

# **ULTRASONIC DISTANCE MEASUREMENT**

## **A MINI PROJECT REPORT**

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# **NEW HORIZON COLLEGE OF ENGINEERING**

New Horizon Knowledge Park, Ring Road, Marathalli

Autonomous College Permanently Affiliated to VTU, Approved by AICTE & UGC

Accredited by NAAC with 'A' Grade, Accredited by NBA

## **DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

### **BONAFIDE CERTIFICATE**

Certified that the Mini Project work entitled **“ULTRASONIC DISTANCE MEASUREMENT”** carried out by **Niranjan K R – 1NH18EE732** , **Shashidhar P H – 1NH18EE746**, **Shiva Prasad L P – 1NH18EE747**, are Bonafide students of New Horizon College of Engineering submitted the report in completion of project at Department of Electrical and Electronics Engineering, New Horizon College of Engineering during the Academic Year 2019-20. It is certified that all the corrections/suggestions indicated for Internal Assessment have been incorporated in the report deposited in the departmental library. The project report has been approved as it satisfies the academic requirements in respect of Project work prescribed for said Degree.

**Project Guide**

**Ms. Roopa C**

**HOD-EEE**

**Dr. RamKumar S**

## **ABSTRACT**

Ultrasonic Distance measurement is based on the principle of Ultrasonic Waves. Where Ultrasonic waves travel in the air medium and get reflected when there is an obstacle. The ultrasonic waves are unaffected to the human beings, so they can be used in many applications. In this project the transmitter of the Ultrasonic Sensor module sends the ultrasonic signal and the reflected signal is received by the receiver. The Total time required for transmission and receiving of the ultrasonic signal is recorded. Using the total time distance can be calculated by using the below formula

$$\text{Distance} = (T/2) * S$$

Where,

S = speed of sound around 340m per second.

T = total time taken by signal

In this project we have used Arduino UNO for controlling the circuit. The Ultrasonic sensor module is connected to the Arduino. The Arduino is programmed in such a way that it triggers the ultrasonic transmitter at a specified interval of time and calculates the distance by using the data received from the ultrasonic sensor module. The calculated distance gets displayed in the 16\*2 LCD display. The distance is displayed in both centimetre and meter.

It can be used as a measuring tape or device for a smaller distance ranging from 2cm to 400cm.

# ACKNOWLEDGMENT

We would like to thank everyone who supported us during this entire period of making of this project. It would not have been possible without the kind support and help of many individuals and professors. We would like to extend our sincere gratitude to all of them. In performing this mini project, we had to take the help and guideline of some respected persons, who deserve our greatest gratitude. The completion of this project gives us much pleasure and satisfaction. We would like to show our gratitude to **Ms. Roopa C, Professor Department of Electrical Engineering** for giving us a good guideline and helping for project throughout numerous consultations and guidance. We would also like to thank **Dr. Ramkumar S, Head of the Department of Electrical Engineering** for guiding us. I am thankful to other professors also for the valuable information provided by them in their respective fields. I am grateful for their cooperation during the period of our mini project. We would also like to expand our deepest gratitude to all those who have directly and indirectly guided us in preparing this report for this mini project. Many people, especially our own classmates and team members itself, have made valuable comment suggestions on this proposal which gave us an inspiration and hope to improve and complete the mini project. We were very excited in doing this. We thank all the people for their help directly and indirectly to complete our project successfully.

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# Chapter 1

## Introduction

There are a few different ways to quantify distance without contact. One path is to utilize ultrasonic waves at 40 kHz for separation estimation. Ultrasonic transducers measure the measure of time taken for a beat of sound to make a trip to a specific surface and return as the reflected reverberation. This circuit figures the separation based on the speed of sound at 25°C surrounding temperature and shows it on a 7-segment Display. Utilizing it, you can gauge separation up to 4 meters.

Direct estimation is an issue that a great deal of utilizations in the modern what's more, buyer advertise fragment need to battle with. Ultrasonic innovation is one of the arrangements utilized by the business. Be that as it may, an enhanced harmony between cost what's more, highlights are an absolute necessity for practically all objective applications. The ultrasonic separation measurer (UDM) is utilized for the most part when a non-contact measurer is required.

A Distance meter is utilized to gauge the separation between two objects. Ultrasonic Distance Measurement working rule depends on ultrasonic waves. As the human ear's discernible recognition goes from 20 Hz to 20 kHz, it is inhumane toward ultrasonic waves, and thus the ultrasound waves can be utilized for applications in businesses/vehicles without frustrating human action. The separation can be estimated utilizing beat resonance and stage estimation technique. The signal is transmitted by a ultrasonic transducer, reflected by a snag and got by another transducer where the signal is identified. The time postponement of the transmitted what's more, the got signal relates to the separation between the framework and the impediment.

The speed which sound voyages relies upon the medium which it passes through. All in all, the speed of sound is corresponding (the square base of the proportion) to the solidness of the medium and its thickness. This is a basic property of the medium. Physical properties and the speed of sound change with the conditions in the earth. The speed of sound noticeable all around relies upon the temperature. In the velocity are roughly 345 m/s, in water 1500 m/s and in a bar of steel 5000 m/s.

A typical utilization of ultrasound is for extend finding. This utilization is additionally called sonar. Sonar works correspondingly to radar. A ultrasonic heartbeat is created in a specific heading. On the off chance that there is an article in the method for this heartbeat, the beat is reflected to the sender as a reverberation and is identified. Estimating the distinction in time between the beat transmitted and the reverberation got, it is conceivable to decide the distance away the article is. Bats use an assortment of ultrasonic going (echolocation) to distinguish their prey.

Ultrasonic generators use piezoelectric materials, for example, zinc or lead zirconium tartrates or quartz precious stone. The material thickness chooses the thunderous recurrence when mounted and energized by cathodes appended on either side of it. The therapeutic scanners utilized for belly or heart ultrasound are planned at 2.5 MHz. In this circuit, a 40 kHz transducer is utilized for estimation noticeable all around medium. The speed of sound noticeable all around will be around 330 m/s at 0°C and differs with temperature. The improvement of the main light wave Electronic Distance Measurement (EDM) instrument is associated with the name of the Swedish researcher E. Bergstrand. He planned the First Geodetic meter (short type of GEODetic separation METER) for the assurance of the speed of light in 1943.



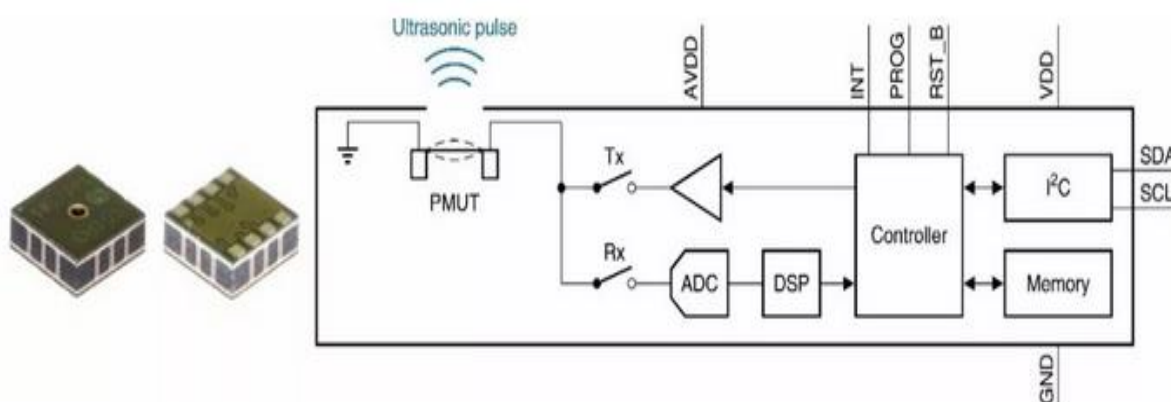
## Chapter 2

### Literature Survey

The first EDM instrument utilizing radio waves was created by T.L. Wadley at the National Institute of Telecommunications Research of South Africa in 1954. It got accessible under the name Tellurometer in 1957. Its range surpassed that of the Geodimeter, and it was hence in a lot more extensive use until lasers were presented in EDM late in the 1960's.

