

A WEARABLE DEVICE FOR VISUALLY IMPAIRED PEOPLE (ULTRASONIC GLOVE)

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering degree in
Electronics and Instrumentation Engineering

by

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**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION
ENGINEERING**

SCHOOL OF ELECTRICAL AND ELECTRONICS

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

Accredited with Grade "A" by NAAC | 12B Status by UGC | Approved by AICTE

JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119

APRIL – 2021



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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **ABINAYA.S** (Reg.No: 37180001) and **DHANUSHKA.A** (Reg.No: 37180006) who carried out the project entitled A WEARABLE DEVICE FOR VISUALLY IMPAIRED PEOPLE (Ultrasonic Vibrator Glove) under my supervision from November 2020 to April 2021.

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ABSTRACT

Third eye for the visually impaired is an advancement with the knowledge of the multidiscipline subjects which encourages the visually impaired individuals to explore with speed and certainty by recognizing the near-by objects utilizing the help of ultrasonic signals and alert them with a sound or vibration.

With the development of the living standards of the people, we've become so materialistic that we've forgotten how the physically disabled people live a troublesome life. They undergo rigorous, apathetic and indifferent behaviour towards them for being physically disabled.

They become hooked in to people during a way for his or her day-to-day routine. Blind and impaired persons always depend on other people for their whole life. Eye may be a prime sense of organ in perceiving the surface environment; dysfunction of such prime sensory receptor severely effects the knowledge perceiving capability of the surface environment. The influenced ones are useful for the convention of white stick for an long time which in spite of the very fact that is more powerful, and still features for a considerable measure of weaknesses.

Therefore, going around to places in such environment may be a very big challenge because the blind people cannot depend upon their own eyes and thus face many difficulties. In order to assist those dim-sighted people, a project that helps those people to steer more confidently is proposed. The study hypothesizes a sensible walking gloves that alerts visually-impaired people over obstacles, pits thus this device could help them in walking with less accident. It outlines a much better navigational tool for the visually impaired.

It consists of an easy walking equipped with sensors to offer information about the environment. Computer voice technology is integrated with microcontroller which will help to alert them. In this system ultrasonic sensor,

vibrator, PCB board, Arduino mini, speaker, motor and battery are used. The overall aim of the device is to supply a convenient and safe method for the blind to beat their difficulties in lifestyle.

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LIST OF ABBREVIATIONS:

YOLO algorithm

You Only Look Once

CPU

Central Processing Unit

PCB	Printed Circuit Board
LED	Light Emitting Diode
TRIG	Trigger pin
USB	Universal Serial Bus
US	Ultrasonic

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CHAPTER-1

INTRODUCTION

According to the Social Security Administration data the in world over there are 220 thousand visually impaired people. Nowadays, visually impaired people have difficulties in the transportation especially in the modern crowded cities. The tools such as wand and cane used by these people are not enough compared to the facilities of today's technology. This study aims to supply an application prototype to form the lifetime of visually impaired people a touch bit easier. Technology and human life can't be separated because it has become the phenomenon of the planet. But, how the technology can help the visually impaired people?

Blind people usually estimate the obstacle in front them by using sticks or only by dogs but without knowing actual distance of the obstacle from them. But that won't help in every time especially in traffic areas.so, we come into new idea of wearable device for those people. A wearable device for visually impaired people (ultrasonic vibrator glove) which will help the visually impaired people to maneuver by themselves during a indoor environment. This reduces the work on people that are assisting the blind. Likely, visually impaired people have difficulties in the transportation especially in the modern crowded cities.

The tools such as wand and cane used by these people are not enough compared to the facilities of today's technology. This study aims to produce an application prototype to make the life of visually impaired people a little bit easier by using intelligent mobile devices. The opinions of visually impaired people are very important as they will use this application. The opinions of the president of the Association of Visually Impaired in Education is taken into consideration during this study. Nowadays, technology and human life can't be separated because it has become the phenomenon of the planet . But, how the technology can help folks that visually impaired?

Blind people usually can estimate the obstacle ahead them without knowing the particular distance of the obstacle from them. Mobility for the blind people are often defined as mobility to maneuver with safety and ease through environment without believe other. Most commonly mobility aid employed by the blind are cane and guide dogs to facilitate their movement. But there are problems for this navigation supports. The cane provide limited preview for the user and as a result, user has got to be more careful to steer and mobile very slowly. As for the guide dogs, the training and coordinating the dogs with blind people are difficult task and therefore the result are minimal. Clearly, there is a growing interest in the number of users who use popular social networking sites (SNSs), such as Facebook, Twitter and Instagram. SNSs are described as online communities for internet users where they can meet each other. The benefits of associating with social networking are not restricted to making friends and interacting with them, but also include searching and gathering information and sharing experiences in order to obtain accurate, personalized and high quality replies from trusted friends.

According to the Arab Social Media Report (ASMR), there are 3.7 million Arab Twitter users while Facebook states that over 55 million users are Arabs. This significant interest in social networking can draw attention to the idea of designing an application with an Arabic language interface using human-powered technology in order to help blind people identify objects. Further more it also provides an opportunity for visually impaired persons to move from one place to another independently. Technology has been developing a lot these days and people are showing interest in them. This device is helpful especially when the person wants to move around a house or some indoor places by themselves. In this device, the distance of the obstacle is determined by using Ultrasonic module and a Microcontroller. The obstacle distance is measured and informed to the visually impaired person in the form of a computer voice and vibrations.

CHAPTER-2

LITERATURE SURVEY

Over the last few years, 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 alert them at danger places or the obstacles. There are many different types of canes used in today's world with growing technologies such as 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. A survey found that the remote guidance system is very difficult to carry and thus the wearable band will be more optimized version. There are some frameworks which has some constraints and clampdown. And the author GVNSK Sravya,N Harini have done the system with the methodology of ultrasonic sensor, AVR RISC microcontroller and buzzers are used to notify hurdles , in this they have limitation in distance. The other author Samartha Koharwal,Samer Bani Awwad,Aparna Vyakaranam have come with the methodology of device utilizes IR sensor,sonar,sensor and camera,based on AI system , this have the limitation of Object detection algorithm utilizes 100% CPU which makes cost high. And Ritik

Singh, Rishi Kumar Kamat have made system with YOLO algorithm, Raspberry camera, sensors are used here so that costs high due to usage of camera, and also need storage capacity to store the images. 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. And few more author 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 analysing the range data collected as the user swings the device around, tracking planar patches and finding discontinuities. Benjamin et al. 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 45° to the ground for overhanging obstacles, the second one is parallel to the ground and third one is for sharpness. 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 cannot detect the obstacles and hurdles. The system is not suitable for the outdoor activities.

By reviewing all those survey we decided to make the System more efficient there are various system that relates to the development for projects related to the blind persons. And to overcome various design and program related improvements. many were facing the problems like cost issues, distance limitations, responding signals and storage capacity etc. So, we have learnt how to overcome all this problems and what can be replaced to make it simple and easy like using Arduino mini, vibrating motor and audio signal etc.

CHAPTER-3

AIM & SCOPE

Aim of the present work is to design a WEARABLE DEVICE FOR VISUALLY IMPAIRED PEOPLE to overcome the lack of visual sense. To generate an audio signal, in order to notify the user about upcoming hurdle. The overall aim of the device is to provide a convenient and safe method for the blind to overcome their difficulties in daily life. To make the navigation process easy for the needy.

