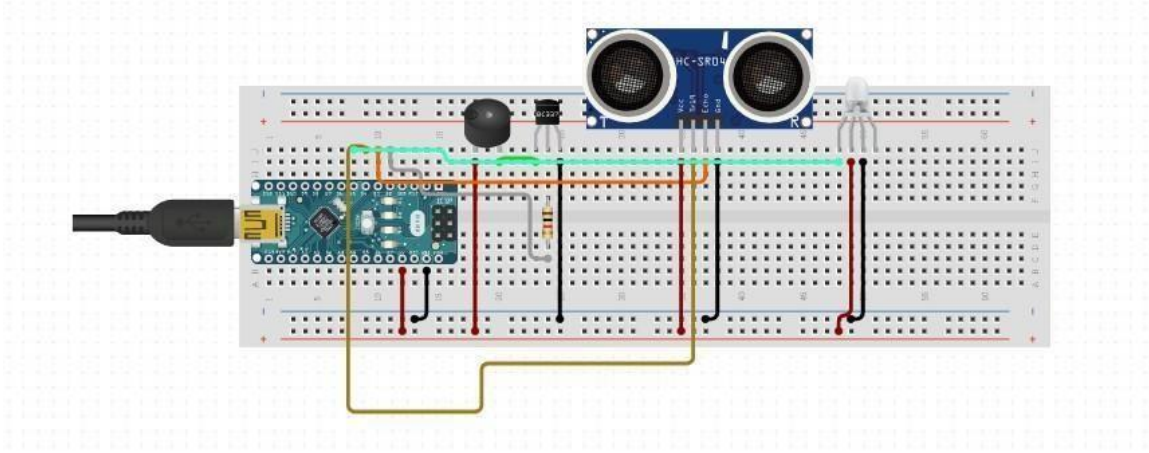



**Fig 4.1** System Architecture

Components contains in system design:

1. Arduino Nano
2. Ultrasonic Sensor
3. Buzzer
4. Led bulb

## 6.2 Block Diagram:

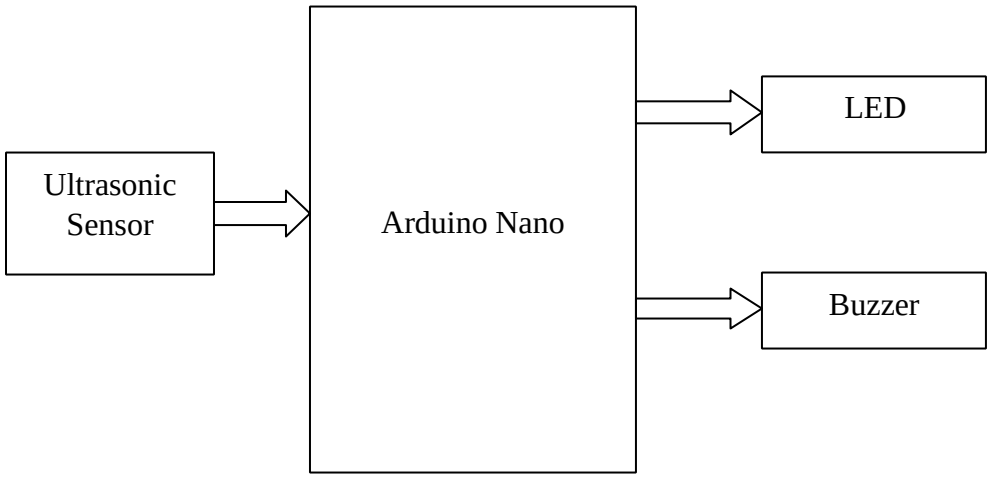



**Fig 4.1** Block diagram

### 6.3 ARDUINO NANO

The Arduino Nano development board was first released in 2008 by Arduino and is one of the most popular Arduino boards. It is based on the ATmega328 8-bit microcontroller by Atmel (Microchip Technology). The Atmega328 comes with a built-in bootloader, which makes it convenient to flash the Nano board with a program. At mega 328P based Arduino Nano pinout and specifications are given in detail in this post.

Arduino Nano has the same functionality but is smaller in size than Arduino Uno. The other difference is that there no DC power jack on Nano and is powered using a Mini-B USB cable instead of a standard one.

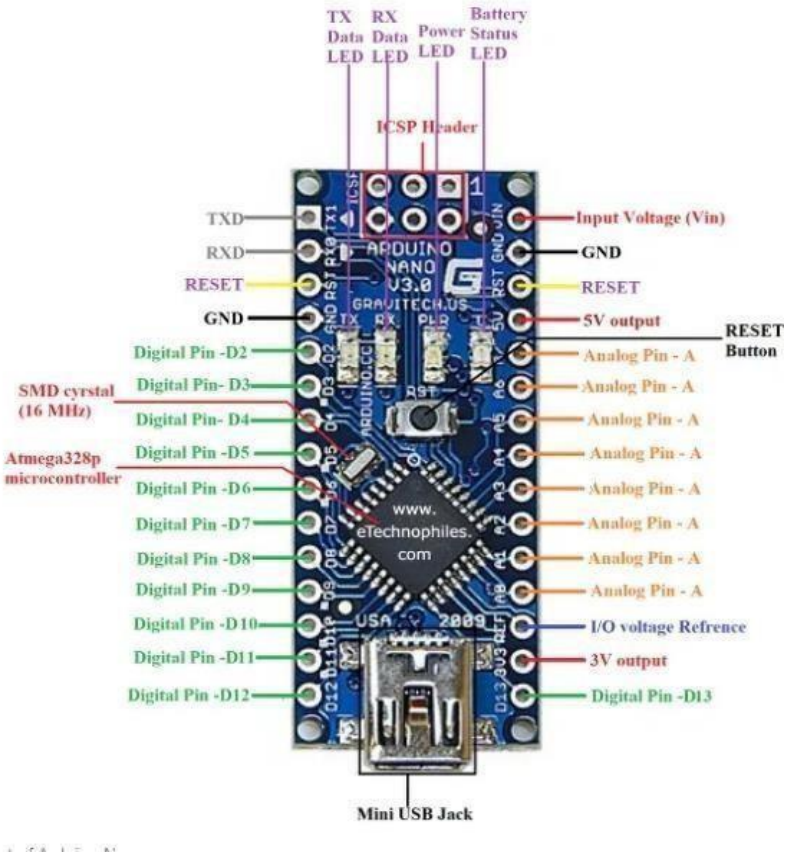
Arduino Nano boards are widely used in the field of robotics, embedded systems, and electronic projects where the required size of the microcontroller is small.

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to 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.

Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.

### 6.3.2 Arduino Nano Pinout and Pin diagram

Arduino Nano has a total of 36 pins. Out of these 8 are analog input pins and 14 digital input/output pins (of which 6 can be used as PWM outputs). Nano has a 16 MHz SMD crystal resonator, a mini-USB-B port, an ICSP header, 3 RESET pins and, a RESET button.