The principal models of short range EDM instruments (consolidating glow diodes) showed up in the mid 1960's (Tellurometer MA 100 of every 1965; Zeiss SM 11 out of 1967). These instruments have been economically discharged since the late 1960's (Wi Id/Secret Distomat DI 10 of every 1968; Tellurometer MA 100 out of 1969; Zeiss SM 11 of every 1970). Short extend instruments with infrared (I R) light sources are currently progressively utilized for a wide range of overviews; long run instruments are utilized for the estimation of geodetic systems.

The foundations of ultrasonic innovation can be followed back to look into on the piezoelectric impact directed by Pierre Curie around 1880. He found that uneven precious stones, for example, quartz and Rochelle salt (potassium sodium tartrate) create an electric charge when mechanical weight is applied. On the other hand, mechanical vibrations are acquired by applying electrical motions to similar precious stones.



**Fig (2.1) Worlds First ultrasonic time of flight sensor**

One of the main applications for ultrasonic was sonar (an abbreviation for sound route running). It was utilized on an enormous scale by the U.S. Naval force during World War II to recognize foe submarines. Sonar works by skipping a progression of high recurrence, concentrated sound wave pillars off an objective and afterward recording the reverberation. Since the speed of sound in water is known, it is a simple issue to compute the separation of the objective. Preceding World War II analysts were propelled by sonar to create practically equivalent to procedures for therapeutic determination. For instance, the utilization of ultrasonic waves in recognizing metal articles was examined starting in 1929. In 1931 a patent was gotten for utilizing ultrasonic waves to recognize blemishes in solids.

Japan assumed a significant job in the field of ultrasonic from an early date. For instance, not long after the finish of the war, specialists there started to investigate the therapeutic indicative abilities of ultrasound. Japan was likewise the primary nation to apply Doppler ultrasound, which identifies inward moving items, for example, blood coursing through the heart.

During the 1950s scientists in the United States and Europe turned out to be progressively mindful of the advancement that had been made in Japan, and they started take a shot at extra therapeutic applications. The primary ultrasonic instruments showed their outcomes with blips on an oscilloscope screen. That was trailed by the utilization of two-dimensional, dark scale imaging. High goals, shading, PC improved pictures are currently normal, Ultrasonic innovation is presently utilized in a wide scope of utilizations in research, industry and drug.

## CHAPTER 03

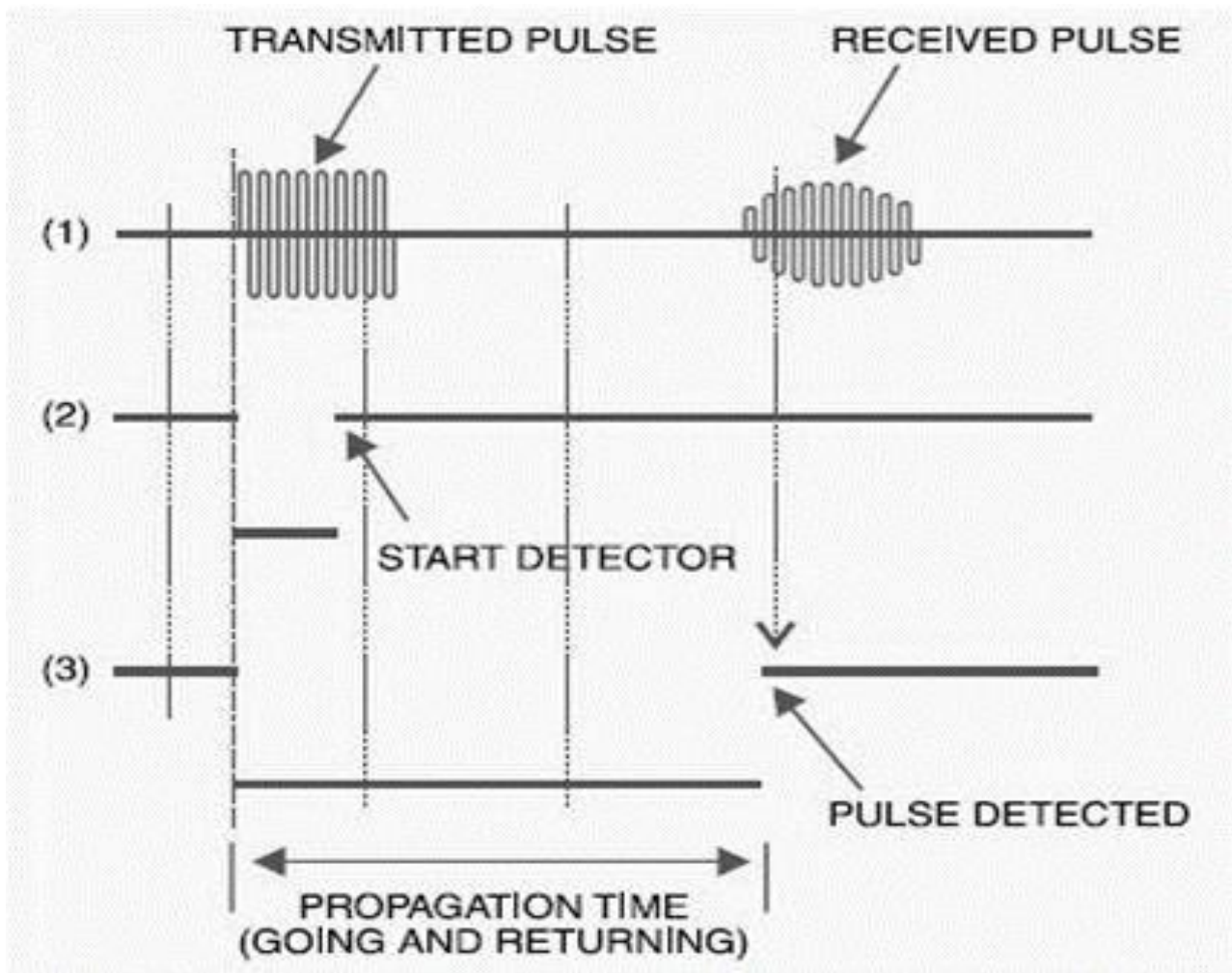
### **PROPOSED METHODOLOGY**

Ultrasonic generators use piezoelectric materials, for example, zinc or lead zirconium tartrates or quartz precious stone. The material thickness chooses the full recurrence when mounted and energized by anodes connected on either side of it. The restorative scanners utilized for mid-region or heart ultrasound are structured at 2.5MHz. In this circuit, a 40kHz transducer is utilized for estimation noticeable all around medium. The speed of sound noticeable all around will be around 330 m/s at 0°C and fluctuates with temperature.