3.1 BLOCK DIAGRAM:

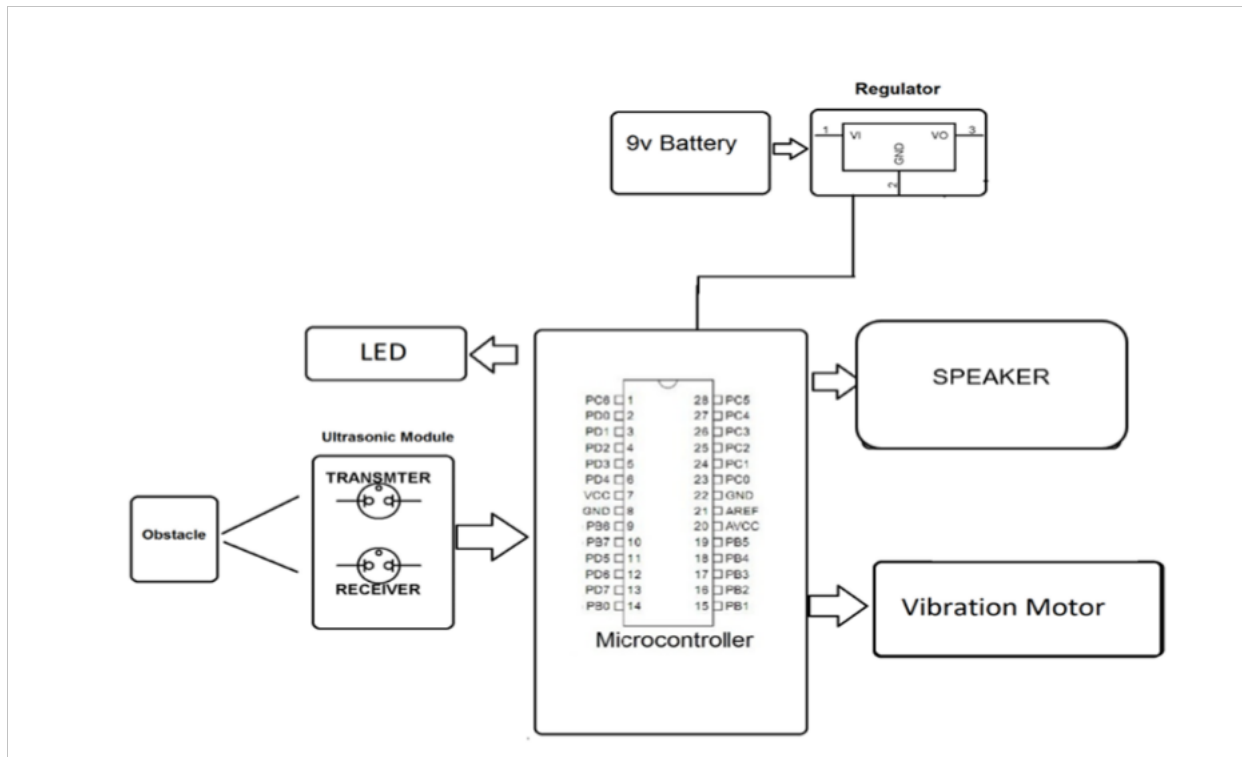


Fig: 3.1: Block Diagram

- Arduino Nano is used for achieving the visually impaired wearable device.
- To sense the obstacles and the distance, the sensor used here is US sensor.
- After sensing the distance between obstacles and impaired person, different computer voice is generated based on the distance.

3.2 EXISTING SYSTEM:

Over the previous couple of years or we will say over the last decades, research has been conducted for brand spanking new devices and technologies to style an honest 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. The features of a existing system , is that the use of white cane and such other devices. the system with the methodology of ultrasonic sensor, AVR RISC microcontroller and buzzers are wont to notify hurdles , during this they need limitation in distance. the opposite system with the methodology of device utilizes IR sensor,sonar,sensor and camera,based on AI system , this have the limitation of Object detection algorithm utilizes 100% CPU which makes cost high. And Ritik Singh,Rishi Kumar Kamat have made system with YOLO algorithm,Raspberrypi camera ,sensors are used here.so that costs high thanks to usage of camera , and also need storage capacity to store the pictures and have many limitations on the angles and therefore the distance. On contrary, this project will have an honest angle for the detection where the sensors range are getting to be wide. And also the dimensions of the merchandise also was big , it'll be inconvenient for the user. and that they all were using only buzzers but in traffic areas it won't help. By studying and knowing all those existing system , we came up with our proposed system , by overcoming all the restrictions within the existing system.

3.2.1 PROBLEM OF THE EXISTING SYSTEM:

- White cane - May easily crack/break,
- The stick may grind to a halt at pavement cracks of varied objects.
- Common Disadvantages (Including the smart devices) can't be carried easily, needs many coaching to use...

- pet dog – huge cost.

3.3 PROPOSED SYSTEM:

In order to beat the difficulties within the prevailing method and to provide the worth effective and user friendly system for blind navigation, the next design is proposed. the planning is predicated on a special wearable device supported the Arduino board which may be worn sort of a cloth for blinds or a band. The features of A wearable device for visually impaired people using ultrasonic glove: By wearing this device they will fully avoid the utilization of white cane and such other devices. this may help the blind to navigate without holding a stick which can be a touch annoying for them. they will simply wear it as a glove and it can function very accurate, quit simple, easy to use and wear. It contains Arduino nano, 9V battery, PCB board, vibrator, speaker, ultrasonic module. And here we use embedded C software. Here when the thing is detected by the ultrasonic sensor supported the space programmed there'll be one voice statement is employed to alert them and therefore the vibrator also vibrates. This device is extremely easy to wear and use.

CHAPTER-4

METHODS, ALGORITHM AND MATERIALS

4.1 CIRCUIT DIAGRAM:

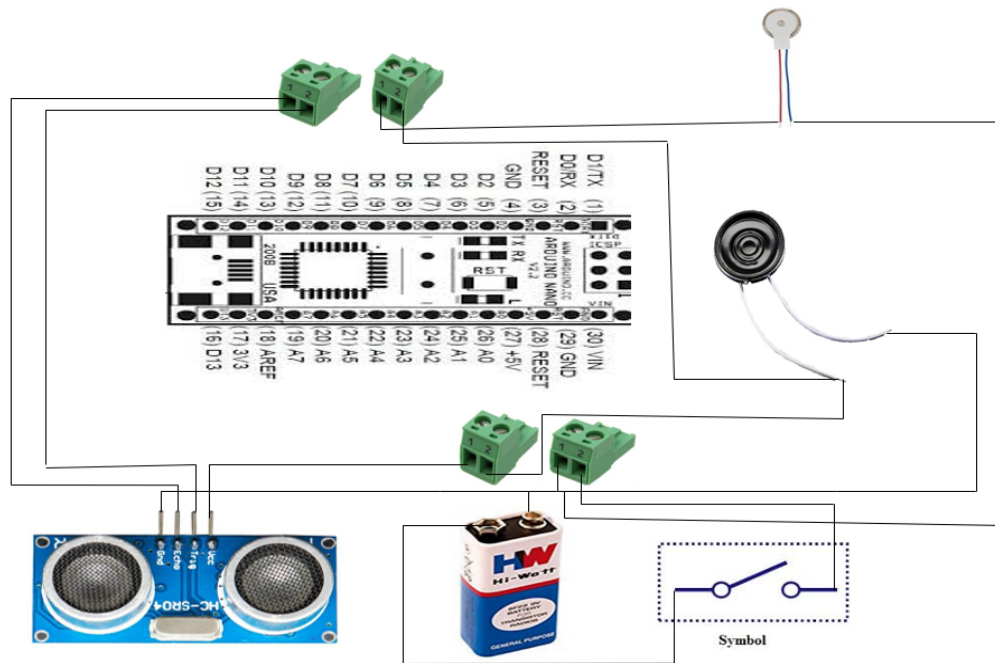


Fig: 4.1: Circuit Diagram

4.1.1 WIRING INSTRUCTION:

- ❖ Here we use 4 connectors to connect the Arduino pins with the other devices

Connector 1 is for pin D9 & D10

Connector 2 is for pin D5 & D6

Connector 3 is for pin reset & 5v

Connector 4 is for pin GND & Vin

- ❖ US sensor's Vcc to 5v, Trig pin to pin D9, Echo pin to pin D10.
- ❖ Battery's positive to switch positive & negative to GND of Arduino.
- ❖ The negative of switch is connected to GND of Arduino.

- ❖ Speaker's negative is connected with pin D5 & positive is connected to GND of Arduino.
- ❖ Vibrating motor's positive is connected to pin D6 & negative is connected to GND of Arduino.