### 6.3.3 Arduino Nano Specifications:

| | |
|---|---|
| Microcontroller: | ATmega328 |
| Operating voltage: | 5 V |
| Input voltage (VIN): | 6-20 V |
| Power consumption: | 19 mA |
| Flash memory: | 32 KB (of which 2 KB is taken by bootloader) |
| SRAM: | 2 KB |
| Clock speed: | 16 MHz |
| EEPROM: | 1 KB |
| Current per I/O pin: | 40 mA (20 mA recommended) |
| PCB size: | 18 x 45 mm |
| Weight: | 7 g |

### 6.3.4 Why Arduino?

Thanks to its simple and accessible user experience, Arduino has been used in thousands of different projects and applications. The Arduino software is easy-to-use for beginners, yet flexible enough for advanced users. It runs on Mac, Windows, and Linux. Teachers and students use it to build low-cost scientific instruments, to prove chemistry

and physics principles, or to get started with programming and robotics. Designers and architects build interactive prototypes, musicians and artists use it for installations and to experiment with new musical instruments. Makers, of course, use it to build many of the projects exhibited at the Maker Faire, for example. Arduino is a key tool to learn new things. Anyone - children, hobbyists, artists, programmers - can start tinkering just following the step-bystep instructions of a kit, or sharing ideas online with other members of the Arduino community.

There are many other microcontrollers and microcontroller platforms available for physical computing. Parallax Basic Stamp, Netmedia's BX-24, Phidgets, MIT's Handyboard, and many others offer similar functionality. All of these tools take the messy details of microcontroller programming and wrap it up in an easy-to-use package. Arduino also simplifies the process of working with microcontrollers, but it offers some advantage for teachers, students, and interested amateurs over other systems:

- Inexpensive - Arduino boards are relatively inexpensive compared to other microcontroller platforms. The least expensive version of the Arduino module can be assembled by hand, and even the pre-assembled Arduino modules cost less than Rs 1000

- Cross-platform - The Arduino Software (IDE) runs on Windows, Macintosh OSX, and Linux operating systems. Most microcontroller systems are limited to Windows.

- Simple, clear programming environment - The Arduino Software (IDE) is easy-to-use for beginners, yet flexible enough for advanced users to take advantage of as well. For teachers, it's conveniently based on the Processing programming environment, so students learning to program in that environment will be familiar with how the Arduino IDE works.

- Open source and extensible software - The Arduino software is published as open-source tools, available for extension by experienced programmers. The language can be expanded through C++ libraries, and people wanting to understand the technical details can make the

leap from Arduino to the AVR C programming language on which it's based. Similarly, you can add AVR-C code directly into your Arduino programs if you want to.

- Open source and extensible hardware - The plans of the Arduino boards are published under a Creative Commons license, so experienced circuit designers can make their own version of the module, extending it and improving it. Even relatively inexperienced users can build the breadboard version of the module in order to understand how it works and save money.

### 6.3.5 What's on the board?

There are many varieties of Arduino boards (explained on the next page) that can be used for different purposes. Some boards look a bit different from the one below, but most Arduinos have the majority of these components in common:

**1.Power (USB / Barrel Jack)**

Every Arduino board needs a way to be connected to a power source. The Arduino UNO can be powered from a USB cable coming from your computer or a wall power supply (like this) that is terminated in a barrel jack. In the picture above the USB connection is labelled (1) and the barrel jack is labelled (2).

The USB connection is also how you will load code onto your Arduino board. More on how to program with Arduino can be found in our Installing and Programming Arduino tutorial.

NOTE: DO NOT use a power supply greater than 20 Volts as you will overpower (and thereby destroy) your Arduino. The recommended voltage for most Arduino models is between 6 and 12 Volts.

**2.Pins (5V, 3.3V, GND, Analog, Digital, PWM, AREF)**

The pins on your Arduino are the places where you connect wires to construct a circuit (probably in conjunction with a breadboard and some wire. They usually have black plastic 'headers' that allow you to just plug a wire right into the board. The Arduino has several different kinds of pins, each of which is labelled on the board and used for different functions.

**GND (3):** Short for 'Ground'. There are several GND pins on the Arduino, any of which can be used to ground your circuit.

**5V (4) & 3.3V (5):** As you might guess, the 5V pin supplies 5 volts of power, and the 3.3V pin supplies 3.3 volts of power. Most of the simple components used with the Arduino run happily from 5 or 3.3 volts.

**Analog (6):** The area of pins under the 'Analog In' label (A0 through A5 on the UNO) are Analog In pins. These pins can read the signal from an analog sensor (like a temperature sensor) and convert it into a digital value that we can read.

**Digital (7):** Across from the analog pins are the digital pins (0 through 13 on the UNO). These pins can be used for both digital input (like telling if a button is pushed) and digital output (like powering an LED).

**PWM (8):** You may have noticed the tilde (~) next to some of the digital pins (3, 5, 6, 9, 10, and 11 on the UNO). These pins act as normal digital pins, but can also be used for something called Pulse-Width Modulation (PWM). We have a tutorial on PWM, but for now, think of these pins as being able to simulate analog output (like fading an LED in and out).

**AREF (9):** Stands for Analog Reference. Most of the time you can leave this pin alone. It is sometimes used to set an external reference voltage (between 0 and 5 Volts) as the upper limit for the analog input.

**3. Reset Button**

Just like the original Nintendo, the Arduino has a reset button. Pushing it will temporarily connect the reset pin to ground and restart any code that is loaded on the Arduino. This can be very useful if your code does not repeat, but you want to test it multiple times. Unlike the original Nintendo however, blowing on the Arduino does not usually fix any problems.

**4. Power LED Indicator**

Just beneath and to the right of the word "UNO" on your circuit board, there is a tiny LED next to the word 'ON' (11). This LED should light up whenever you plug your Arduino into a power source. If this light does not turn on, there is a good chance something is wrong. Time to re-check your circuit!

**5. TX RX LEDs**

TX is short for transmit; RX is short for receive. These markings appear quite a bit in electronics to indicate the pins responsible for serial communication. In our case, there are two places on the Arduino UNO where TX and RX appear -- once by digital pins 0 and 1, and a second time next to the TX and RX indicator LEDs (12). These LEDs will give us some nice visual indications whenever our Arduino is receiving or transmitting data (like when we're loading a new program onto the board).

**6. Main IC**

The black thing with all the metal legs is an IC, or Integrated Circuit (13). Think of it as the brains of our Arduino. The main IC on the Arduino is slightly different from board type to board type, but is usually from the ATmega line of ICs from the ATMEL company. This can be important, as you may need to know the IC type (along with your board type) before loading up a new program from the Arduino software. This information can usually be found in writing on the top side of the IC. If you want to know more about the difference between various IC's, reading the datasheets is often a good idea.

**7.Voltage Regulator**

The voltage regulator (14) is not actually something you can (or should) interact with on the Arduino. But it is potentially useful to know that it is there and what it’s for. The voltage regulator does exactly what it says -- it controls the amount of voltage that is let into the Arduino board. Think of it as a kind of gatekeeper; it will turn away an extra voltage that might harm the circuit. Of course, it has its limits, so don’t hook up your Arduino to anything greater than 20 volts.