In this venture, we energize the ultrasonic transmitter unit with a 40kHz heartbeat blast and expect a reverberation from the item whose separation we need to quantify transmitted burst, which goes on for a time of roughly 0.5ms. It goes to the article noticeable all around and the reverberation signal is grabbed by another ultrasonic transducer unit (recipient), likewise a 40 kHz pre-tuned unit. The got sign, which is exceptionally powerless, is intensified a few times in the collector circuit and shows up to some degree as demonstrated figure when seen on a CRO.

Frail echoes additionally happen because of the sign being legitimately gotten through the side flaps. These are overlooked as the genuine reverberation got alone would give the right separation. That is the reason we ought to have a level control. Obviously, the sign gets flimsier if the objective is more remote than 2.5 meters and will require a higher heartbeat excitation voltage or a superior transducer.

Here the microcontroller is utilized to produce 40 kHz sound beats. It peruses when the reverberation shows up; it finds the time taken in microseconds for forward and backward travel of sound waves. Utilizing speed of 333 m/s, it does the computations and shows on the four 7-portion shows the separation in centimetres and millimetres (three digits for centimetres and one for millimetres).



**Fig (3.1) The ultrasonic pulse, echo signal and time measurement**

Ultrasonic sensors can quantify the accompanying parameters without reaching the medium to be estimated

- Level
- Diameter
- Presence
- Position
- Distance

Ultrasonic sensors make exact estimations in numerous troublesome situations and abnormal materials. Estimations are unaffected by:

- ❖ Light
- ❖ Surface
- ❖ Mist and Vapor
- ❖ Dust
- ❖ Material

To quantify the separation of a sound sign transmitted, it should be reflected. This sound sign is a longitudinal sound wave that strikes a level surface. Sound is then reflected, gave that the element of the intelligent surface is huge contrasted with the wavelength of the sound.

Above all else, we must trigger the ultrasonic sensor module to transmit signal by utilizing Arduino and afterward hang tight for get ECHO. Arduino peruses the time among activating and Received ECHO. We realize that speed of sound is around 340m/s. so we can figure separation by utilizing given equation:

$$\text{Distance} = (T/2) * S$$

Where

S = speed of sound around 340m per second.

T = total time taken by signal

## Distance

The shorter the good ways from the ultrasonic sensor to an item, the more grounded the returning reverberation is. In this manner, as the separation expands, the article requires better intelligent qualities to restore an adequate reverberation.

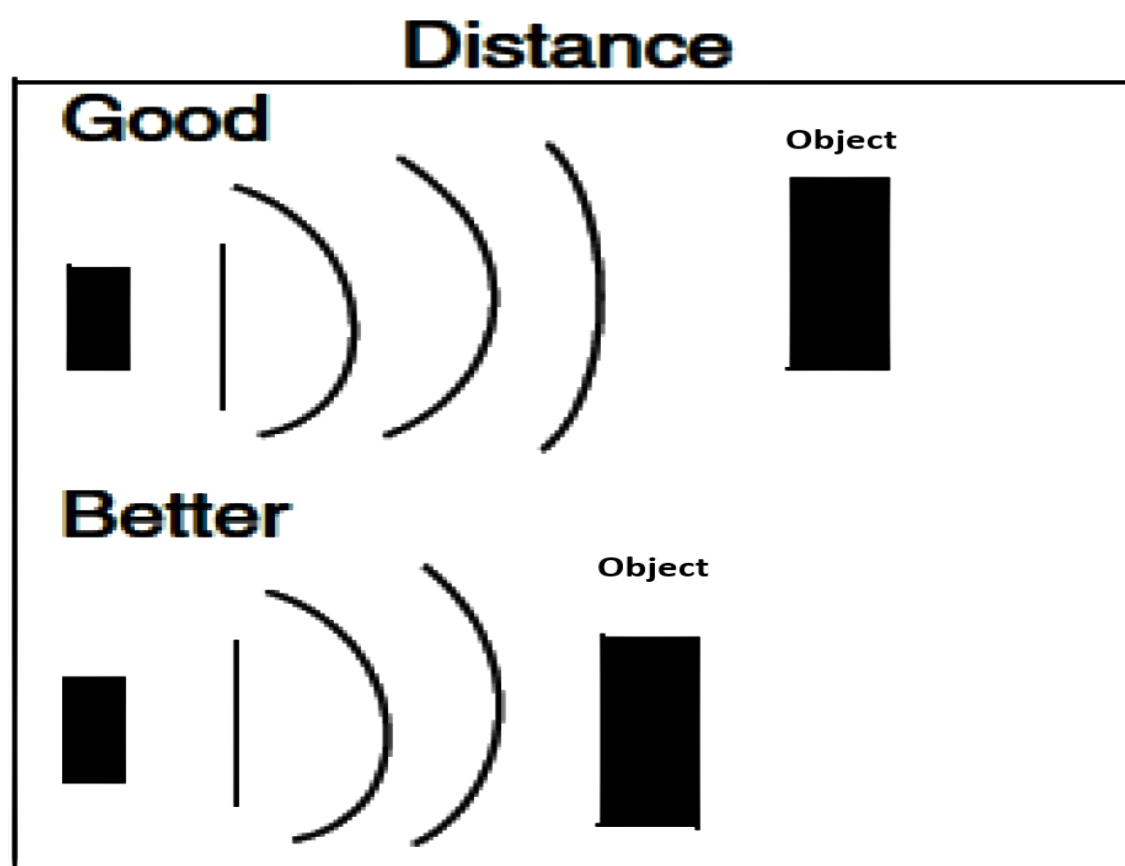


Fig (3.2) Reflection cases

## CHAPTER 04

### **PROJECT DESCRIPTION**

#### **4.1 Software Description**

Arduino IDE is an open source programming that is principally utilized for composing and incorporating the code into the Arduino Module.

It is an authority Arduino programming, making code arrangement too simple that even a typical individual with no earlier specialized information can consider going all in with the learning procedure.

It is effectively accessible for working frameworks like MAC, Windows, Linux and runs on the Java Platform that accompanies inbuilt capacities and directions that assume an indispensable job for troubleshooting, altering and incorporating the code in the earth.

A scope of Arduino modules accessible including Arduino Uno, Arduino Mega, Arduino Leonardo, Arduino Micro and some more. Every one of them contains a microcontroller on the board that is really modified and acknowledges the data as code. The principle code, otherwise called a sketch, made on the IDE stage will eventually create a Hex File which is then moved and transferred in the controller on the board.

The IDE condition predominantly contains two fundamental parts: Editor and Compiler where previous is utilized for composing the necessary code and later is utilized for aggregating and transferring the code into the given Arduino Module. This condition underpins both C and C++ dialects.

The Arduino programming is open-source. The source code for the Java condition is discharged under the GPL and the C/C++ microcontroller libraries are under the LGPL.

Sketch: The primary new phrasing is the Arduino program called "sketch".