4.1.2 POWERING OF THE MODULES:

Connect the 4 Arduino pro mini to a USB male pin and connect to a power bank. For the module in the hand use a small lithium battery. First cut the PCB board in 5 X 3 cm dimension and solder the female headers for the Arduino to the board. Then solder the speaker. then connect the vibrating motor using the glue gun and solder wires to it. Then connect the LED. Then connect the switch. Then connect header pins for ultrasonic sensors and for battery input. All the connections are made in the PCB board for making the product less weight. Now connect the Arduino nano and ultrasonic sensor to the board. Also connect the elastic band to all the modules.

4.1.3 WORKING OPERATIONS:

This proposed system consists the equipment like Arduino nano, ultrasonic sensor, PCB board, vibrating motor, speakers for detecting the obstacles and letting the user know about the obstacle, Switches, Jumper cable, power bank, Male and feminine header pins, 9 volt battery , some elastic and stickers to form the device wearable as a band for wearing for the users. The wiring of the device is completed during a following manner. The Ground of speaker and vibration motor are connected to GND of the Arduino. Wire the speaker to the primary leg of the switch and thus the +ve of the Vibration motor is wired to the third leg of the switch. The Ultrasonic sensor are wired accordingly.

The pin VCC of US 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 pin 12 of Arduino, Ultrasonic sensor pin Echo is connected to the Arduino PIN 12. The switch used here is for choosing the mode. We first cut the PCB board in 5 X 3 cm dimension and solder the feminine headers for the Arduino to the board. Then soldering of the speaker is carried out. Then using the glue connect the vibrating motor and solder the wires there. Then connect the switch. Connect the header pins for US and for the battery input. Then solder all the items and connect the Arduino and ultrasonic sensor to the board. Also connect the rubber band to all or any the modules.

For making it comfortable to wear, connect the ultrasonic sensor to the board by using 4 jumper cables. Then connect a 9 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 embedded C code to Arduino board. 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 within the path, the US waves hits the obstacles and gets reflected back, the reflected wave is received by the receiver. The US sensor may be a combination of 1 transmitter and receiver. The interval between sending and receiving of the US signal is calculated, this point interval is employed to calculate the space between sensor and therefore the obstacle. And based on the distance the computer voice is generated to the user to alert them.

4.2 FLOW CHART:

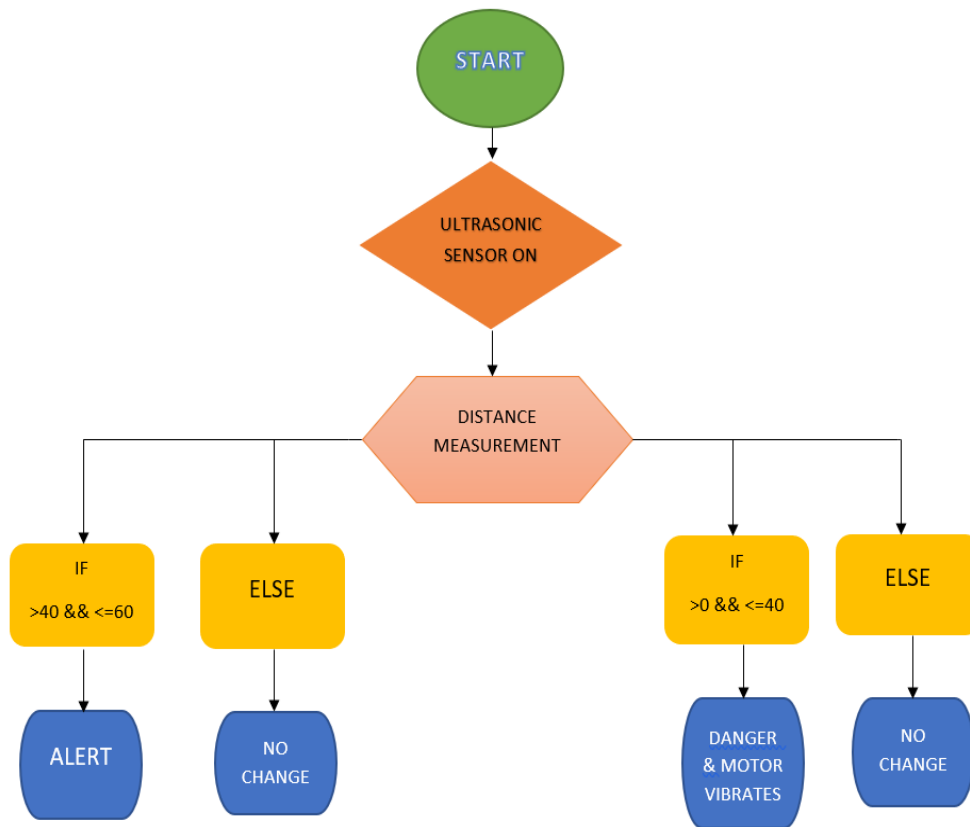


Fig: 4.2: Flow Chart

4.3 HARDWARE REQUIREMENT:

- ❖ Arduino Nano
- ❖ Ultrasonic sensor
- ❖ PCB board
- ❖ Vibrating motor
- ❖ Speaker

❖ Slide switch

❖ Battery

4.3.1 ARDUINO (NANO):

Arduino is an open-source in both hardware and software company, project and user community that manufactures and designs the single-board microcontrollers and microcontroller kits for building digital devices. Its products hardware are licensed under a CC-BY-SA license, while software is licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), Arduino boards are available in both from the official website and through authorized distributors. The Arduino project began in 2005 as a tool for college kids at the Interaction Design Institute Ivrea in Ivrea, Italy, getting to provide a low-cost and straightforward way for novices and professionals to make devices that interact with their environment using sensors and actuators. And such devices common samples are intended for beginner hobbyists like simple robots, thermostats and motion detectors.

The name Arduino comes from a bar in Ivrea, Italy, where variety of the founders of the project used to meet. The bar was named after Arduino of Ivrea, who was the margrave of the March of Ivrea and King of Italy from 1002 to 1014. The Arduino Nano may be a small, complete, and bread board-friendly board supported the ATmega328P released in 2008. It offers an equivalent connectivity and specs of the Arduino Uno board during a smaller form factor. The Arduino Nano is given 30 I/O headers, during a dip-30 like configuration, which may be programmed using the Arduino Software integrated development environment (IDE), it is common to all Arduino boards and running in both online and offline for our wish. The board are often powered through a type-b micro-USB cable, or through a 9V battery.

The Arduino Nano was released Everywhere in 2019, an pin-equivalent evolution of the Nano. ATmega4809 processor is more powerful, and twice the RAM.

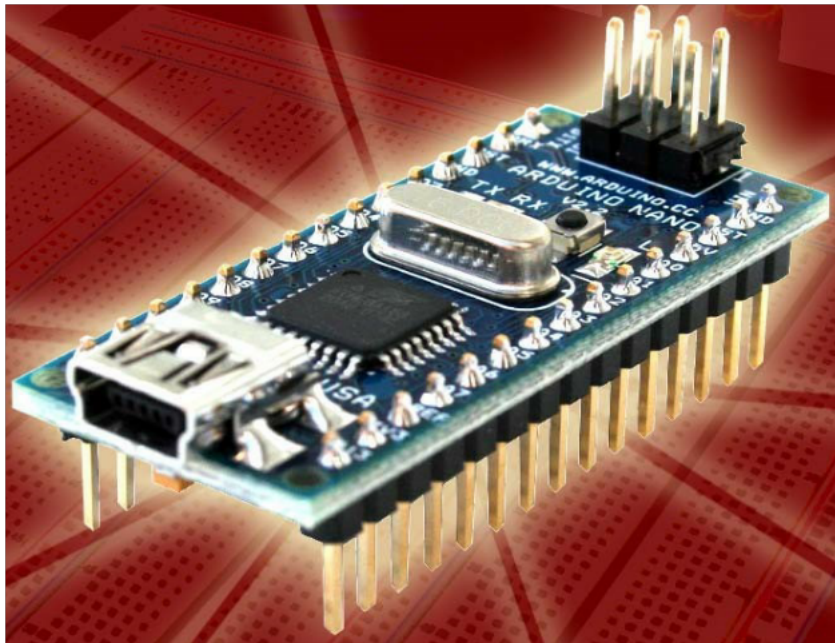


Fig: 4.3: Arduino

4.3.1.1 Technical specifications:

- Microcontroller: Microchip ATmega328P
- Operating Voltage: 5 Volts
- Input Voltage: 6 to 20 Volts
- Digital I/O Pins: 14 (plus 6 can PWM output pins)
- Analog Input Pins: 8
- DC Current per I/O Pin: 40 mA