## 6.4 ULTRASONIC SENSOR

**HC-SR04 Ultrasonic (US) sensor** is a 4-pin module, whose pin names are Vcc, Trigger, Echo, and Ground respectively. This sensor is a very popular sensor used in many applications where measuring distance or sensing objects are required. The module has two eyes like projects in the front which forms the Ultrasonic transmitter and Receiver. The sensor works with the simple high school formula that

**Distance = Speed × Time**

The Ultrasonic transmitter transmits an ultrasonic wave, this wave travels in air and when it gets objected by any material it gets reflected back toward the sensor this reflected wave is observed by the Ultrasonic receiver module as shown in the picture below


Now, to calculate the distance using the above formulae, we should know the Speed and time. Since we are using the Ultrasonic wave, we know the universal speed of US wave at room conditions which is 330m/s. The circuitry inbuilt on the module will calculate the time taken for the US wave to come back and turns on the echo pin high for that same

amount of time, this way we can also know the time taken. Now simply calculate the distance using a microcontroller or microprocessor.

**Ultra-Sonic Pin Configuration**

| Pin Number | Pin Name | Description |
|---|---|---|
| 1 | Vcc | The Vcc pin powers the sensor, typically with +5V |
| 2 | Trigger | Trigger pin is an Input pin. This pin must be kept high for 10us to initialize<br><br>measurement by sending US wave. |
| 3 | Echo | Echo pin is an Output pin. This pin goes high for a period which will be equal to the time taken for the US wave to return back to the sensor. |
| 4 | Ground | This pin is connected to the Ground of the system. |

### 6.5 BUZZER

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

There are two types are buzzers that are commonly available. The one shown here is a simple buzzer which when powered will make a Continuous Beeeeeeppp.... sound, the other type is called a readymade buzzer which will look bulkier than this and will produce a Beep. Beep. Beep. Sound due to the internal oscillating circuit present inside it. But, the one shown here is most widely used because it can be customised with help of other circuits to fit easily in our application.

This buzzer can be used by simply powering it using a DC power supply ranging from 4V to 9V. A simple 9V battery can also be used, but it is recommended to use a regulated +5V or +6V DC supply. The buzzer is normally associated with a switching circuit to turn ON or turn OFF the buzzer at required time and require interval.

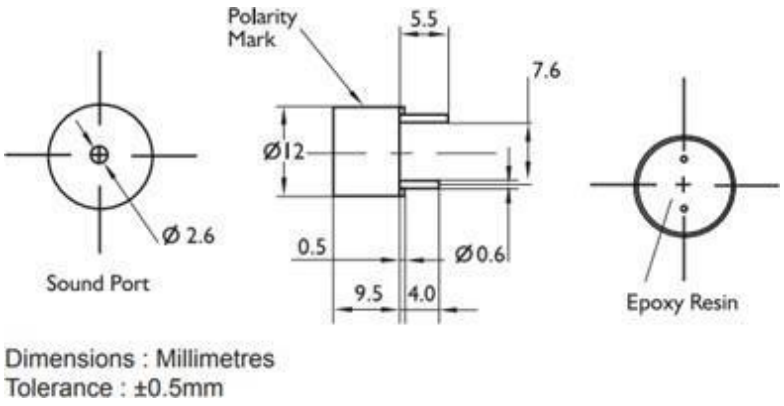
**Buzzer Pin Configuration**

| Pin Number | Pin Name | Description |
|---|---|---|
| 1 | Positive | Identified by (+) symbol or longer terminal lead. Can be powered by 6V DC |
| 2 | Negative | Identified by short terminal lead. Typically connected to the ground of the circuit |

**Buzzer Features and Specifications**

- Rated Voltage: 6V DC
- Operating Voltage: 4-8V DC
- Rated current: <30mA
- Sound Type: Continuous Beep
- Resonant Frequency: ~2300 Hz
- Small and neat sealed package
- Breadboard and Perf board friendly

**2D Model of Buzzer**




**Applications of Buzzer**

- Alarming Circuits, where the user has to be alarmed about something
- Communication equipment's
- Automobile electronics
- Portable equipment's, due to its compact size

## 6.6 JUMPER CABLES

Jumper wire is a type of hook up wire that has been cut and stripped in preparation for use in many electronic applications. Consisting of a single core (solid wire) or multiple strands (stranded wire), jumper wire can be bare or tinned. Jumper wire is commonly used for transferring electrical signals to any position by using a breadboard. Also known as stripped wire, jumper wire is a quick and convenient solution to countless electrical and engineering projects.

## 6.7 BATTERY


It is very easy to use the Hi-Watt 9V Battery in any circuit but get a battery snap connector so that you can easily replace the discharged battery and also it is much easier to use without having to solder

the wires on the terminals of the battery. Some precautions you must take while using the battery are you must not short circuit the terminals and do throw the battery in fire or water after use.

## 6.8 VELCRO

Velcro fasteners are used in shoes and clothing to replace buttons, laces, zippers and snaps. It is useful for wall hangers, medical bandages, and numerous other fastening purposes. The rough side is called the hook. And the soft side is called the loop. The hook and loop fastener's name were inspired by how the technology works.

# CHAPTER – 7

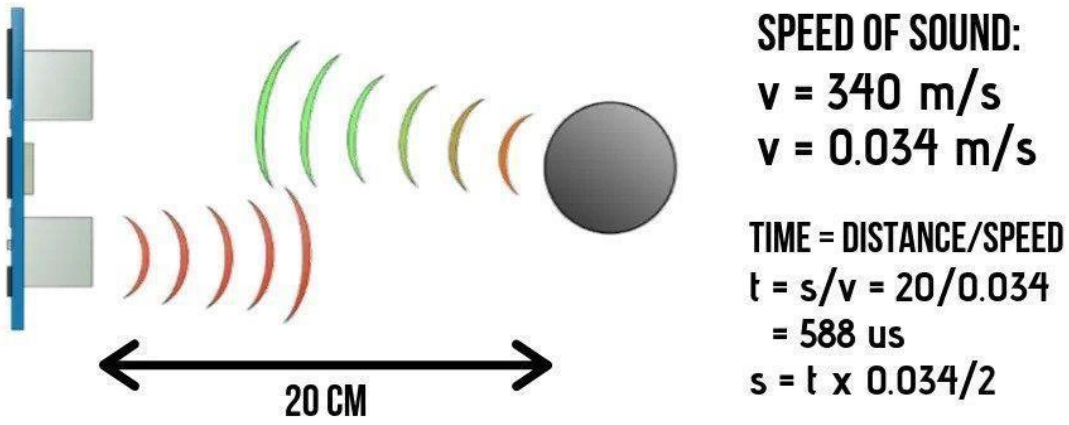
# WORKING PRINCIPLE

# CHAPTER-7 WORKING PRINCIPLE

## 7.1 METHODOLOGY

Ultrasonic Sensor HC-SR04 is a sensor that can measure distance. It emits an ultrasound at 40 000 Hz (40kHz) which travels through the air and if there is an object or obstacle on its path It will bounce back to the module. Considering the travel time and the speed of the sound you can calculate the distance.