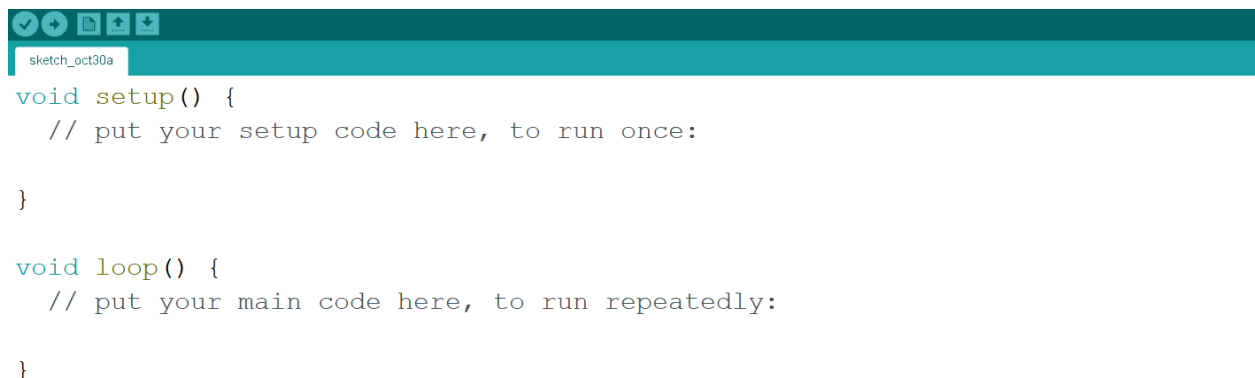
# Structure

Arduino projects can be isolated in three primary parts: Structure, Values (factors and constants), and Functions. In this instructional exercise, we will find out about the Arduino programming program, bit by bit, and how we can compose the program with no linguistic structure or accumulation mistake.

Programming structure comprise of two primary capacities:

Software structure consist of two main functions:

- ❖ Setup( ) function
- ❖ Loop( ) function



```
sketch_oct30a
void setup() {
  // put your setup code here, to run once:
}

void loop() {
  // put your main code here, to run repeatedly:
}
```

**Fig (4.1.1) Software Window**



## 4.2 Hardware Description

### Circuit Diagram

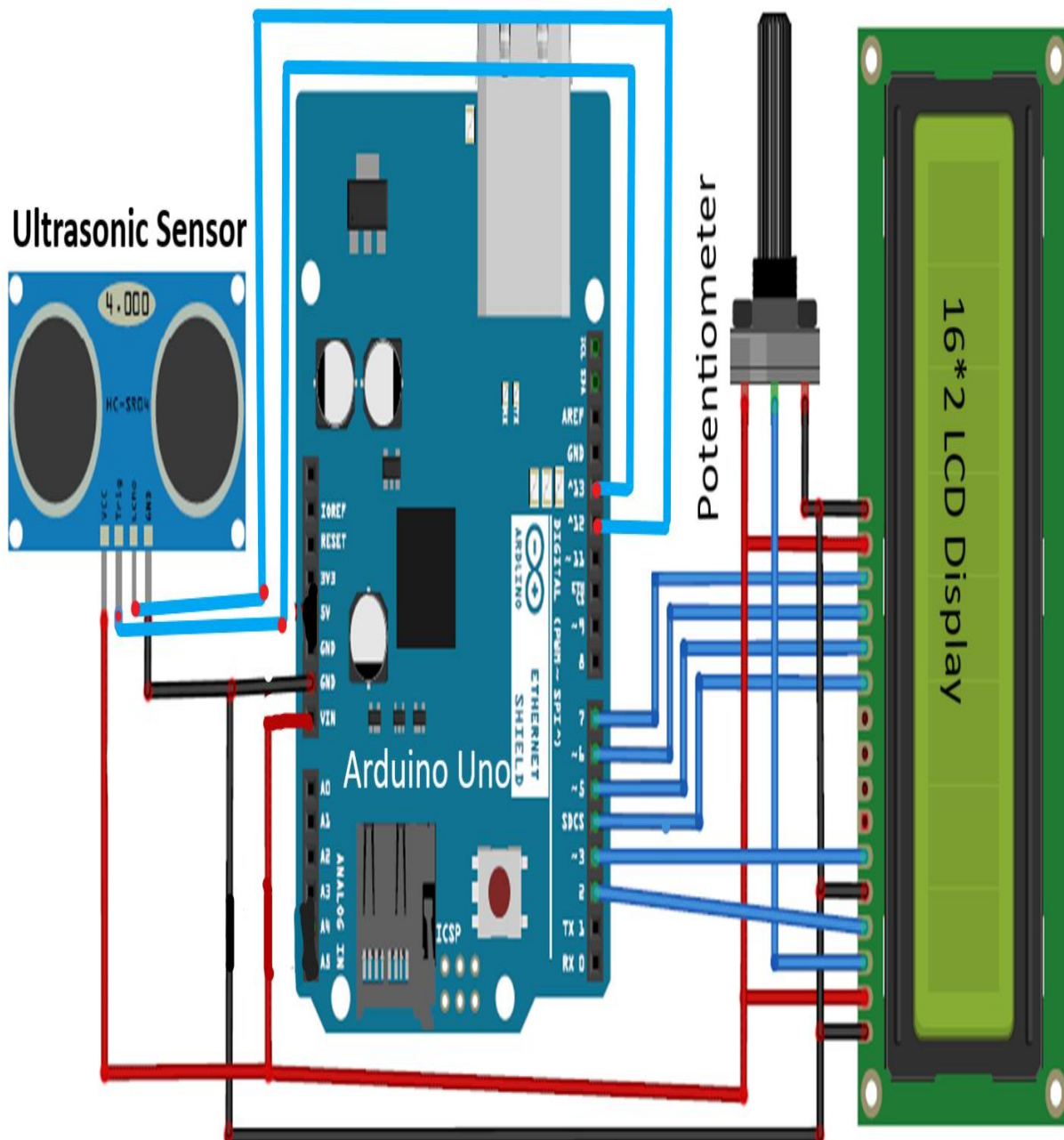
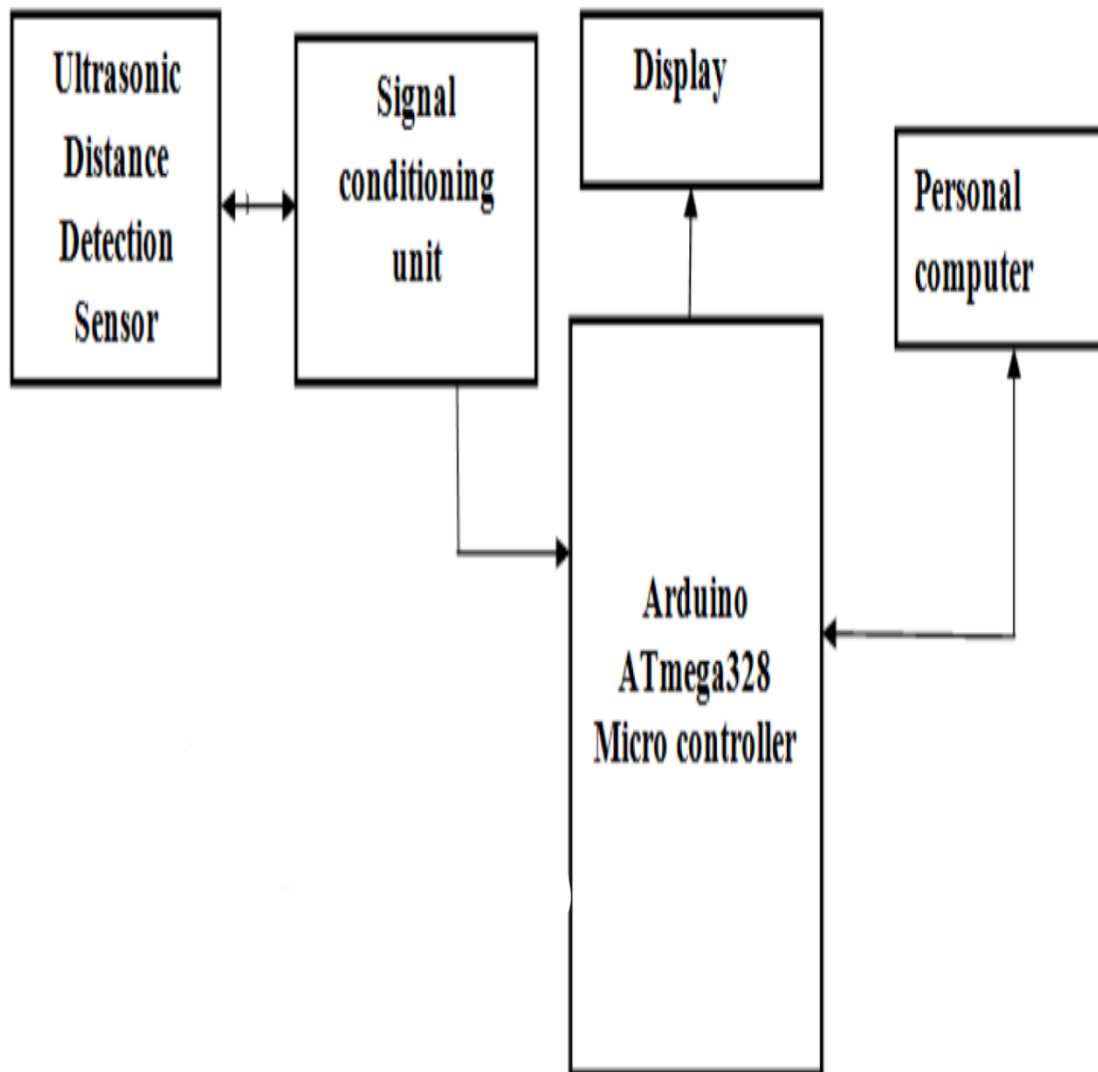