- DC Current for 3.3V Pin: 50 mA
- Flash Memory: 32 KB of which 0.5 KB used by bootloader
- SRAM: 2 KB
- EEPROM: 1 KB
- Clock Speed: 16 MHz
- Length: 45 mm
- Width: 18 mm
- Weight: 7 g

4.3.1.2 ARDUNIO NANO PIN LAYOUT:

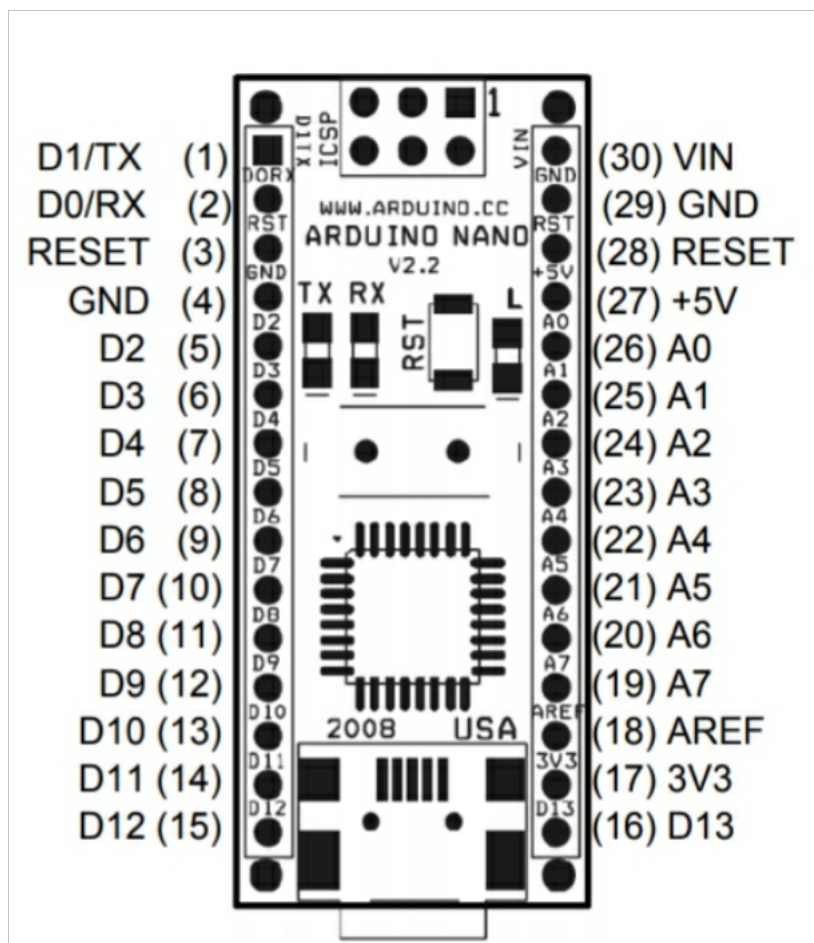


Fig: 4.4: Arduino Nano pin layout

Table: 4.1: Arduino pin Names

Pin No.	Name	Type	Description
1-2, 5-16	D0-D13	I/O	Digital input/output port 0 to 13
3, 28	RESET	Input	Reset (active low)
4, 29	GND	PWR	Supply ground
17	3V3	Output	+3.3V output (from FTDI)
18	AREF	Input	ADC reference
19-26	A7-A0	Input	Analog input channel 0 to 7
27	+5V	Output or Input	+5V output (from on-board regulator) or +5V (input from external power supply)
30	VIN	PWR	Supply voltage

4.3.1.3 ARDUINO NANO SCHEMATIC DIAGRAM:

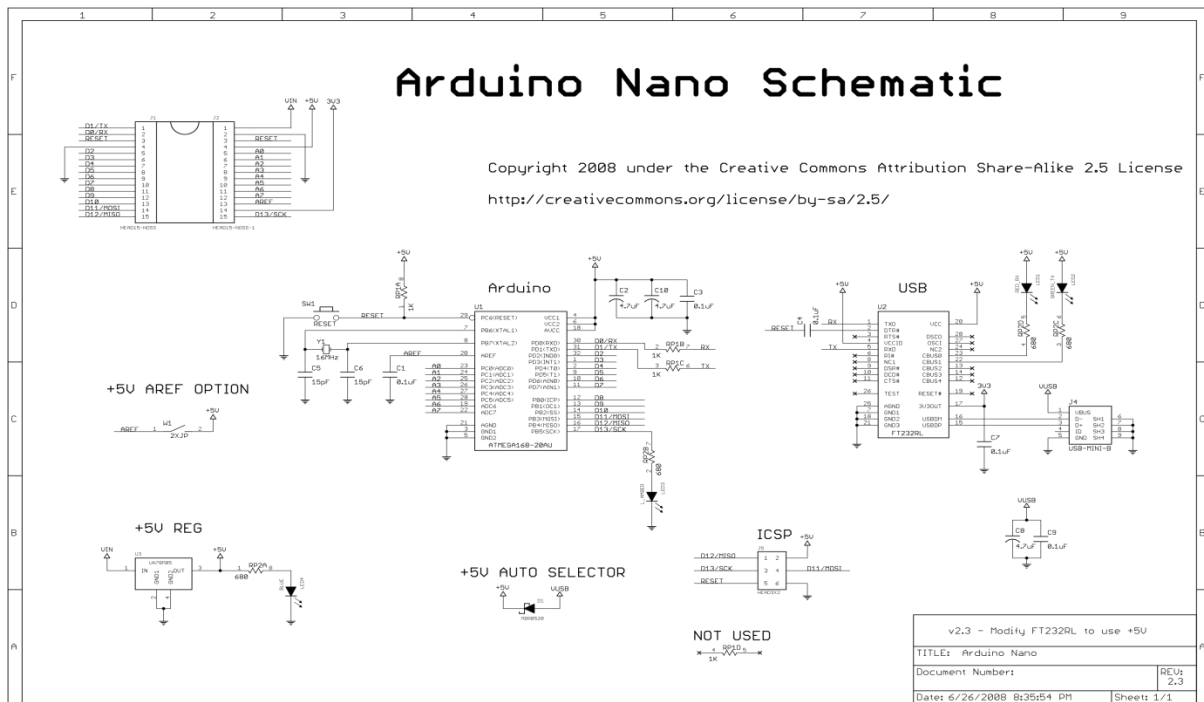


Fig. 4.5: Arduino Nano Schematic Diagram

4.3.2 ULTRASONIC MODULE:

Ultrasonic ranging is that the technique employed by bats and lots of other creatures of the Animalia for navigational purposes. In a bid to imitate the ways of nature to get a foothold over everything, we humans haven't only understood it but have successfully imitated a number of these manifestations and harnessed their potential to the best extent. US sensors are devices which use transformation electrical to mechanical energy, the mechanical energy being in the form of ultrasonic waves, to measure distance from the sensor to the target object.

US waves are mechanical waves and longitudinal which travel as a succession of compressions and rarefactions along the direction of wave propagation through the medium. Any acoustic wave above the human auditory range of 20,000 Hz is named ultrasound. US sensors are devices which can generate or sense ultrasound energy. It is divided into three parts: transmitters, receivers and

transceivers. conversion of electrical signals into ultrasound is transmitters, conversion of ultrasound into electrical signals receivers, and transceivers which can both transmit and receive ultrasound.

US sensors are utilized in systems which evaluate targets by interpreting the reflected signals. For example, by measuring the time between sending a sign and receiving an echo the space of an object are often calculated. Passive ultrasonic sensors are basically microphones that detect ultrasonic noise that is present under certain conditions. Here, it receives and sends the signal from the obstacles and detect the distance and make the computer voice programmed for the appropriate distance.