Based on the Distance, the buzzer will Beep Accordingly and help the person determine the distance of the Object



## 7.2 Arduino IDE

To edit, compile and upload software projects (sketches) from your computer, you need at least the Arduino IDE. Two other pieces of software are also recommended, i.e., Processing for the connection between your Arduino projects and your computer and Fritzing to create drawings. Arduino IDE software with this Arduino Integrated Development Environment you can edit, compile and upload Arduino sketches to the Arduino boards.

1.6.5, available for Windows, OS X and Linux (and an older version for Raspberry Pi).

**Structure of the Arduino sketch**

```
// Put the inclusions of libraries, declaration of constants
// and declaration and initializing of variables here

void setup()
{
     // Put your setup code here, to run once:
}

void loop()
{
     // Put your main code here, to run repeatedly:
     // The loop never ends!. Quiting the loop is performed
     // by turning off the power to the Arduino board.
}

// Put the declaration of functions and procedures here
```

**Sample writing to Serial port**

```
void setup() {
  // put your setup code here, to run once:
  Serial.begin(9600);
  Serial.println("Start of serial communication");
}

void loop() {
  // put your main code here, to run repeatedly:
  Serial.println("Hello World");
}
```

Arduino is an open-source hardware and software platform. It is commonly used by hobbyists, DIYers, students, and working professionals. It is my personal favourite prototyping platform due to its ease of use and cost. Today, I am going to help you get started using Arduino by walking you through downloading and installing Arduino IDE, writing an Arduino Sketch to blink an LED, and implementing the sketch by uploading it an Arduino board.

**Estimated Time to Complete: 30-45 Minutes**

**Parts and Equipment Needed**

- Arduino Board (Uno, Nano, Mega, etc.)
- LED
- Resistor
- Breadboard
- Jumper Wires
- Computer with Internet connection

**Table of Contents**



**1) Installing Arduino IDE**

Arduino IDE is Arduino's open-source software integrated development environment. An IDE consists of all the necessary tools for software development. To use your Arduino board, you will need to download the Arduino IDE and use it to edit your source code and then upload your code to the board. Arduino IDE is available for Windows, Mac, and Linux.

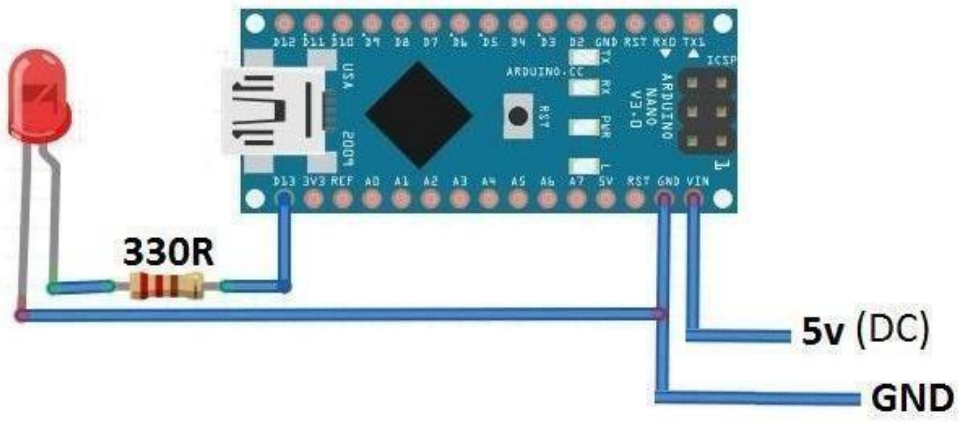
You can find the latest version of Arduino IDE here:

https://www.arduino.cc/en/Main/Software

Download and follow the necessary install steps for your machine.

**2) Building the Circuit**

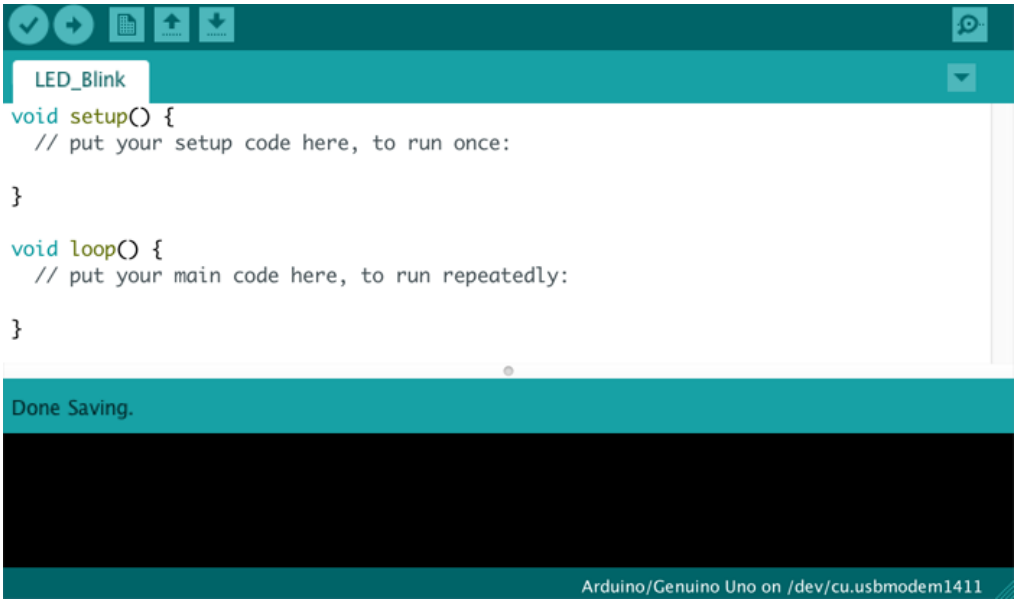
The circuit we are building is really simple. I am using a breadboard to make the circuit; feel free to solder the components together or to make a shield out of a protoboard for your Arduino. I like to make Fritzing schematics of my circuits before building them (Figure 1: Fritzing Schematic). Fritzing is an open-source schematic capture and PCB routing software. If you wish to download Fritzing, you can find it here: http://fritzing.org/home/.




The LED and resistor should be connected in series between Digital I/O Pin 3 and a ground pin. The resistor is there to limit current through the LED and should be sized accordingly depending on your LED to prevent burning it out.

### 3) Writing an Arduino Sketch

Once you've successfully installed Arduino IDE, it's time to start coding. The source code files for Arduino are called sketches. The Arduino programming language is based off C/C++ and is very similar. Open Arduino IDE and a new blank sketch will appear on your screen (Figure 4: New Arduino Sketch).




The sketch is divided into two program parts: a) setup and b) loop. I like to add a header to all my source code, giving the code a title, date, description, and version if necessary (Figure 5: Source Code Header).

The next step would be to include any necessary libraries, but since our code does not use any libraries, we can skip this step.

Next you will write any global variable definitions. This step is not vital. However, when working on more complex code, making these definitions can simplify the code and make it easier to edit. When writing a variable definition, you are assigning a value to a variable. In this case I will define Digital I/O Pin 3 on my Arduino Uno as my LED output pin (Figure 6: LED Pin Definition).