Fig (4.2.1) Project Circuit Diagram

## Block Diagram



Fig(4.2.2) Block Diagram

## Circuit Connections

- ❑ The circuit diagram for Arduino and ultrasonic sensor is shown above to measure the distance. The battery positive terminal is connected to Vin of the Arduino board and negative terminal is connected to GND of the Arduino. We Can connect power supply through Programming USB Cable.
- ❑ In circuit connections Ultrasonic sensor module's "trigger" and "echo" pins are directly connected to pin 13 and 12 of Arduino.
- ❑ A 16x2 LCD is connected with Arduino in 4-bit mode. Control pin RS, RW and En are directly connected to Arduino pin 2, GND and 3.
- ❑ And data pin of D4,D5,D6,D7 is connected to 4, 5, 6 and 7 of Arduino.
- ❑ Vcc and GND of LCD are connected to Battery.
- ❑ Potentiometer middle pin is connected to 5<sup>th</sup> pin of LCD. Which will control the contrast of LCD. Another two pins are connected to Vcc and GND of the battery.

## Components Used

1. Arduino Uno
2. Ultrasonic Sensor Module
3. 16\*2 LCD Display
4. Potentiometer
5. Switch and wires

## Description of Components

### 1. Arduino Uno

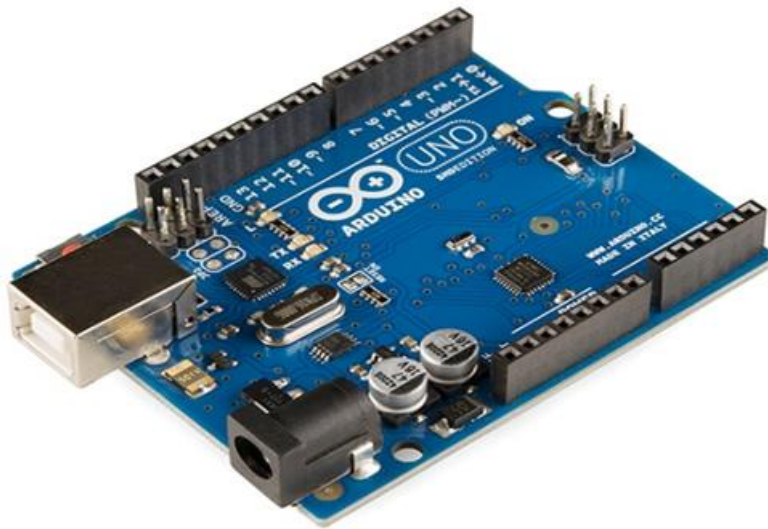


Fig (4.2.3) Arduino Uno

### Overview

The Arduino Uno is a microcontroller consisting of ATmega328p Microcontroller. It has 14 computerized input/output pins (of which 6 can be utilized as PWM outputs), 6 simple data sources, a 16 MHz ceramic resonator, a USB association, a power jack, an ICSP header, and a reset button. It contains everything expected to help the microcontroller; essentially interface it to a PC with a USB link or power it with an AC-to-DC connector or battery to begin.

The Uno varies from every single going before board in that it doesn't utilize the FTDI USB-to-serial driver chip. Rather, it includes the Atmega16U2 (Atmega8U2 up to adaptation R2) modified as a USB-to-serial converter. Update 2 of the Uno board has a resistor dismantling the 8U2 HWB line to ground, making it simpler to place into DFU mode.

Revision of the board has new features

- ❖ It has stronger Reset Circuit
- ❖ Atmega 8U2 is replaced by the 16U2
- ❖ Pinout: added SDA and SCL pins that are near to the AREF pin and two other new pins are placed near to the RESET pin. The IOREF that allow the shields to adapt the voltage provided from the board. In future, the shields will be compatible both with the board that use the AVR, which operate with 5Volts and with the Arduino Uno Due that operate with 3.3Volts. The second pin is a not connected pin, that is reserved for further purposes.

## Summary

I.	Microcontroller	ATmega328p
II.	Operating Voltage	5Volts
III.	Input Voltage (recommended)	7-12Volts
IV.	Input Voltage (limits)	6-20Volts
V.	Digital I/O Pins	14 ( 6 is PWM output)
VI.	Analog Input Pins	6
VII.	DC Current per I/O Pin	40 mAmps
VIII.	DC Current for 3.3V Pin	50 mAmps
IX.	Flash Memory	32 KB of microcontroller of which 0.5 KB used by bootloader
X.	SRAM	2 KB (microcontroller)
XI.	EEPROM	1 KB (microcontroller)
XII.	Clock Speed	16 MHz

## Input and Output

All the 14 digital pins on the Arduino Uno can be used as an input or output pins, using pin Mode(), digital Write(), and digital Read() functions. They work at 5 volts. Each pin can send or receive a maximum of 40 m Amps and has an internal pull-up resistor of 20-50kOhms. Some pins have extra functions:

- Serial: 0 (RX) and 1 (TX). They are used to receive (RX) and transmit (TX) TTL serial data. These pins can be connected to the corresponding pins of the ATmega328p USB-to-TTL Serial chip.
- External Interrupts: 2 and 3. These are the pins that can be configured to trigger an interrupt on a low value, a rising or a falling edge, or a change of the value.
- PWM: pins 3, 5, 6, 9, 10, and 11. They will provide 8-bit PWM output with the analog write() function in the programming.
- SPI: pin 10 (SS), 11 (MOSI), 12 (MISO), and 13 (SCK). These are the pins that support SPI communication using the SPI library.
- LED: 13. There is a builtin LED connected to digital pin 13 to indicate high or low value. If the pin is HIGH value, the LED is on, when the pin is LOW value, it is off.
- The Arduino Uno has 6 analog inputs, from A0 through A5, each of which provide 10 bits (i.e. 1024 different inputs). By default, they measure from 0 to 5 volts, though it is possible to change the higher end of their range using the AREF pin and the analog Reference () function.