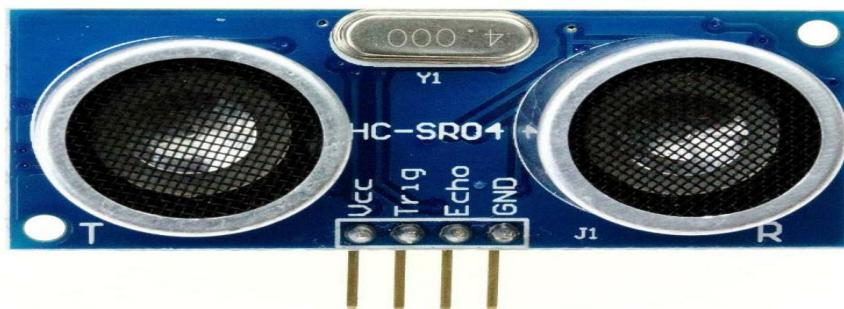


Fig: 4.6: Ultrasonic sensor

4.3.2.1 ULTRASONIC SENSOR 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 has to be kept high for 10us to initialize measurement by sending US wave.
3	Echo	Echo pin is an Output pin. This pin goes high for a period of time 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.

Table: 4.2: Ultrasonic Sensor Pin Configuration

4.3.2.2 HC-SR04 SENSOR FEATURES:

- Operating voltage: +5V
- Theoretical Measuring Distance: 2cm to 450cm
- Practical Measuring Distance: 2cm to 80cm
- Accuracy: 3mm
- Measuring angle covered: <15°
- Operating Current: <15mA
- Operating Frequency: 40Hz

4.3.3 VIBRATING MOTOR:

A vibratory motor could also be a three-phase motor that's intentionally unbalanced, and is additionally mentioned as an eccentric rotating mass (ERM) or vibrating motor. Vibratory motors are wont to vibrate sieves, troughs and tables, but also to separate products during a bunker or landfill pipe. A vibrator acts like a robot

to get vibrations. The vibration is always generated with the help of an electrical motor with an unbalanced mass on its driveshaft. Here, we use mini vibrator, this vibrating motor vibrates when the computer voice is generated, it will make extra sense for the user.

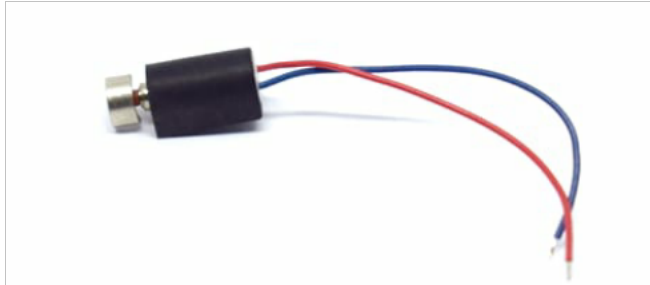


Fig: 4.7: Vibrating Motor

4.3.4 PCB BOARD:

A printed circuit board (PCB) mechanically supports and electrically connect electrical or electronic components using conductive tracks, pads and other features etched from one or more sheet layers of copper were laminated between the sheet layers of a non-conductive substrate. Components are usually wired and soldered onto the PCB to both electrically connect and mechanically fasten.

Printed circuit boards (PCBs) are the boards which were used because the bottom in most electronics – both as a physical support piece and mechanical because the wiring area for the surface-mounted and socketed components. PCBs are most ordinarily made out of fiberglass, composite epoxy, or another material.

The computer circuit boards (PCBs) utilized in today's electronics equipment were first designed and developed within the 1930s. In 1936, Austrian inventor Paul Eisler developed the primary PCB to work a radio system, supported a circuit design originally patented by Charles Ducas.

Most PCBs for easy electronics are simple and composed of only one layer. More sophisticated hardware like special effects cards or motherboards can have multiple layers, sometimes up to 12. Although PCBs are most frequently related to computers, they will be found in many other electronic devices, like TVs, Radios, Digital cameras and Cell phones. In addition to their use in consumer electronics and computers, differing types of PCBs are utilized in a spread of other fields, including

4.3.4.1 Medical devices:

Compare to the earlier days, electronics products are now denser and consume less power, making it possible to see new and exciting medical technology. Most medical devices use a high-density PCB, which is employed to make the littlest and densest design possible. This helps to alleviate a number of the unique constraints involved developing devices for the medical field thanks to the need of small size and lightweight weight. Now a days PCBs had their way into everything from even a small devices, like pacemakers, to much larger devices like X-ray equipment or scan machines.

4.3.4.2 Industrial machinery:

PCBs are commonly used in high-powered industrial machinery. In places where current one-ounce copper PCBs don't fit the wants, thick copper PCB are often utilized instead. The situation examples where thicker copper PCBs which would be beneficial and include motor controllers, industrial load testers and high-current battery chargers.

4.3.4.3 Lighting:

As LED-based lighting solutions catch on in popularity due to their low power consumption and high levels of efficiency, so too does aluminum-backed PCB which is employed to form them. These PCBs function heat sinks and permit for higher levels of warmth transfer than a typical PCB. The same aluminum-backed PCBs which form the basis for both high-lumen LED applications and basic lighting solutions.

4.3.4.4 Automotive and aerospace industries:

Both the automotive and aerospace industries make use of flexible PCB, which is meant to face up to the high-vibration environments that are common in both fields. Depending on specifications and style, they will even be very lightweight, which may be a necessity when manufacturing parts for transportation industries. They are also able to conform to the tight spaces behind the instrument gauge on a dashboard. There are several different types of circuit board.

Single layer PCB

- Double layer PCB
- Multilayer PCB
- Rigid PCB
- Flexible PCB
- Rigid flex PCB
- High frequency PCB
- Aluminium baked PCB

SINGLE LAYER PCB:

A single-layer or single-sided PCB is one that's made out of one layer of base material or substrate. One side of the bottom material is coated with a skinny layer of metal. Copper is that the commonest coating thanks to how well it functions as an electrical conductor. After the copper base plating is applied, followed by a protective solder mask is typically applied, followed by the last silk-screen to mark off all of the weather on the board.

Since single-layer/single-sided PCBs only have their various circuits and components soldered onto one side, they're easy to style and manufacture.

This popularity means they will be purchased at a low-cost, especially for high-volume orders. The low-cost, high volume model means they're commonly used for a spread of applications, including calculators, cameras, radio, stereo equipment, solid state drives, printers and power supplies.

DOUBLE LAYER PCB:

Double-layer or double-sided PCBs have a base material with a skinny layer of conductive metal, like copper, applied to each side of the board. Holes drilled through the board allow circuits on one side of the board to attach to circuits on the opposite. The circuits and components of a double-layer PCB board are usually connected in one among two ways: either utilizing a through-hole or with the utilization of a surface-mount. A through-hole connection means small wires, referred to as leads, are fed through the holes, with each end of the leads then soldered to the proper component.

Surface mount PCBs don't utilize wires as connectors. Instead, many small leads are soldered on to the board, meaning that the board itself is employed as a wiring surface for the various components. This allows circuits to be completed using less space, freeing up space to permit the board to finish more functions,

usually at higher speeds and a lighter weight than a through-hole board would allow.

Double-sided PCBs are typically utilized in applications which require an intermediate level of circuit complexity, like industrial controls, power supplies, instrumentation, HVAC systems, LED lighting, automotive dashboards, amplifiers and vending machines.

MULTILAYER PCB:

Usually Multi-layer PCBs contain like a series of three or more double -layered PCBs. These boards are then secured along side a specialized glue and sandwiched between pieces of insulation to make sure that excess heat doesn't melt any of the components. Now Multi-layer PCBs are also in a variety of sizes, going as small as four layers or as large as ten or twelve. Now its build as a largest multi-layer PCB which is 50 layers thick. It is made to very thick with many layers of circuit boards, designers , complex designs which are suitable for a broad range of complicated electrical tasks. And the applications used where multi-layer PCBs would be beneficial include File servers, Data storage, GPS technology, Satellite systems, Weather analysis and Medical equipment.

