

Design Lab - 1

Project-2 Report

Ultrasonic Radar

Project report submitted for the partial fulfillment of the
requirements for the degree of

*Bachelor of Technology in
Electronics and Communication Engineering*

by

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Design Lab 1

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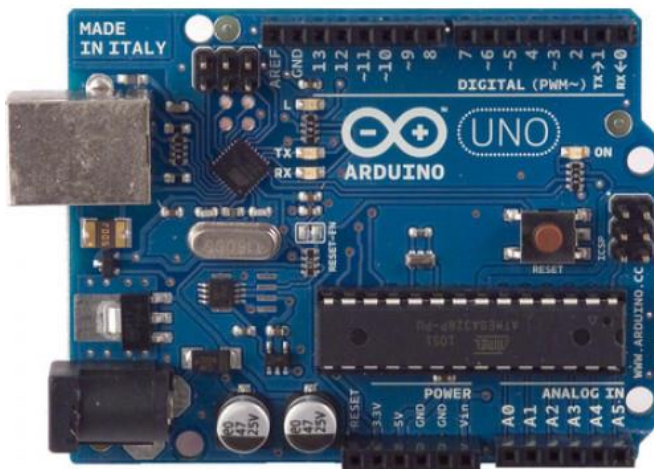
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Chapter 1: INTRODUCTION

In this project, we have designed Arduino RADAR Model using Ultrasonic Sensor for Detection & Ranging. RADAR is an object detection system that uses radio waves to identify the range, altitude, direction, and speed of the objects. The radar antenna transmits radio wave pulses that bounce off any object in its path. The object returns a portion of the wave received by the receiver which is in line of sight with the transmitter.

This Arduino RADAR project aims to achieve a radar system prototype based on an Arduino board, capable of detecting stationary and moving objects.