Additionally, some pins have specialized functionality

- TWI: A4 or SDA pin and A5 or SCL pin. Support communication using the Wire library.
- There are a couple of other pins on the board:
- AREF. Reference voltage for the analog inputs. Used with analog Reference ().
- Reset. Bring this connection LOW to reset the microcontroller. Typically used to add a reset button to shields which acts to block the one on the board.



**Fig (4.2.4) Ultrasonic sensor**

## **2.Ultrasonic Sensor Module**

Ultrasonic sensors use sound to decide the separation between the sensor and the nearest object in its way. How do ultrasonic sensors do this? Ultrasonic sensors are basically stable sensors, yet they work at a recurrence above human hearing.

The sensor conveys a sound wave at a particular recurrence. It at that point tunes in for that particular sound wave to bob off of an object and return . The sensor follows along of the time between sending of the sound wave and the sound wave after returning,

### **Specifications**

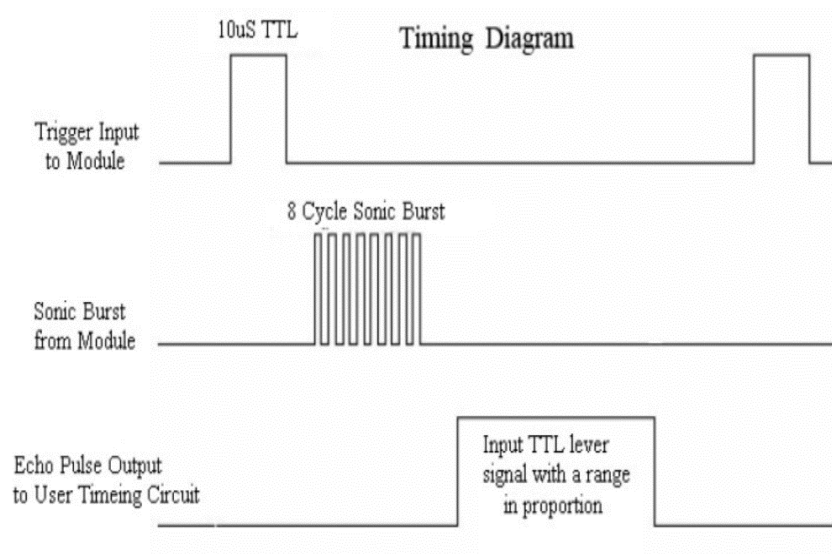
The sensor picked for the Ultrasonic distance measurement Project was the HCSR04.This area contains the particulars and why they are essential to the sensor module. The sensor modules necessities are as per the following.

- i. Cost

- ii. Weight
- iii. Community of specialists and backing
- iv. Accuracy of article recognition
- v. Probability of working in a smoky situation
- vi. Ease of utilization

The HCSR04 Specifications are recorded underneath,

- ☐ Power Supply 5V DC supply
- ☐ Quiescent Current < 2mA
- ☐ Working current 15mA
- ☐ Effectual Angle < 15 degree
- ☐ Ranging Distance 4000cm
- ☐ Resolution 0.3cm
- ☐ Measuring Angle 30 degree
- ☐ Trigger Input Pulse width 10µs
- ☐ Dimensions 45mm x 20mm x 15mm



**Fig (4.2.5) Timing Diagram**



## Timing chart

The Timing chart is appeared in figure 3. 10uS beat is required to the trigger information and start the extending, and afterward the module will convey a 8 cycle explosion of ultrasound at 40 kHz and raise its reverberation. The Echo is a separation object that is beat width and the range in extent. At that point figure the range through the time interim between sending trigger sign and accepting reverberation signal. We recommend to use over 60ms estimation cycle, so as to anticipate trigger sign to the reverberation signal. There are just four associations, +5v, Gnd, trigger and Echo.

The HCSR04 can be activated to convey a ultrasonic burst by setting the TRIG stick to HIGH. When the burst is sent the ECHO stick will naturally go HIGH. This stick will stay HIGH until the burst hits the sensor once more. You can compute the separation to the article by monitoring to what extent the ECHO stick remains HIGH. The time ECHO remains HIGH is the time the burst spent voyaging. Utilizing this estimation in condition 1 alongside the speed of sound will yield the separation voyaged. A rundown of this is recorded previously.

The HCSR04 has 4 pins

1. VCC is a 5v control stock. This should originate from the microcontroller
2. GND is a ground stick. Append to ground on the microcontroller.
3. TRIG ought to be appended to a GPIO stick that can be set to HIGH
4. Reverberation is somewhat more troublesome.

The HCSR04 yields 5v, which could decimate numerous microcontroller GPIO pins (the greatest permitted voltage differs). So as to step down the voltage utilize a solitary resistor or a voltage divider circuit. Indeed, this relies upon the particular microcontroller you are utilizing, you should discover its GPIO most extreme voltage.

## Working of ultrasonic sensor

The Ultrasonic sensor fills in as a burst sign is transmitted for brief span (is produced) by the producer. After that there will be a quiet period. This period is really called "reaction time" and is the time hanging tight for reflected waves. The acoustic transmitted sign may discover a deterrent or not. In the event that a hindrance is discovered, the acoustic sign will be bobbed once again from the impediment. This back bobbed signal is designated "reverberation". The reverberation is gotten by the getting transducer and is changed over into electrical sign. Typically, this sign is intensified, sifted and can be changed over into advanced structure. Utilizing the passed time among transmission and gathering, the separation between the Ultra Sonic framework and snag/item can be determined.