In the future if I want to change the pin that outputs to the LED, I only have to change this definition; I will not have to change any other code.

The setup part of your code is where you make necessary hardware and software configurations. This part of the code runs only once. Since we are driving an LED, we configure the digital I/O pin we have our LED tied to as an output pin (Figure 7: Pin Configuration).

```
const int LED = 3;  //define digital pin 3 as LED output

void setup() {

  //Pin Configurations
  pinMode(LED, OUTPUT); //configure the LED pin as an Output

}
```

Now that we have finished setting up the Arduino we can write the main body of the code. This will go under the loop section and will repeat over and over unless otherwise stated or until power is removed from the Arduino.

To flash the LED on and off every second we write the following command:

1) Turn LED On
2) Wait ½ of a second (500 milliseconds)
3) Turn LED Off
4) Wait ½ of a second
5) Repeat

Since the code we write is within the loop function, the Arduino will automatically repeat the code over and over.

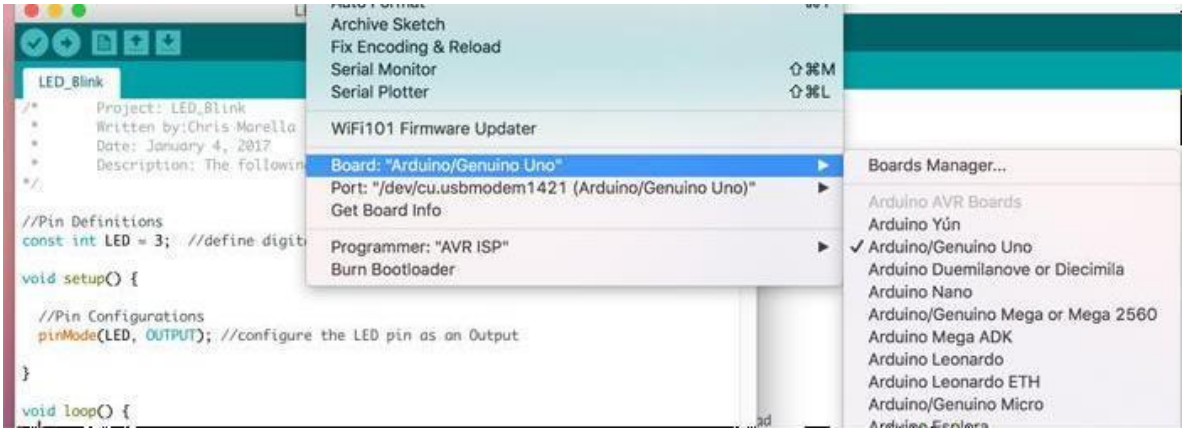
```
  //Flash a LED on and off every second
  digitalWrite(LED, HIGH);  //Turn LED on for 1/2 a second
  delay(500);
  digitalWrite(LED, LOW);   //Turn LED off for 1/2 a second
  delay(500);

}
```

### 4) Uploading an Arduino Sketch

Connect the Arduino board to your computer through USB. Once the Arduino is connected, follow these steps to upload the sketch:

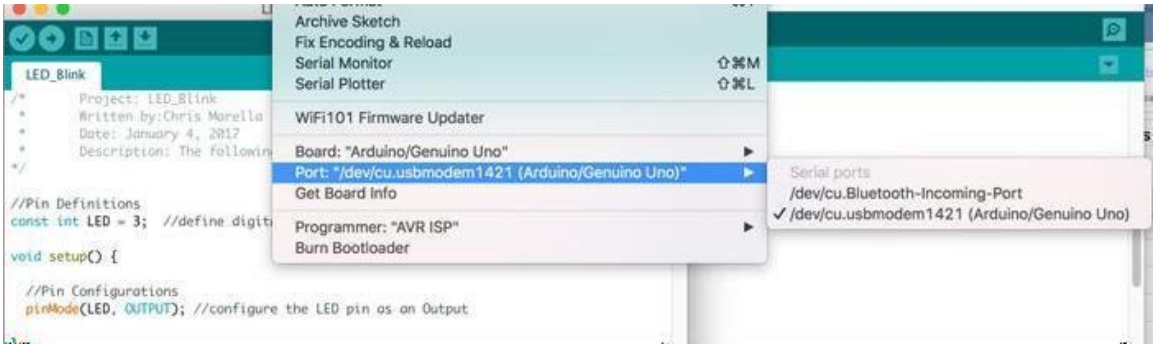
### 1) Select the target board

- The target board selection tells Arduino IDE which Arduino board you are uploading to
- Note: If you have a different board then the Arduino Uno, select that board