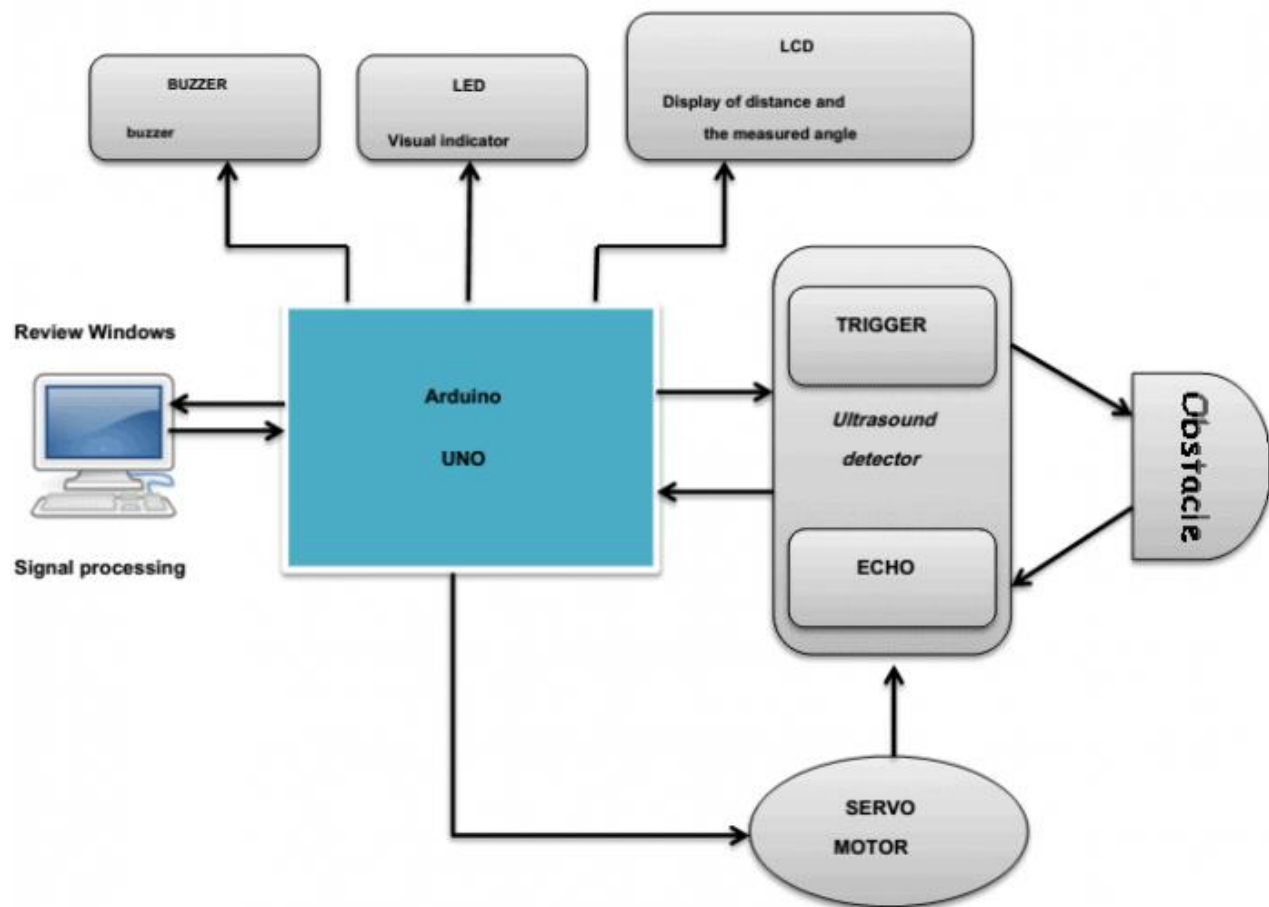
1.1 About Arduino UNO



Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. You can tinker with your Uno without worrying too much about doing something wrong, worst-case scenario you can replace the chip for a few dollars and start over again.