RIGID PCB:

Rigid PCBs are made out of a solid substrate material that forestalls the board from twisting. Possibly the foremost common example of a rigid PCB may be a computer motherboard. The motherboard is also called as a multilayer PCB which is designed to allocate electricity from the power supply, while simultaneously allowing communication between all of the many parts of the system, such as GPU, RAM and CPU.

Rigid PCBs structure perhaps the most important number of PCBs manufactured. These rigid PCBs are usually used anywhere when there's a requirement for the PCB itself to be found out in one shape and remain that way for the rest of the device's lifespan. Rigid PCBs are often anything from an easy single-

layer PCB all the high to an eight or ten-layer multi-layer PCB.

All Rigid PCBs have single-layer, double-layer or multilayer constructions, in order that they all share an equivalent applications.

FLEXIBLE PCB:

Rather than rigid PCBs, which use an un moving materials like fiberglass, flexible computer circuit boards is formed of materials which will flex and move, like plastic. Like rigid PCBs, flexible PCBs are available single, double or multilayer formats. As it should be printed on a versatile material, flexible PCB is high cost for fabrication.

Till now, the flexible PCBs gives more advantages over rigid PCBs. The most prominent of those advantages is that the incontrovertible fact that they're flexible. This means they were closed over the edges and the corners were wrapped. Their flexibility can cause high cost and moderate weight savings since one flexible PCB are often wont to cover areas which may take multiple rigid PCBs.

Flexible PCBs also can be utilized in parts which may be subject to environmental hazards. To do so, they're simply built using materials which may be corrosion-resistant, waterproof, shockproof, or immune to high-temperature oils - an option that traditional rigid PCBs might not have.

RIGID FLEX PCB:

Rigid flex circuits combine the fine of both worlds when it comes under the two most important types of PCB boards. Flex-rigid boards contains a multiple layers of flexible PCBs attached to a count of rigid PCB layers.

Flex-rigid PCBs have more advantages over just using rigid or flexible PCBs for particular applications. For one, rigid-flex boards have a lower parts number

than traditional rigid or flexible boards because the wiring options for both can be attached into a single board. The combination of rigid and flexible boards into a single rigid-flex board also gives in for a more streamlined design, for making less the overall board size and package weight.

HIGH FREQUENCY PCB:

High-frequency PCB involve to a general PCB design element, instead of a kind of PCB construction just like the before models. High-frequency PCB is meant to transmit signals over one gigahertz.

In current, High-frequency PCB materials frequently include polyphenylene oxide (PPO) resin. Teflon is one among the foremost expensive options available due to its short and stable dielectric constant, less amounts of dielectric loss and overall low tide absorption.

ALUMINIUM BAKED PCB:

Aluminium-backed PCBs are designed in much an equivalent way as their copper-backed counterparts. However, instead of the usual fiberglass used in most PCB board types, aluminium circuit board make use of aluminium substrate board.

The aluminium backing is lined with thermally insulant that's designed to possess a coffee thermal resistance, meaning less heat is transferred from the insulant to the backing. Once the insulation is applied, a circuit layer of copper, ranging in thickness from one ounce to 10, is applied.

4.3.5 BATTERY:

The nine-volt battery is a common size of battery which was introduced for the first transistor radios. It has an oblong prism shape with rounded edges and a polarized snap connector at the highest. This type batteries are usually utilized in gas detectors, clocks, walkie-talkies, electric guitars, smoke detectors and effects units. Mercury-oxide batteries in this format are once common, haven't been manufactured in a few years thanks to their content of mercury. The size, no matter chemistry, is usually designated PP3—a originally reserved solely for carbon-zinc, or in some countries, E or E-block.

Many of the nine-volt alkaline batteries are built of six individual 1.5 V LR61 cells and also enclosed using a wrapper. These cells are slightly smaller than LR8D425 AAAA cells and may be utilized in their place for a few devices, albeit they're 3.5 mm shorter. Types like carbon zinc are built with six flat cells during a stack, enclosed during a resistant of moisture wrapper to stop drying. Important lithium types are classified with three cells serial.

9-volt batteries accounted for 4% of alkaline primary battery sales within the us in 2007, and a couple of battery sales in Switzerland in 2008.



Fig: 4.8: Battery

4.3.5.1 TECHNICAL SPECIFICATION:

Type		IEC name ^[10]	ANSI/NEDA name ^[11]	Typical capacity in mAh	Nominal voltages
Primary (disposable)	Alkaline	6LR61	1604A	550	9
		6LP3146 ^[12]	1604A	550	9
	Zinc-carbon	6F22	1604D	400	9
	Lithium		1604LC	1200	9
Rechargeable	NiCd	6KR61	11604	120	7.2, 8.4
	NiMH	6HR61	7.2H5	175-300	7.2, 8.4, 9.6
	Lithium polymer			520	7.4
	Lithium-ion			620	7.4
	Lithium iron phosphate			200-320	9.6

Table: 4.3: Technical Specifications

4.3.6 AMPLIFIER SPEAKER:

An audio power amplifier or power amp is an most common electronic amplifier which amplifies the less-power audio signals in electronics like the signal from receiving set or guitar develop to a level that's more sufficient for driving loudspeakers or headphones. Audio power amplifiers are found altogether manner of sound systems including, public address, sound reinforcement and residential audio systems and such as instrument amplifiers like guitar amplifiers. It is the ultimate electronic stage during a typical audio playback chain before the signal is shipped to the loudspeakers.

The most foregoing steps in such a sequence are less power audio amplifiers which

can do tasks like pre-amplification of the signal (this is especially related to record turntable signals, microphone signals and electric instrument signals from pickups, such as the electric bass and electric guitar, equalization (e.g., adjusting the bass and treble), tone controls, mixing different input signals or adding electronic effects such as reverb. The input signals can also be any count of audio sources like CD players, digital audio players, record players and cassette players. Many of the audio power amplifiers require these less-level inputs, which are also called line level. While the input to an audio power amplifier, like the signal from an electrical guitar, may measure only a couple of hundred microwatts, its output could also be a low watts for some consumer electronics devices, like clock radios, tens or many watts for a home stereo, several thousand watts for a nightclub's audio system or tens of thousands of watts for an outsized concert sound reinforcement system. Meanwhile power amplifiers are also available in standalone units, typically aimed toward the hi-fi audiophile market (a niche market) of audio enthusiasts and sound reinforcement system professionals, most consumer electronics audio products, like clock radios, boomboxes and televisions have relatively small power amplifiers that are integrated into the merchandise .

4.3.6.1 DESIGN PARAMETERS:

For audio power amplifiers, the key design parameters are frequency response, gain, noise, distortion etc. These are interdependent, increased profit often leads to undesirable increase in noise and distortion. While the negative feedback actually less the gain and distortion. Audio amplifiers are also called a linear amplifiers which are operating in class AB. Until in 1970s, vacuum tubes are used by amplifiers. In 1970s, tube amps were highly replaced with transistor-based amplifiers, which are more reliable, light weight, and it needs low maintenance.

Tube preamplifiers are available in niche markets, such as with WI-FI home enthusiasts, audio engineers, music producers and electric bassists, electric guitarists and Hammond organ players, some use tube preamps, tube power amps

and tube effects units. While hi-fi enthusiasts and as well audio engineers can do live sound or monitoring tracks in the studio typically to seek out the amplifiers with the low distortion, electric instrument players in genres such as rock music, blues and heavy metal music, use tube amplifiers because they like the natural overdrive that tube amps produce when pushed hard.

The Class-D amplifier are high important than Class AB amplifiers, is now widely used in consumer electronics audio products, bass amplifiers and sound reinforcement system gear, as Class D amplifiers are light weight and produces very less heat.

4.3.7 ETCHING:

Etching is traditional process of using strong acid or mordant to make parts in the parts where it is unprotected of a metal surface to introduce a design in intaglio (incised) in the metal. In newly manufacturing, other chemical solutions may be used on other types of material. As a method of printmaking, it is, along with engraving, the major important technique for old master prints, and remains in wide use today. In a number of modern variants such as microfabrication etching and photochemical milling it is a morden technique in much modern technology, including circuit boards.