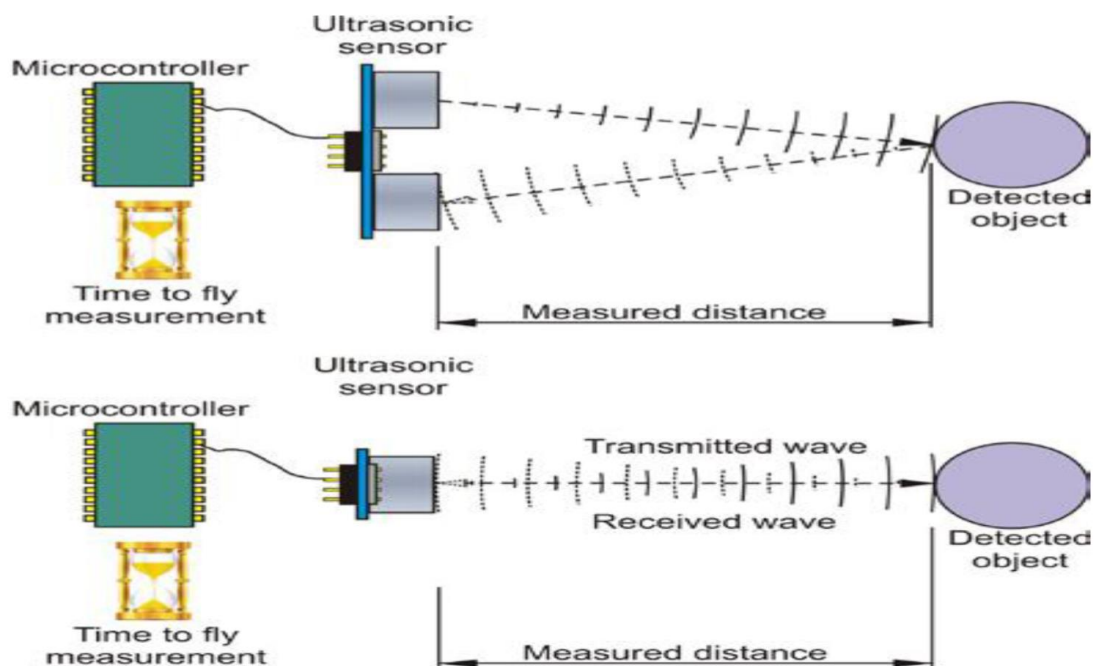
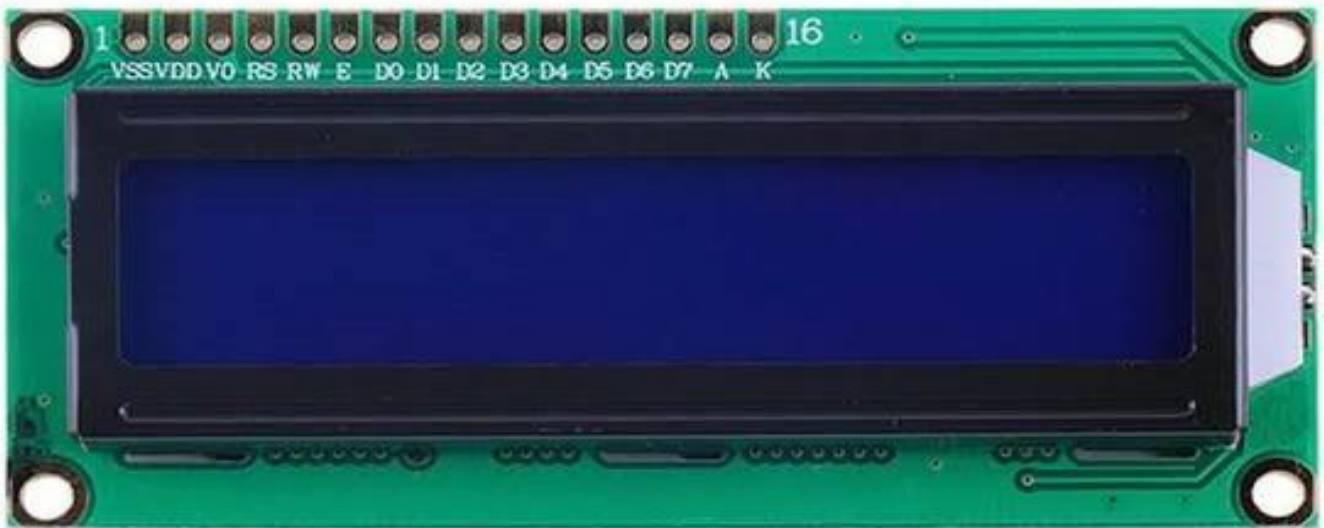


Fig (4.2.6) Ultrasonic Signal Transmission

### 3. 16\*2 LCD Display



**Fig (4.2.7) 16\*2 LCD Display**

This is a LCD Display intended for E-squares. It is a 16 character, 2-line alphanumeric LCD show associated with a solitary 9-way D-type connector. This enables the gadget to be associated with most E-Block I/O ports. The LCD show requires information in a sequential arrangement, which is point by point in the client control underneath. The showcase additionally requires a 5V control stock. If it's not too much trouble take care not to surpass 5V, as this will make harm the gadget. The 5V is best created from the E-squares Multiprogram or a 5V fixed directed power supply.

The potentiometer RV1 is a difference control that ought to be utilized to modify the differentiation of the showcase for nature it is being utilized in.

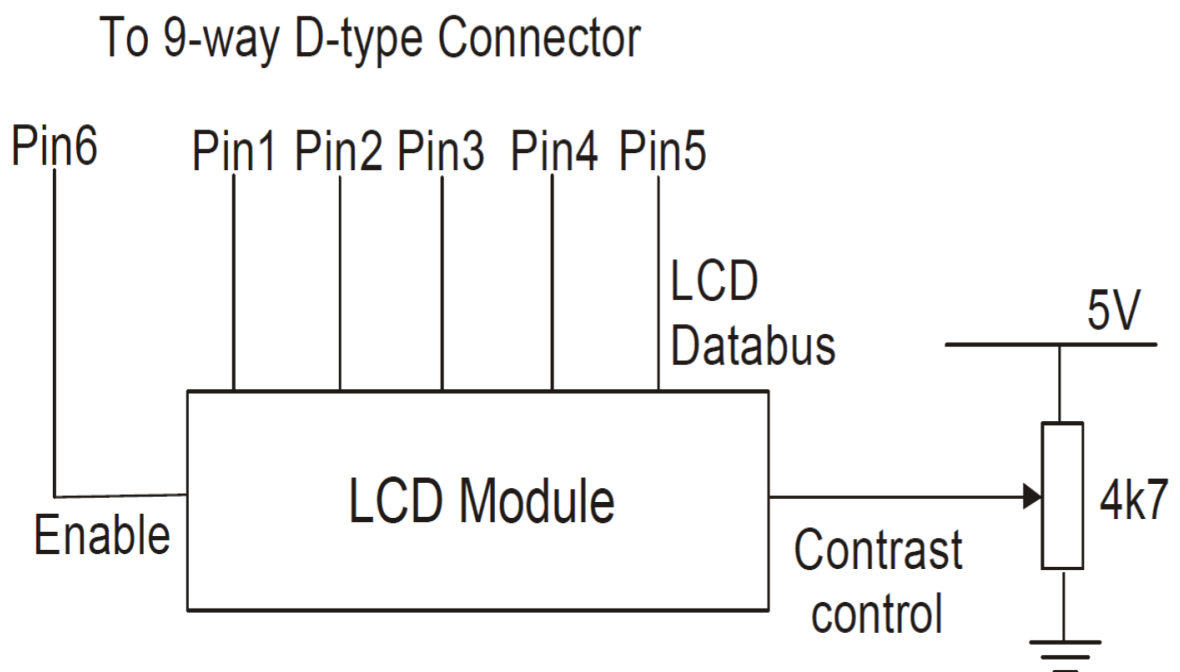
#### Highlights

- E-squares perfect
- Low cost
- Compatible with most I/O ports in the E-Block extend

- Ease to create programming code utilizing Flow code symbols.

The LCD Module utilizes a Samsung KS0066U controller, which is like the Hitachi HD44780 controller.

