

## Arduino based Proximity Warning System

Aim of the project is to develop a proximity warning system based on a scanning SONAR developed using Arduino board. It has a range of 4m and scans over 0 to 180 deg. When an object is detected within 10cm, a Red LED lights up and the distance measured in cm is shown using a 7 segment display.

**Items required:** Arduino kit from Amazon, which includes the following items:

- 1) Arduino
- 2) 7 segment LED display (5501 Common Anode type)
- 3) Servo Motor (SG90), which rotates by +/- 90 deg.
- 4) SONAR (HC-SR04)
- 5) Breadboard
- 6) Jumper wires

### Software Required:

I have developed a small C++ program which needed to be downloaded to the Arduino using a USB cable. A small software known as Arduino IDE is to be installed in Laptop, which is used to download the software into Arduino.

IDE (**ARDUINO 1.8.13**): <https://www.arduino.cc/en/main/software>

We also need the following libraries to drive the SONAR and 7-segment LED display.

Libraries required.:

- 1) **NewPing Library:** Install this library via library manager from Arduino IDE, V 1.9.1. This library is used to drive SONAR and also to recover the distance of the object in cm or in inches unit. I am using the cm unit in my software.
- 2) **Seven Segment Library:** <https://github.com/dgduncan/SevenSegment> (Download this library from GitHub, extract the libraries from the ZIP file to the library folder of Arduino inside the My Documents section of Windows OS. Then goto IDE, and select sketch > include library. Under the contributed library section, click and select "Seven Segment Library". This library is used to drive the 7-Segment LED display.

**How to Setup:** Mount the 7 segment LED display and the warning RED LED on the breadboard. Connect the breadboard to the Arduino using jumper wires. Mount the SONAR (Sound Navigation And Ranging) on the top of the Stepper Motor. The servo Motor is a device that can rotate precisely over from 0 deg to 180 deg, with the help of Arduino command. Connect the Servo and SONAR to the Arduino using the connection diagram given in the next page.

The required Software Code is given below. It is also available at my GitHub repository.

Download the "Full\_Working.ino" from the GitHub repository at:

[https://github.com/AMALj248/SONAR\\_Detector](https://github.com/AMALj248/SONAR_Detector) [\[Link\]](#)

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```
//Code By AJ
#include <SegmentDisplay.h>
#include <Servo.h>
#include <NewPing.h>
#define TRIGGER_PIN 10
#define ECHO_PIN 13
#define MAX_DISTANCE 400
int srv = 11;
int led = 12;
int angle = 0;

// NewPing setup of pins and maximum distance
NewPing sonar(TRIGGER_PIN, ECHO_PIN, MAX_DISTANCE);
// Setup the 7 segment Display with the correct pin order
SegmentDisplay segmentDisplay(2, 3, 4, 5, 6, 7, 8, 9);
//Setup for the Servo
Servo servo_test;

void setup() {
  // Configuring Pins for output for 7 segment
  pinMode(2, OUTPUT);
```

```

pinMode(3, OUTPUT);
pinMode(4, OUTPUT);
pinMode(5, OUTPUT);
pinMode(6, OUTPUT);
pinMode(7, OUTPUT);
pinMode(8, OUTPUT);
pinMode(9, OUTPUT);

//Configuring Pin for LED
pinMode(led, OUTPUT);

//Configuring Pin for Servo
servo_test.attach(srv);

//Configuring HC-SR04 Serial
Serial.begin(9600);

}

void loop() {

// To turn the Servo in Postive Direction
for(angle=0;angle<180;angle++)
{
// T move the servo
servo_test.write(angle);
delay(5);

// To Calculate Distance
unsigned int distance = sonar.ping_cm();

// To Print Distance to Serial Monitor
Serial.print(distance);
Serial.println("cm");