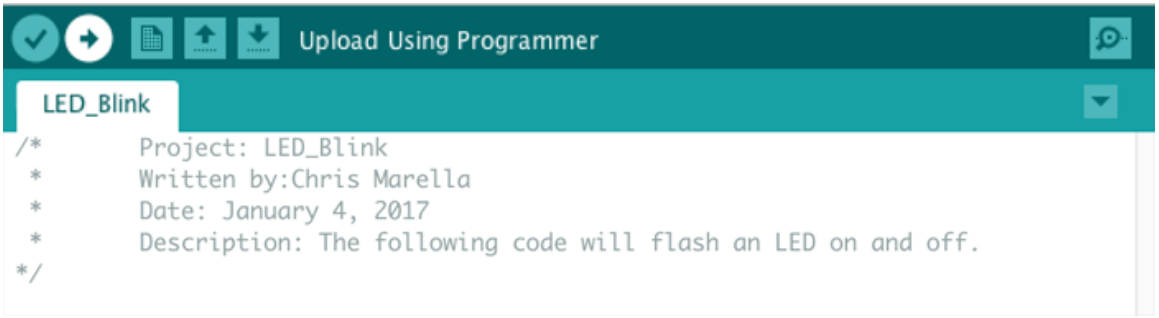

**2) Select the serial port the board is connected to** (Figure 10: Serial Port Connection)

- Note: On Windows this will typically be a COM port

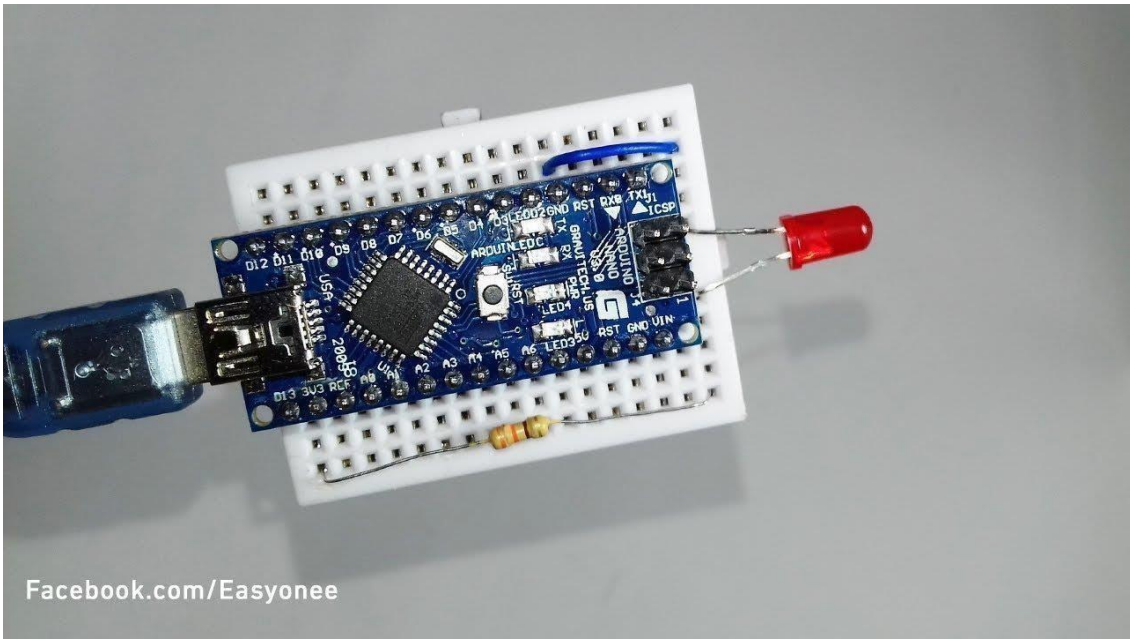


**3) Press the "Upload" button to upload the sketch to the Arduino**

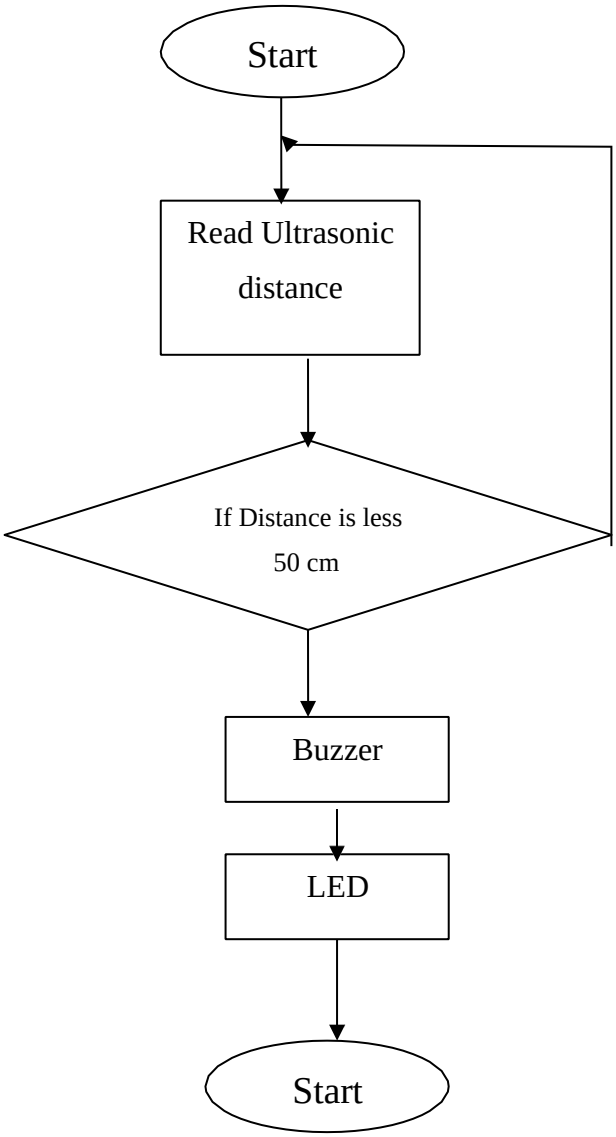
(Figure 11: Upload Button Location)



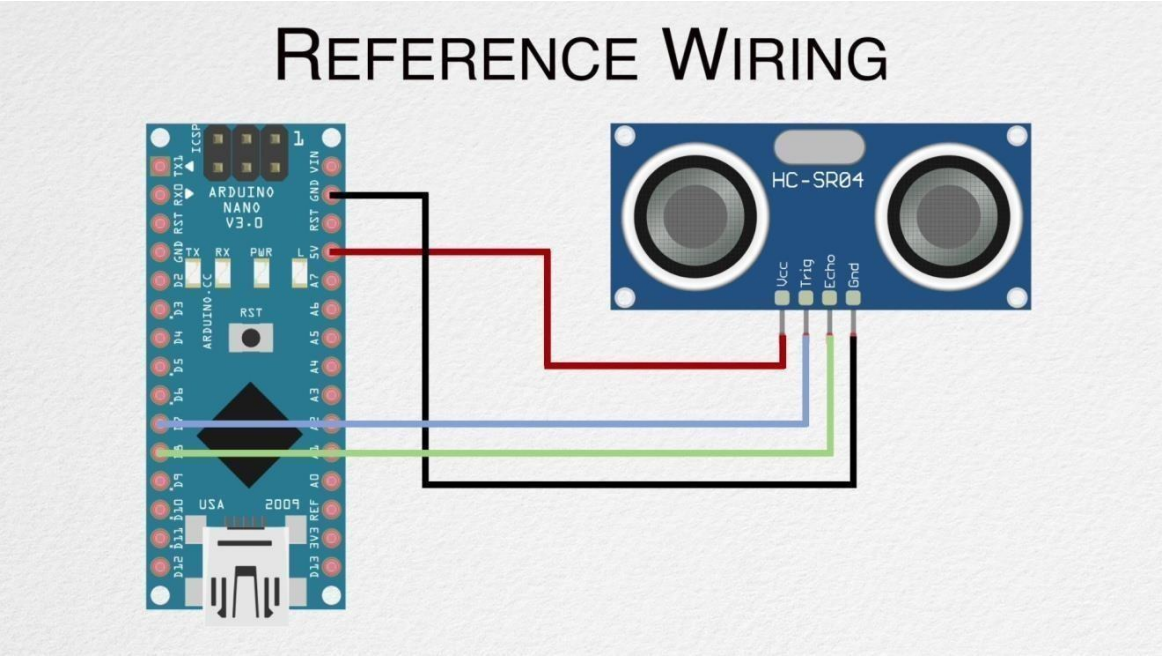

Congratulations! Your LED should now be flashing OFF (Figure 12: LED Off) and ON (Figure 13: LED On) every second. You have just installed Arduino IDE and used it to successfully write and upload your first Arduino sketch.