There are two types:

- Non toxic etching
- Photo etching

NON-TOXIC ETCHING:

In late 20th century, take care about the health side effects of using

acids and as well as solvents which led to the growth of small amount of toxic etching methods. An initial developed was the need of floor wax as a tough ground which was used for coating the plate. Printmakers by Mark Zaffron and Keith Howard growth systems with the help of acrylic polymers as a base and ferric chloride for the process of etching. sodium carbonate, a washing soda solution is used to remove polymers, not than solvents. When ferric chloride is used for etching, it does not make a corrosive gas, like acids, thus it eliminates another danger.

The aquatint uses powdered rosin or enamel spray paint, which is replaced with an acrylic polymer tough ground. Other than the soda ash solution, no solvents are needed, though a ventilation hood is needed due to acrylic particulates from the spray. The traditional soft base, requires solvents for removal, which is taken replace with the water based relief printing ink. It receives impressions which doesn't allows the ferric chloride etchant, still to be washed up with warm water or with soda ash solution or ammonia.

For over a century, Anodic etching is used in industrial processes. The source of direct current is etching current. The item to be etched that is anode, which is made attached to the positive pole. A receiver plate that is cathode which is attached to its negative pole. Both are gaped slightly apart, are inserted in an aqueous solution with a appropriate electrolyte. The electricity pushed out the metal from the anode into solution and gives it as metal on the cathode. In 1990, two groups were working independently developing different ways to create intaglio printing plate. Electroetch system, which was developed by Marion and Omri Behr, founded nontoxic etching methods, an etched plate can be reworked according to the artist desires.

This system uses 2 volts which displays the metal crystals which is uneven in the etched parts results in superior ink retention and quality of printed image which is equal to traditional acid methods. The reversed polarity produces less voltage and produces a method for making mezzotint plate and steel copper plate.

Some of the firstly printmaking workshops experimenting, preparing and promoting nontoxic techniques include Grafisk Eksperimentarium, in Copenhagen, Denmark, Edinburgh Printmakers, in Scotland, and New Grounds Print Workshop, in Albuquerque, New Mexico.

PHOTO ETCHING:

A photo-sensitive layer was applied as a coating to the plate by the plate supplier or by the committee. Light rays are made fall on the plate as a negative image. Photopolymer plates are cleaned in warm water or under the chemical solutions in an order of the instructions given by plate manufacturer. The part of the photo-etch picture might be stopped out before in order to prevent them from etching from the final image on the plate or removed or lightened by scraping and burnished once after the plate is etched. After the photo-etching process, the plate turns into normal plate, engraving, using dry point, further etching, etc. It results in the printing of intaglio plate.

TYPES OF METAL PLATES:

As we all know Copper(Cu) is a traditional metal, As it bites evenly and holds texture well and does not distort the colour so its used for an etching process. Zinc is very cheaper than copper, and the beginners prefer this a lot, but compare to copper it cannot be cut properly, and it also varies some colours of ink. Steel has a highest famous in an etching substrate. As there is increase in the rate of copper and zinc have guided steel which cannot be replaceable. The quality of steel is somewhat less light than copper, but very lighter than zinc. Steel has a special nature that it is natural and has very rich pastel.

The type of metal which is used for the plate collision and the count of prints that the plate will generate. The hard pressure given to the printing press slow by slow rubs out the information of the image for every step taken. With probably soft copper, for example, the etching will begins very quickly, some copper plates shows very extreme wear after ten prints. Steel, which is on the next hand, is abundantly durable. Using out of the image for many time is also one of the reason etched prints were created firstly in a numbered series and it is tend to be evaluated very highly.

4.3.7.1 PCB Etching Processes:

Etching is a process of a thing or material is being removed from its own surface. The process of etching sometimes demand using liquid chemicals to blast off the substrate material and previously they are widely used in fabrication. The other methods involve like laser etching and plasma etching.

The etching process is a part of the major steps in the final processing of PCBs. This process removes excess copper so as to reveal the desired circuit patterns. In the process of PCB etching, all copper(cu) is vanished except the circuitry which is secured by the tin plating that was put in during the treatment done before in PCB manufacturing. Then the tin is cleared and the copper is made cleaned and the recently prepared circuit is prepared to move on to the next step in manufacturing.

Take a closer look at the 3 different processes for PCB etching below.

Chemical Etching for PCB Manufacturing:

It is used on metals and it is a manufacturing method which is not an addition process and which uses chemical baths. During the process, the metal is removed in order to produce metal parts in particular shape and thickness. This process was said to be developed during Renaissance which is an alternative to engraving on metal. This method involves bathing of material in an alkali chemical which gives action with the area that to be cut. This reaction will give rise to the solid material to be dissolved.

Laser Etching for PCB Manufacturing:

To create high quality PCB, this process enables the use of precise, computer-controlled hardware. It uses a maximum power laser to carve the lines on a PCB substrate. The computer can carve the design on the PCB without unwanted copper traces. It minimizes the number of steps involved in etching and it eliminates the usage of inks, acids and toxic chemicals. During this process, the energy contained in the laser beam changes the material, thereby releasing it from the PCB either by evaporation or by flaking off. It may lower production costs because of the reduction in products needed to complete the process as well as low overall production time.

Plasma Etching for PCB Manufacturing:

In mid 1960s, Plasma etching was introduced to circuit manufacturing and more largely in the period of 1970s. The process was created a way to make less liquid waste out in preparing and to reach selectivities that were not easy to obtain. Plasma etching is a etching of material done by reaction with chemically active radicals which involves a high-speed stream of glow discharge (plasma) of a gas mixture pointed at a material.

It is dry, clean and it offers process simplification and improves dimensional tolerances when compared to existing wet, chemical etching processes. It is capable of controlled and precise etching for very small scales. This process lessens the occurrence of contaminated vias and solvent absorption.

4.4 SOFTWARE REQUIREMENT:

- Embedded c

- Arduino compiler

Here in this system we use EMBEDDED C language for the implementation of this project. It is a batch of language additions for the programming language by the Committee of C Standards. And the circuit connection is done with the PCB board software. This makes the system simple and small and also easy to wear.

4.4.1 EMBEDDED C:

Embedded C coding or programming needs nonstandard additions to the C language in need to support and encourage the enhanced microprocessor features. From 2008, the C Standards Committee has enlarged the C language which includes more features that is not available in normal C. It utilize the most of the syntax and semantics from the standard C. For example conditional statements (if, switch case), loops (while, for), macros, etc.

4.4.2 ARDUINO COMPILE:

In open-source Arduino software (IDE) writing code and uploading it to the board is very easy. We can use this software to any Arduino board. Arduino IDE is chiefly used to write and compile the program or code into the Arduino Module. The official Arduino software makes code compilation very simple that even a unknown person can do without having any technical knowledge.

It is simply available for operating systems like widows, MAC, linux and runs on the java platform which comes with an inbuilt functions and instructions for debugging, editing and compiling the program or code. The range of Arduino modules available including Arduino Uno, Arduino Mega, Arduino Leonardo, Arduino micro and many more. On the board, microcontroller is already coded and it agree to receive the information in the form of program or code type.

The main code is called as a sketch, which is developed on the IDE platform which is then transferred and uploaded in the controller on the board.

The IDE environment contain two important basic parts:

- 1.Editor
- 2.Compiler

Former is mostly helpful for writing the program or code and later it is used for compiling and uploading the program or code into the given Arduino module.

SOURCE CODE:

Active development of the Arduino software is hosted by GitHub.