Chapter 2: CIRCUIT

2.1 Block Diagram and Principle



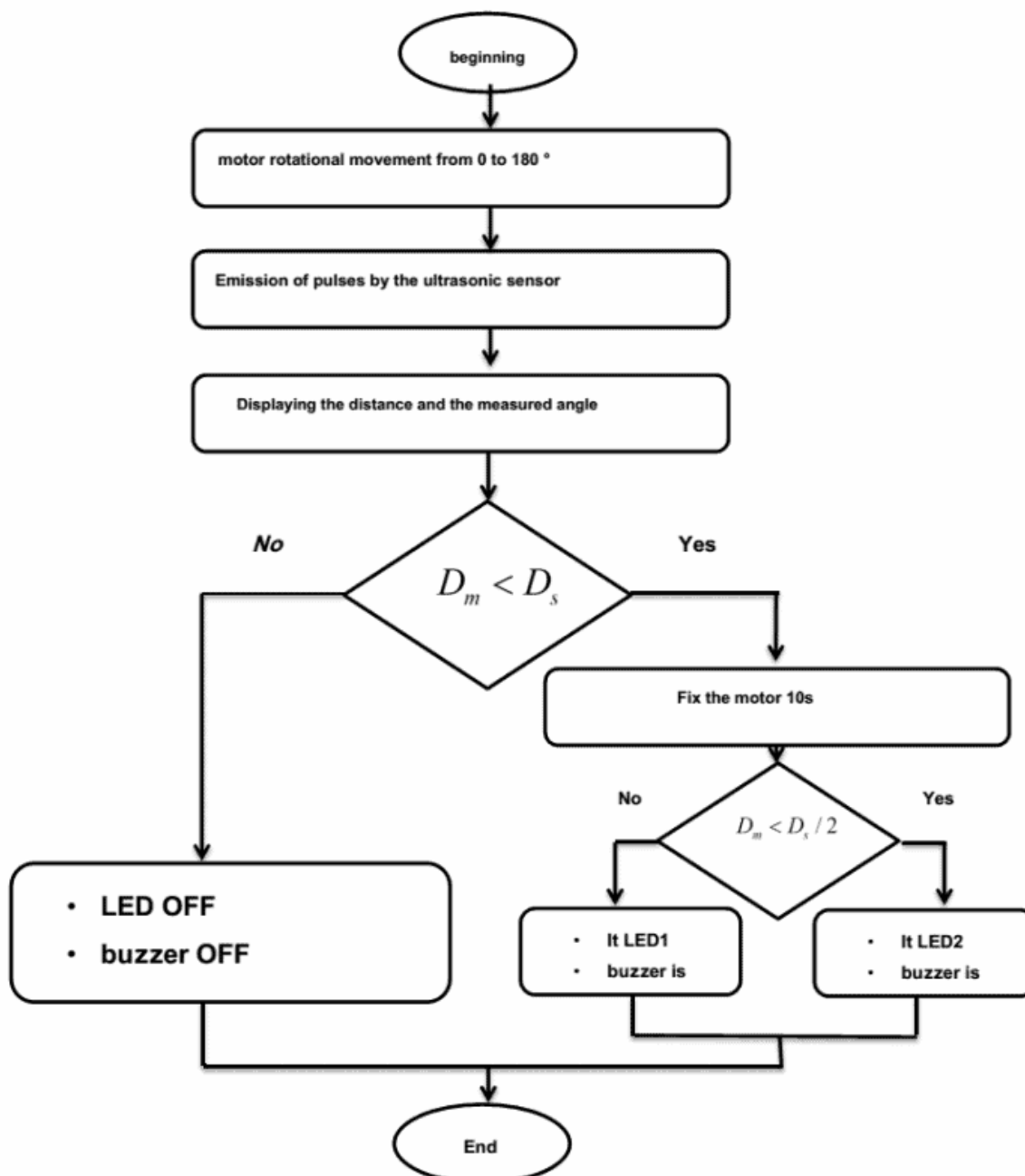
2.2 Working of the circuit

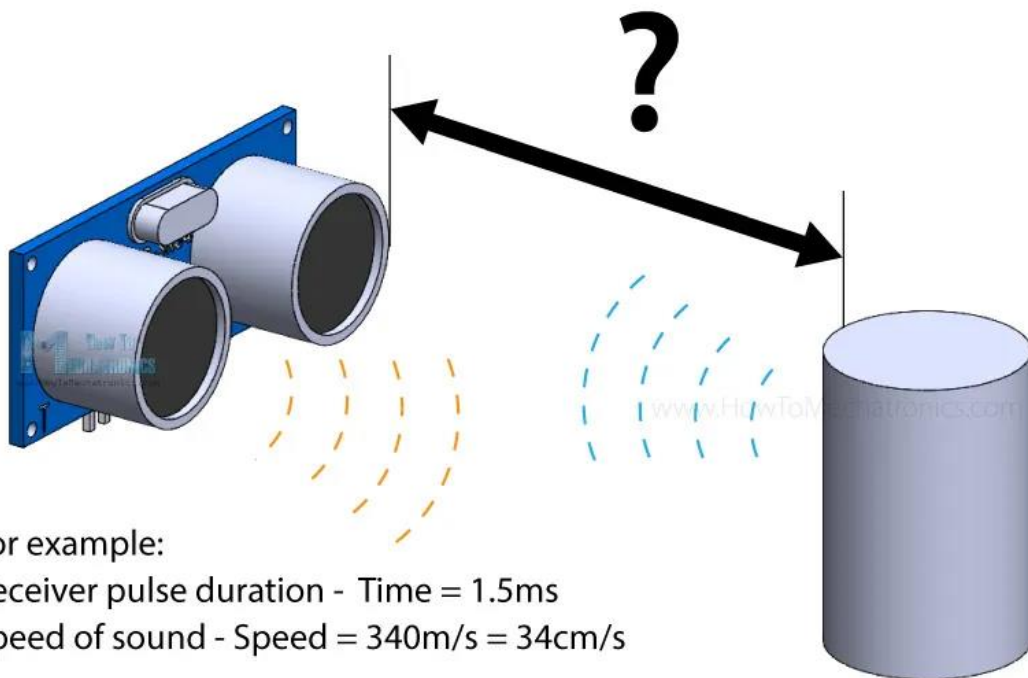
Arduino board sends a signal of +5V to the trig pin of Ultrasonic Sensor HC-SR04 which triggers the sensor. Then it provides rotational action at the servo motor mechanically fitted along with ultrasonic Sensor HC-SR04 so that it can detect the moving objects and locate within 180 degrees.

The Arduino sends a HIGH pulse width of (10 S) on the TRIGGER pin of the sensor to regenerate a series of ultrasonic waves that propagate through the air until it touches an obstacle and returns in the opposite direction towards the sensor pin ECHO. The sensor detects the width of the pulse to calculate the distance.

The signal on pin ECHO the sensor remains at the HIGH position during transmission, thereby measuring the duration of the round trip of ultrasound and thus determine the distance.

The LCD display displays the calculated distance and the angle of rotation. The buzzer is an additional component, it rings when there is a detection (Tone1 and Tone2) along with LEDs. Both LEDs along with the buzzer determine the field where the object is located (near or distant).





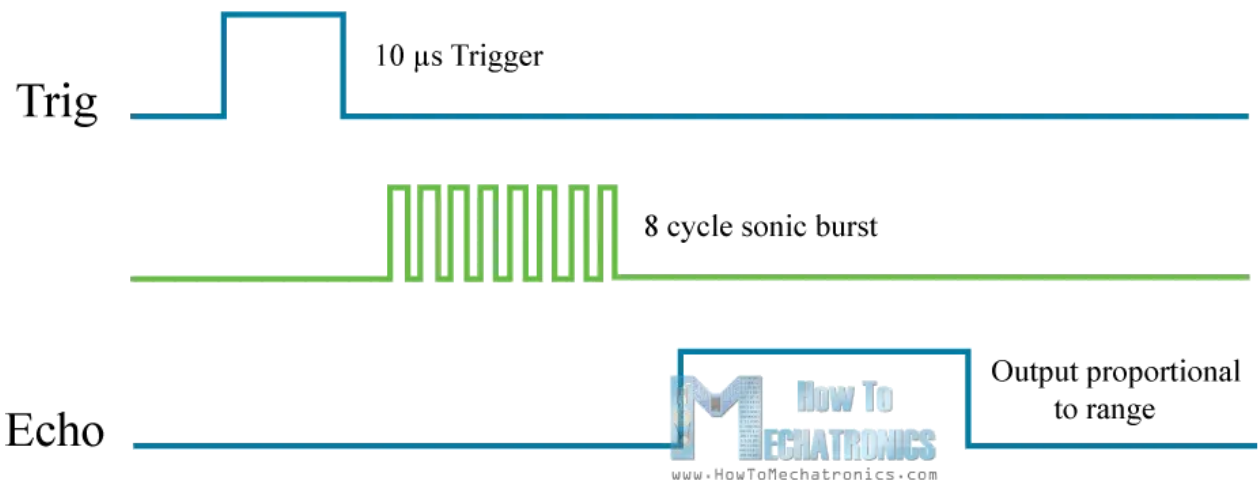
For example:

Receiver pulse duration - Time = 1.5ms

Speed of sound - Speed = 340m/s = 34cm/s

$$\text{Distance} = (\text{Speed} \times \text{Time}) / 2$$

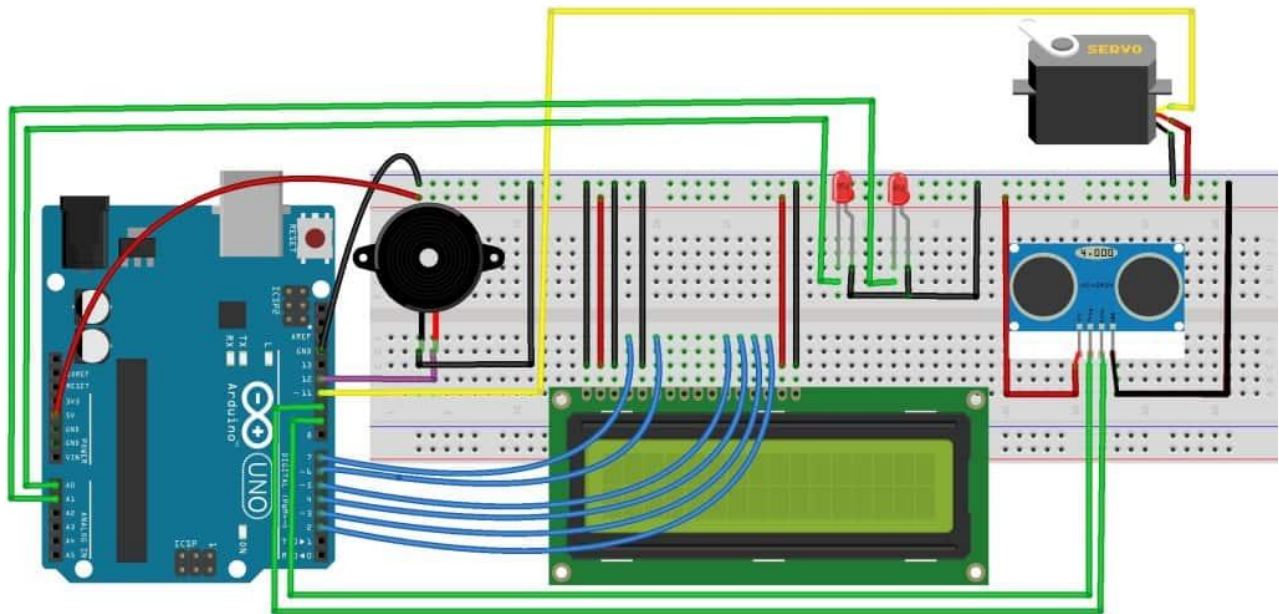
$$\text{Distance} = (34\text{cm/ms} \times 1.5\text{ms}) / 2 = 25.5\text{cm}$$



2.3 Components Used and Costing

- 1. Arduino UNO R3 Development Board – Rs. 2401**
- 2. Ultrasonic Sensor 4X3 KeypadHC-SR04 – Rs. 220**
- 3. LCD Display JHD162A 16x2 LCD Display – Rs. 375**
- 4. SG90 Servo Motor – Rs. 190**
- 5. 5V Active Buzzer – Rs. 10**
- 6. LED x2 – Rs. 4**
- 7. Jumper wires**
- 8. Breadboard – Rs. 210**

2.4 Breadboard Layout and Pseudo code



Pseudo code for distance measurement-

```
digitalWrite(trigger,HIGH);  
delayMicroseconds(10);  
digitalWrite(trigger,LOW);  
delayMicroseconds(2);  
time=pulseIn(echo,HIGH);  
distance=time*340/20000;  
lcd.clear();  
lcd.print("Distance:");  
lcd.print(distance);  
lcd.print("cm");
```

References

1. <https://create.arduino.cc/projecthub>
2. <https://how2electronics.com/>
3. www.wikipedia.com
4. <https://store-usa.arduino.cc/products/arduino-uno-rev3>