## 7.3 Flow Chart



## 7.4 Connection between Arduino Nano and ultrasonic sensor




Connect Ground, Power, Trigger, and Echo to the Ultrasonic Ranger Sensor Module

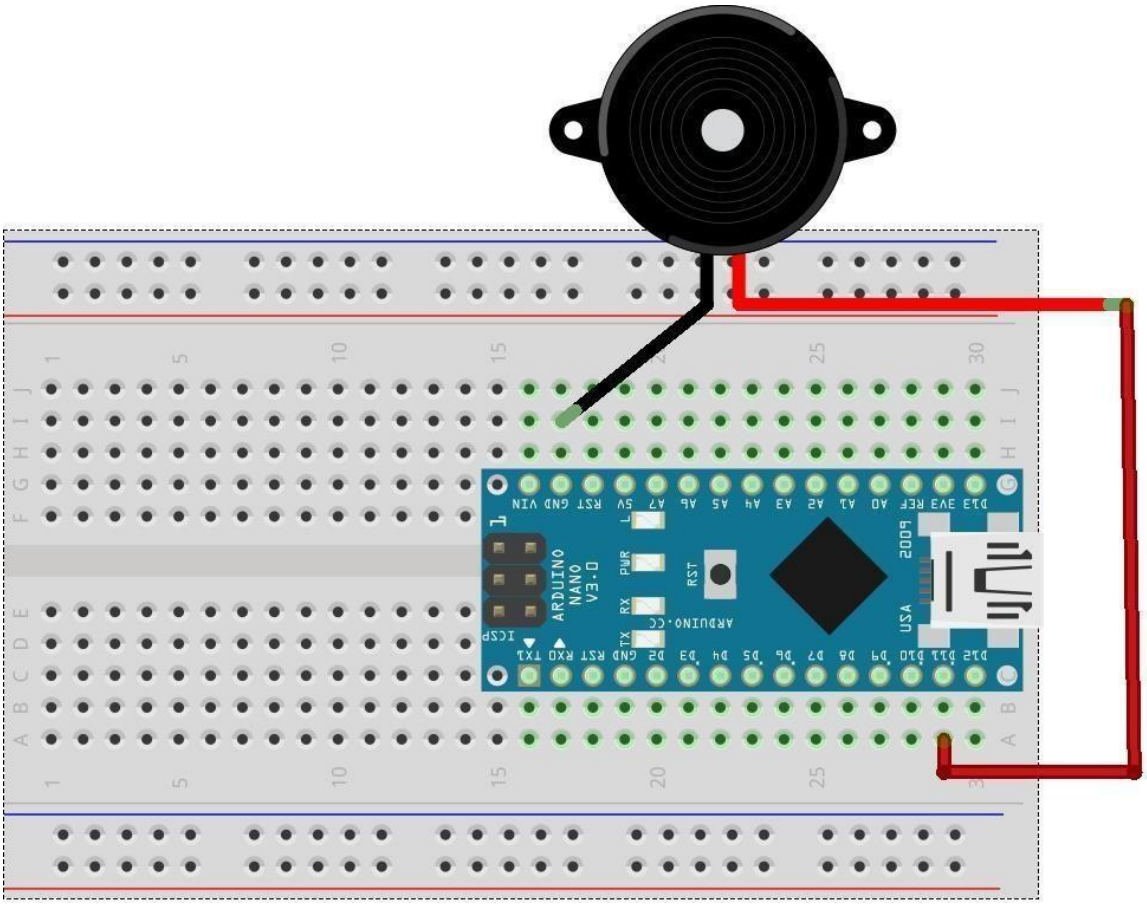
Connect the other end of the Power wire to the 5V power pin of the Arduino board

Connect the other end of the Ground wire to Ground pin of the Arduino board

Connect the other end of the Trigger wire to Digital pin 7 of the Arduino board

Connect the other end of the Echo wire to Digital pin 8 of the Arduino board

## 7.5 Connection between Arduino Nano and Buzzer



Connect the buzzer Power wire to the 5V power pin of the D11.

Connect the buzzer Ground wire to Ground pin of the Arduino board.

## 7.6 Sample Code:

```
const int pingTrigPin = 12; //Trigger connected to PIN 7
const int pingEchoPin = 10; //Echo connected to PIN 8
int buz=5; //Buzzer to PIN 4
void setup() {
Serial.begin(9600);    pinMode(buz, OUTPUT);
 }
void loop(){
  long duration, cm;
  pinMode(pingTrigPin, OUTPUT);
digitalWrite(pingTrigPin, LOW);      delayMicroseconds(2);
  digitalWrite(pingTrigPin, HIGH);
delayMicroseconds(5);
digitalWrite(pingTrigPin, LOW);
pinMode(pingEchoPin, INPUT);
duration = pulseIn(pingEchoPin, HIGH);
cm = microsecondsToCentimeters(duration);
if(cm<=50 && cm>0)
  {
  int d= map(cm, 1, 100, 20, 2000);
digitalWrite(buz, HIGH);      delay(100);
  digitalWrite(buz, LOW);
delay(d);
  }      Serial.print(cm);
  Serial.print("cm");
Serial.println();     delay(100);
  }
  long microsecondsToCentimeters(long microseconds)
  {
  return microseconds / 29 / 2;
  }
```

### 7.7 Code for Arduino:

```
const int pingTrigPin = 11; //Trigger connected to PIN 7
const int pingEchoPin = 9; //Echo connected yo PIN 8
int buz=6; //Buzzer to PIN 4
int led=2;

void setup() {
Serial.begin(9600);
pinMode(buz, OUTPUT);
pinMode(led, OUTPUT);
}
void loop()
{
digitalWrite(led, HIGH);
long duration, cm;
pinMode(pingTrigPin, OUTPUT);
digitalWrite(pingTrigPin, LOW);
delayMicroseconds(2);
digitalWrite(pingTrigPin, HIGH);
delayMicroseconds(5);
digitalWrite(pingTrigPin, LOW);
pinMode(pingEchoPin, INPUT);
duration = pulseIn(pingEchoPin, HIGH);
cm = microsecondsToCentimeters(duration);
if(cm<=50 && cm>0)
{
int d= map(cm, 1, 100, 20, 2000);
digitalWrite(buz, HIGH);
delay(50);
digitalWrite(buz, LOW);
delay(d);
}
Serial.print(cm);
Serial.print("cm");
Serial.println();
delay(100);
```

```
}
long microsecondsToCentimeters(long microseconds)
{
return microseconds / 29 / 2;
}
```