The PIC smaller scale board utilizes pins 1 - 6 on the 9-way D-type connector to program the LCD, as appeared in the circuit graph underneath. At the point when the LCD load up is turned on, information must be sent to it after 30ms, this is the time taken for the LCD to introduce.



**Fig (4.2.8) LCD block diagram**

To send a direction to the LCD, information must be sent in two stages, the MSB pursued by the LSB [byte is information on pins 1 - 4]. As every byte is sent to the LCD, B5 must be go high at that point low, for the LCD to recognize the byte. After the subsequent byte has been recognized the LCD executes the direction. The PIC small scale load up must sit tight for at any rate the length of the execution time for that order, before the following direction can be sent

## 4. Potentiometer



**Fig (4.2.9) Potentiometer**

Potentiometers otherwise called POT, are only factor resistors. They can give a variable opposition by just changing the handle over its head. It tends to be arranged dependent on two primary parameters.

The worth or obstruction chooses how much restriction it gives to the progression of current. The more noteworthy the resistor esteem the littler the present will stream. Some standard qualities for a potentiometer are 500 $\omega$ , 1K, 2K, 5K, 10K, 22K, 47K, 50K, 100K, 220K, 470K, 500K, 1 M.

Resistors are additionally arranged dependent on how much current it can permit; this is called Power (wattage) rating. The higher the power rating the greater the resistor gets and it can likewise progressively current. For potentiometers the power rating is 0.3W and subsequently can be utilized distinctly for low current circuits. The chart shows the parts present inside a potentiometer. We have a resistive track whose total opposition will be equivalent to the appraised obstruction estimation of the POT.

As the image proposes a potentiometer is only a resistor with one variable end. Give us a chance to accept a 10k potentiometer, here in the event that we measure the obstruction between terminal 1 and terminal 3 we will get an estimation of 10k in light of the fact that both the terminals are fixed parts of the bargains. Presently, let us place the wiper precisely at 25% from terminal 1 as appeared above and on the off chance that we measure the opposition somewhere in the range of 1 and 2 we will get 25% of 10k which is 2.5K and estimating crosswise over terminal 2 and 3 will give an obstruction of 7.5K.

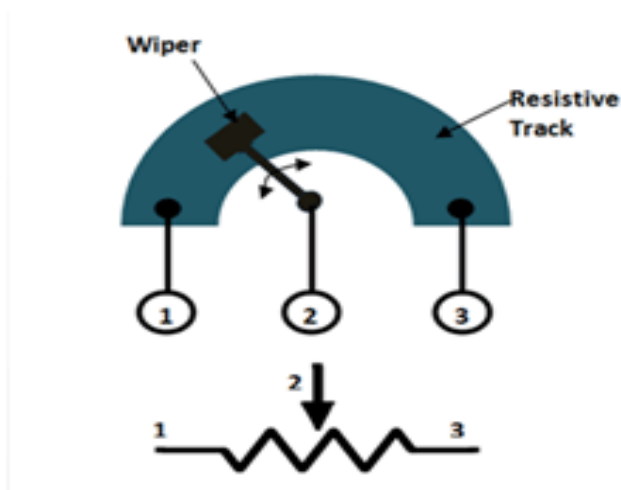


Fig (4.2.10) Potentiometer Pin Configuration

So the terminals 1 and 2 or terminals 2 and 3 can be utilized to get the variable opposition and the handle can be utilized to shift the obstruction and set the necessary worth.

#### Applications

- Voltage and Current Control Circuits
- Used as volume control handles in radios
- Tuning or controlling circuits
- Analog input control handles

## 5. Switch and Wires



Fig (4.2.11) Switch



Fig (4.2.12) Multicolour ribbon wires

## CHAPTER 05

### Result and Discussion

By using Ultrasonic sensor, we recorded the values

Distance Measured using Scale in cm	Distance Measured Using Ultrasonic Sensor	
	In cm	In Meters
10	10.017	0.10
20	20.031	0.2
30	30.066	0.3

**Table (5.1) Observation of measured distances**

After going through all the hard times of completing the Ultrasonic Range Finder, the brief experience has opened our eyes to a wider world. For all the mistakes that we have made and the number of dead ends that we have accidentally trapped in. It is with pride that our team announces the completion of this project according to the requirement of objectives that have been stated in the early chapters.

Through this project, we have gained a lot of knowledge in Arduino UNO and its related family especially on how to use the capture features and controlling the input-output ports and timers. A lot of valuable information also obtained during this project which is not taught in classes through 1 year of study. Besides, other skills such as communication, problem-solving,



self-learning skills and self-working ability have been developed in our minds while achieving this project.

## **CHAPTER 06**

### **CONCLUSION AND FUTURE SCOPE**

#### **Conclusion**

Separation estimation utilizing ultrasonic sensor and Arduino comprise of a transmitter some portion of ultrasonic module unit's ultrasonic high recurrence waves as polices after crash of these products with any item, these products distinguished by mouthpiece time taken by these products from transmitter and beneficiary is utilized to quantify good ways from any article. We had utilized a ultrasonic sensor module of HC-SR04, in light of the fact that this ultrasonic module is started with heartbeat of 10us The good ways from any article is determined from. Separation =speed\*time. The human discernible range can be changed over measure the separation absolutely way.

The target of the task was to structure and actualize a ultrasonic separation meter. The gadget portrayed here can distinguish the objective and ascertain the separation of the objective. The ultrasonic separation meter is a minimal effort, low a basic gadget for separation estimation. The gadget figures the separation with appropriate exactness and goals. It is a helpful framework for non-contact estimation of separation. The gadget has its application in numerous fields. It very well may be utilized in vehicle backing framework, robotization and apply autonomy, recognizing the profundity of the day off, level of the tank, generation line. This gadget will likewise have its application in common and mechanical field for exact and little estimations. For ascertaining the separation utilizing this gadget, the objective whose separation is to be estimated ought to consistently be opposite to the plane of engendering of the ultrasonic waves. Henceforth the direction of the objective is a restriction of this framework. The ultrasonic discovery extend likewise relies upon the estimate and position of the objective. The greater is the objective, more grounded will be the reflected sign and

increasingly precise will be the separation determined. Subsequently the ultrasonic separation meter is a very helpful gadget.

## **Future Scope**

I.Ultrasonic innovation can be utilized to identify moving article based on Doppler recurrence move rule utilizing sensor with high rang mounting on a stepper engine. Thus, it goes about as radar. This sort of ultrasonic radar can likewise be utilized in route and non-military personnel applications and military.

II.The sound wave proliferation speed in air changes with the surrounding temperature. So in the event that we need to get exact outcomes, some alteration can be made at beneficiary circuit and microcontroller to recognize temperatures around. The temperature control results likewise can be shown on LCD to show the total undertaking of sending and accepting the waves.

III.When applied the Ultrasonic Range Finder on a vehicle a bell or a beeper which is a flagging gadget can be utilized to show the separation of the vehicle with the deterrents behind it. The quicker tone of the signal of ringer implies the separation of snags and vehicle are nearer.

IV.New prototyping equipment and capacity and interfacing with other customer elantrine/television/cell phones and flooding of shields.

V. Mining hardware's may require where involve.

VI.Already perfect with many significant re-enactment programming like MATLAB and lab see, we may see even move adaptable programming condition and advancement alternative

VII. Using temp. Pay, it very well may be utilized over wide temp extend.

VIII.Height estimation, horticulture hidden, impact/security can be other application.

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