4.5. ALGORITHM:

Steps:

1. Start
2. Defining the pins and variables
3. Setting of input, output and serial communication
4. Loop function
5. Setting the trigger pin on high state for 10ms
6. Echo pin monitors the return wave
7. Calculating the distance ($\text{distance} = \text{duration} * 0.03/2$)
8. If distance >40 && ≤ 60 , it gives "Alert" as a voice message
9. If distance >0 && ≤ 40 , it gives "Danger" as a voice message and the motor starts vibrating
10. Else no change

11. Return to step 4

CHAPTER-5

RESULT AND DISCUSSION

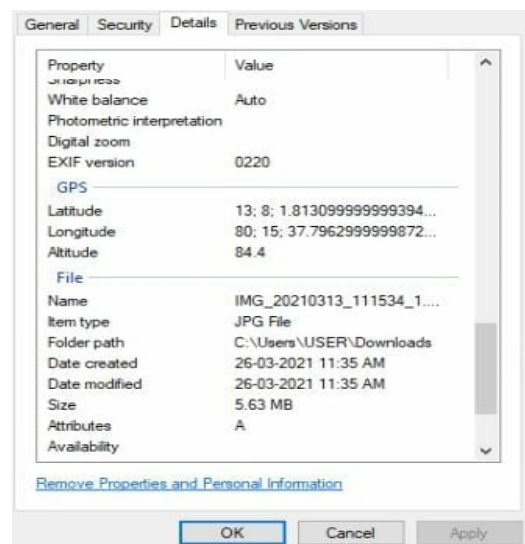
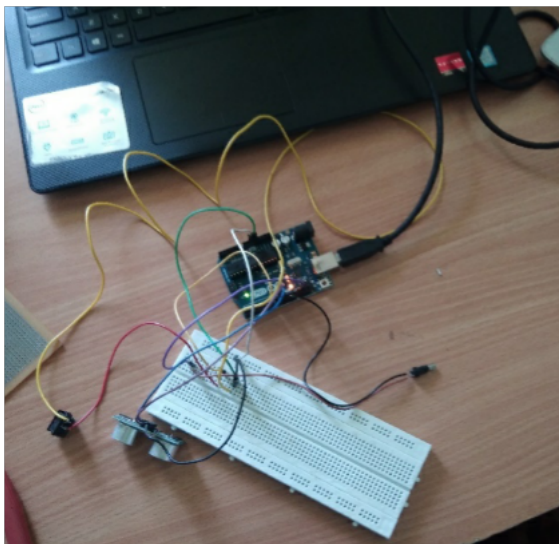


Fig: 5.A: Programming Output

Fig.5.A. is a programming output, here when we execute the program and

simultaneously “ON” the switch, as per the connections given the Arduino starts working and when any objects come near the ultrasonic sensor the vibrating motor starts vibrating.

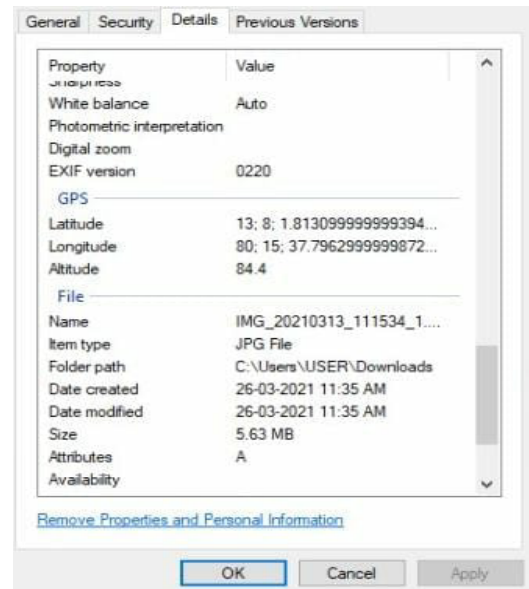
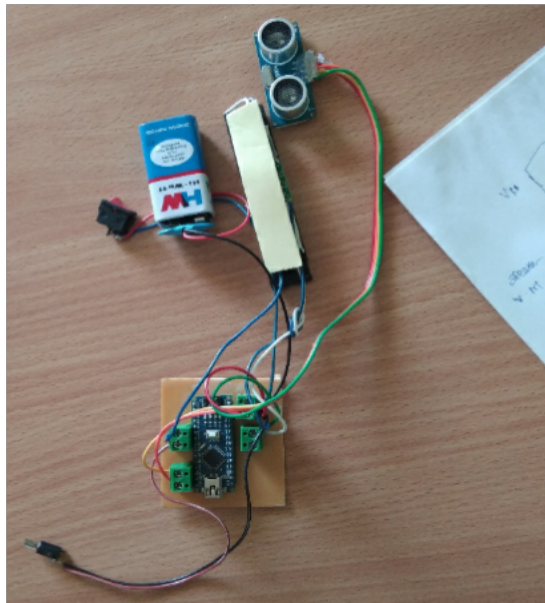


Fig: 5.B: Process

Fig.5.B.Process, Here we have shortened the device and attached with the PCB board, connectors, battery and a speaker. Here the program is already saved in the Arduino so, when we switch ON the device and if any object is near to the distance we have given, the vibrating motor starts vibrating and the speaker gives a comment which we have given to it.

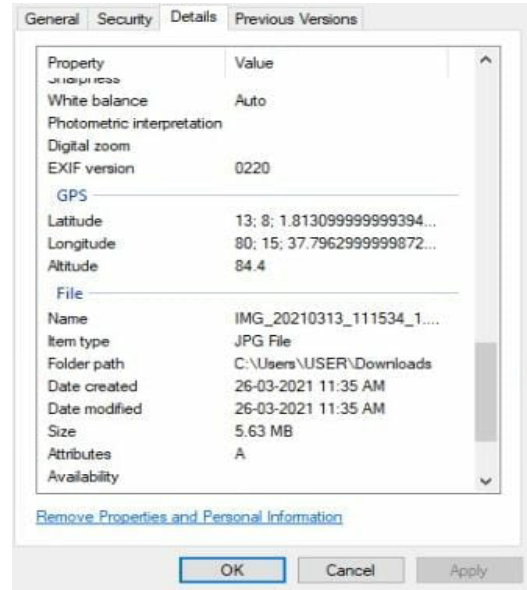


Fig: 5.C: Final output (front)

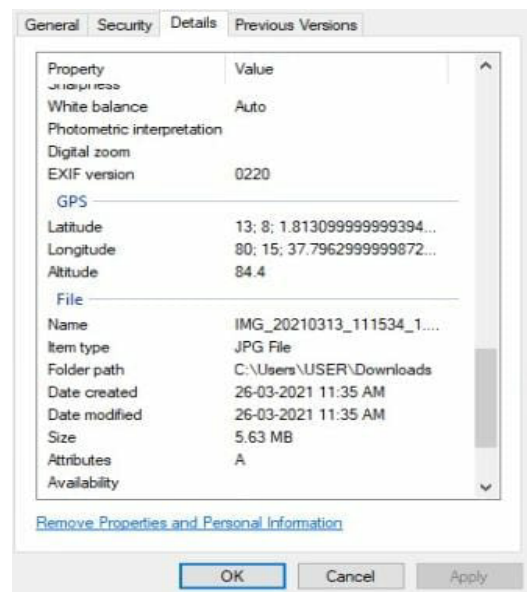


Fig: 5.D: Final output (back)

Fig.5.C. and Fig.5.D. is a final output of our device, in the palm of our glove we have the US sensor and in the wrist we have the switch, rest where stitched inside the glove.

CHAPTER-6

SUMMARY AND CONCLUSION

Thus, this project proposed the design and architecture of a replacement concept of Arduino based Virtual Eye for the blind people. It is quit simple, cheap, efficient, easy to hold, configurable, easy to handle electronic guidance device with more amazing properties and advantages is proposed to supply constructive assistant and support for the blind and visually impaired persons. The system are getting to be more efficient and similar in its capacity to specify the source and distance of the obstacules which can encounter the blind. it's ready to scan and detect the obstacles within the areas like ahead of the blind man no matter its height or depth. With the proposed architecture, if constructed with at the foremost accuracy, the blind are getting to be able to move from one place to a special without others help. Smart glove for the blind project is to help blind people walk and estimate the space from obstacles. The component mainly used for this project are Arduino nano, Vibrator motor and ultrasonic sensor. supported the experiment that are conducted, there are few advantages and limitations of this project. one among the benefits of this project was the utilization of ultrasonic sensor. This sensor was very sensitive and may trigger faster when it detect obstacles. Besides that, the worth to develop this project was low and should be afforded by blind people. The limitation of this project was the ultrasonic sensor used can only detect the obstacles but cannot illustrate the form of the obstacles. Furthermore, this assistive glove can only be employed by blind people but not the blind and deaf people.

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by Ashwin Sharma

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