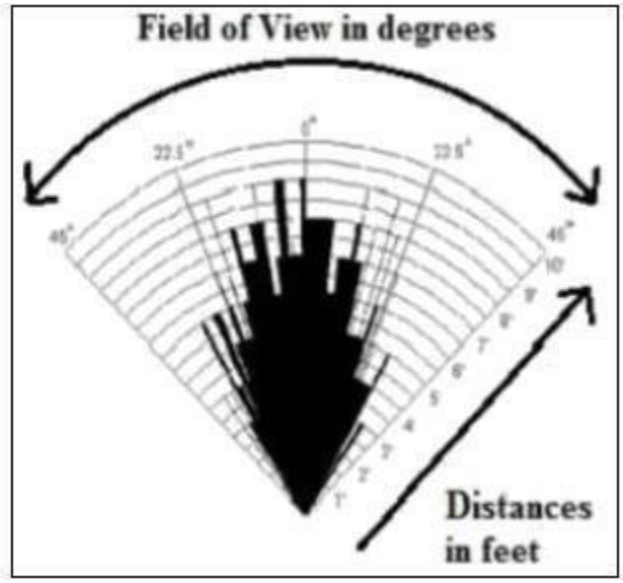
## 7.8 Working Principle

This proposed system consists the equipment like Arduino mini pro, ultrasonic sensor, pref board, vibrating motor, buzzers for detecting the obstacles and letting the user know about the obstacle, Red LEDs, Switches, Jumper cable, power bank, Male and female header pins, 3.3-volt old mobile battery which is unused or discarded, some elastic and stickers to make the device wearable as a band for wearing for the users. The wiring of the device is done in a following manner. The Ground of LED, buzzer and vibration motor are connected to GND of the Arduino. The +ve of the LED and the middle leg of switch is connected to the Arduino pin 5. The +ve of the Buzzer is wired to the first leg of the switch and the +ve of the Vibration motor is wired to the third leg of the switch. The Ultrasonic sensor are wired accordingly. The Ultrasonic sensor pin VCC is connected to the Arduino pin VCC, Ultrasonic sensor pin GND is connected to the Arduino pin GND, Ultrasonic sensor pin Trig is attached to the Arduino pin 12, Ultrasonic sensor pin Echo is connected to the Arduino PIN 12. The switch used here is for selecting the mode. (Buzzer or vibration mode.) We first cut the pref board in 5 X 3 cm dimension and solder the female headers for the Arduino to the board. Then soldering of the buzzer is carried out. Then using the glue connect the vibrating motor and solder the wires to it. Then connection of the LED is done. Then connect the switch. Connect the header pins for ultrasonic sensors and for the battery input. Then solder all the things and connect the Arduino and ultrasonic sensor to the board. Also connect the elastic band to all the modules. For making the module for the hand, connect the ultrasonic sensor to the board by using 4 jumper cables. Then connect a 3.7 volt mobile battery to this module. Then connect the elastic band. In the end after all the connections are done to the Arduino board, upload the code to each Arduino board and power the 4 other modules using a power bank.

The US sensor is a transducer, and is used in pair as trans receiver. The transmitter emits the US waves and if obstacles are present in the path, the US waves hits the obstacles and gets reflected back, the reflected wave is received by the receiver. The US sensor is a combination of one transmitter and receiver. The time interval between sending and receiving of the US signal is calculated, this time interval is used to calculate the distance

between sensor and the obstacle. The equation for the distance calculation between the sensor and the object is as follows:

D = (HPTW * SV)/2 Where, D = Distance in cm. HPTW = High time of pulse width. SV = Sound velocity in cm/s. The sensors which are placed in waist belt are in such a manner that the Ultrasonic pulses of sensors must not be overlapped one over the other. Sensors has a field of view (coverage) of about 60 degrees for 4 feet distance, as the distance from the sensor increases, the coverage angle decreases. Thus, the objective is to cover a wide angle to detect the obstacles with the help of the ultrasonic sensors to help the blind and make it easy for them to move around easily without any hassle. Hence, the distance calculation is calculated and the sensor detects and the further procedure of the buzz sound to the user is carried out.




Thus, this way Third Eye for Blind will be designed for the visually impaired people and will make it very easy and convenient as it will be a wearable device and thus will help the user in travelling and detecting the obstacles while walking very easily.

**WORKING**

1. One can wear the Glove in Hand and Straps in Shoulder and Legs, Since we have made a working model, we have made a single kit.

2. After Wearing, One can direct hand towards the direction the person wants to Move.

3. When the Arduino Starts, it Runs the Program in loop

4. The Ultrasonic sensor sends Ultrasonic sound, and waits to detect the reflected waves

5. Once the waves are Detected by the sensor, it Highs (5v) echo pin

6. Through Code, Arduino calculates the Distance of the Object

7. If the Object is far, it does not Trigger the buzzer.

8. If the Object is Nearby, it triggers the beep.

9. As the buzzer beeps, one can know that the object is nearby and may collide and hence change the Direction Accordingly.

# CHAPTER-8

# CONCLUSION

## 8.1 CONCLUSION

In Conclusion, this Project has the capability and help Blind People Navigate without the need of expensive tech or Dog or Sticks. This system can be paired with 4 other units and used as whole body kit for the Blind people by wearing one in hand, Two in Shoulders and two on knees. This Project can help transform Blind People's lives in Positive way.

Thus, this project proposed the design and architecture of a new concept of Arduino based Virtual Eye for the blind people. A simple, cheap, efficient, easy to carry, configurable, easy to handle electronic guidance system with many more amazing properties and advantages is proposed to provide constructive assistant and support for the blind and visually impaired persons. The system will be efficient and unique in its capability in specifying the source and distance of the objects that may encounter the blind. It can scan and detect the obstacles in the areas like left, right, and in front of the blind person regardless of its height or depth. With the proposed architecture, if constructed with at most accuracy, the blind will be able to move from one place to another without others help.

## 8.2 FUTURE SCOPE

The entire project can be made in the form of jacket, so that the device does not need to be wear one by one.

By specifically using the specialized boards that are designed, using them instead of Arduino and by using high quality ultrasonic sensors makes and gives faster response which make the device capable of working in crowded places and thus this will be implemented in the future enhancement of this device.

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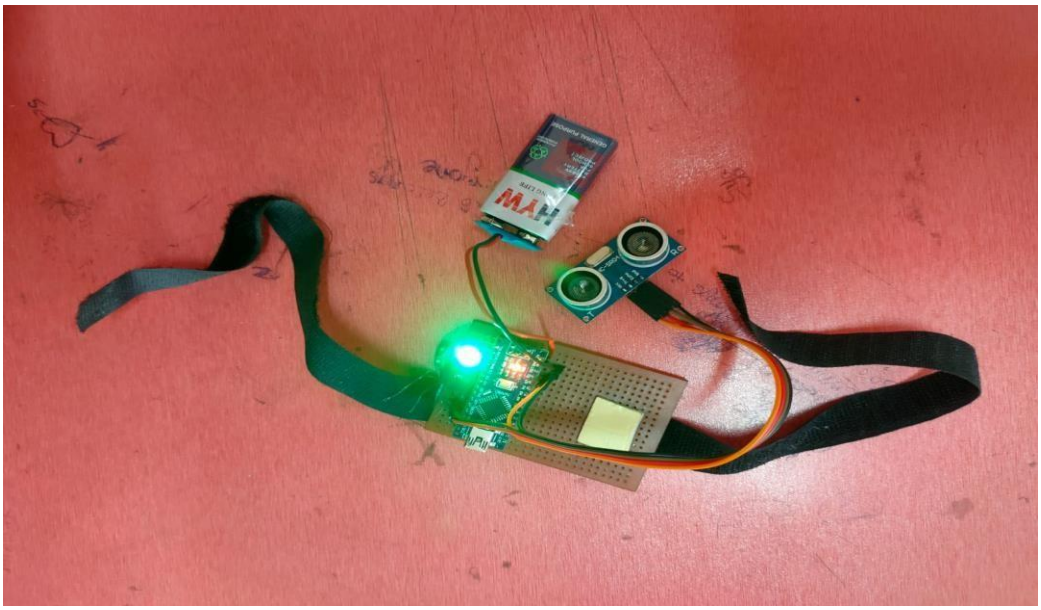
## FINAL PROJECT OUTPUT



**All Four Sets of the Project**