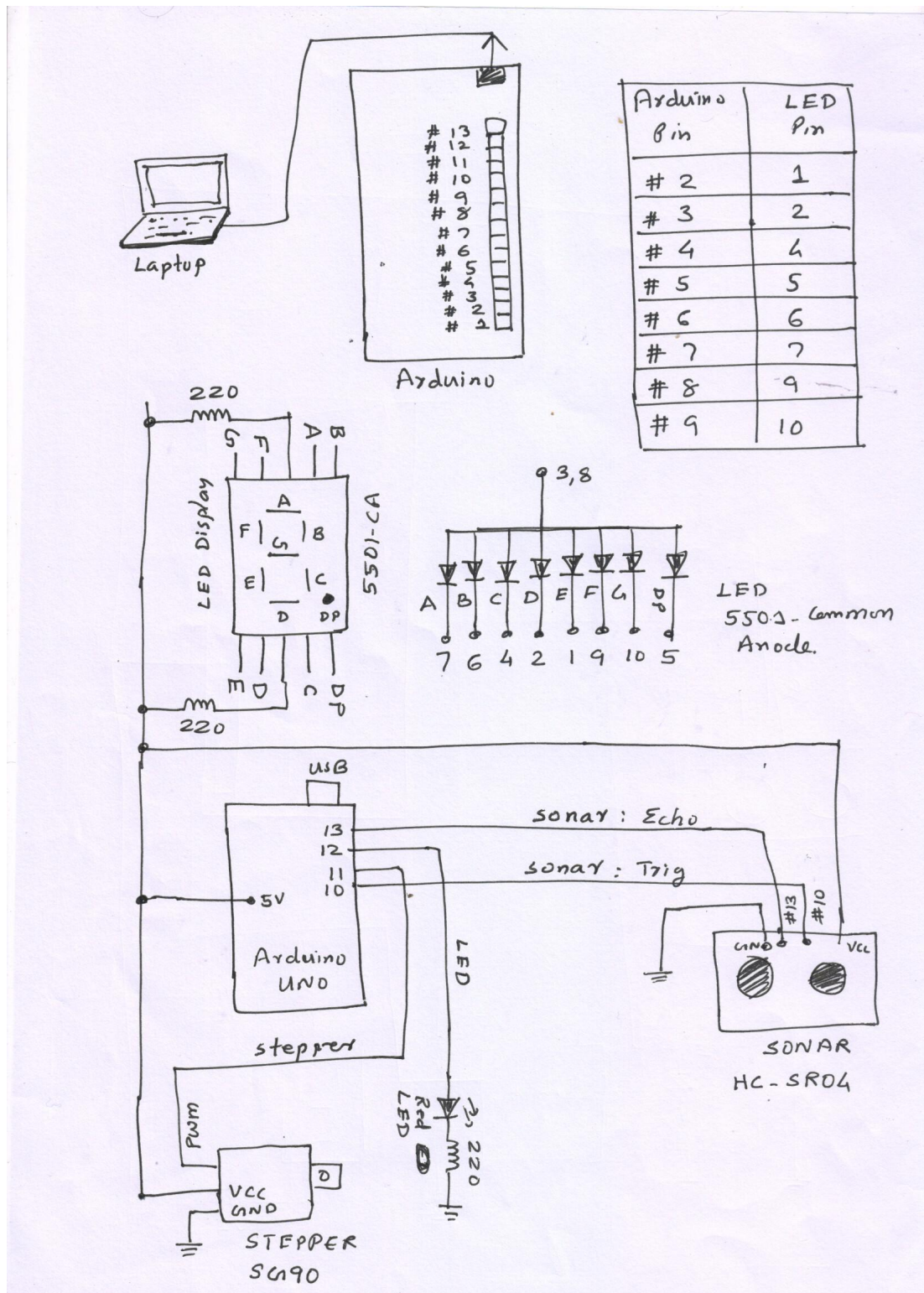
// Danger Proximity Check
if(distance<10)
{
//Display the Distance to 7 segment Display
segmentDisplay.displayHex(distance , false);
//To turn LED ON
digitalWrite(led , HIGH);
delay(20);
//To turn LED OFF
digitalWrite(led , LOW);

}
}

delay(1000);

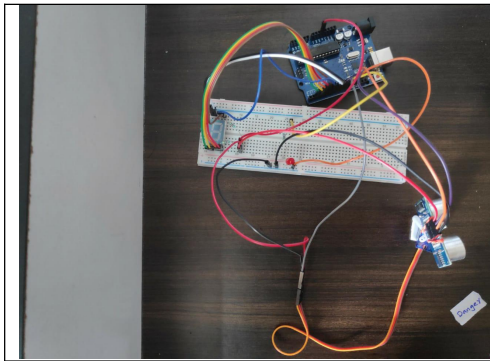
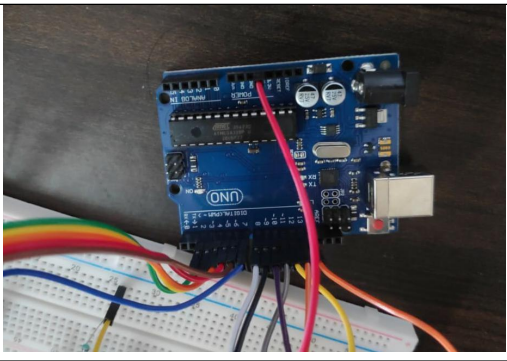
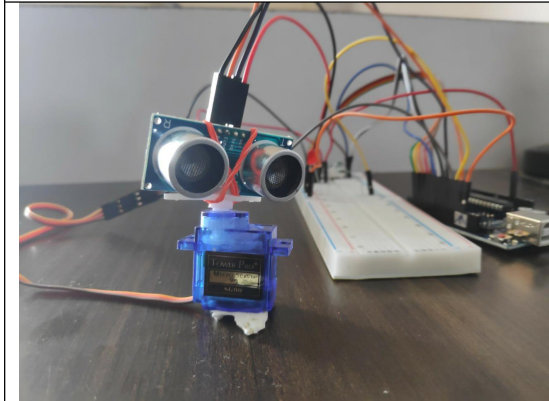
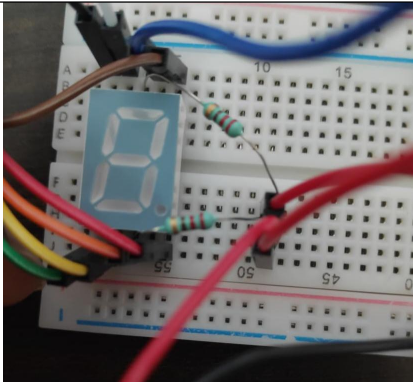
// To turn the Servo in Negative Direction
for(angle=180;angle>1;angle--)
{servo_test.write(angle);
delay(5);
unsigned int distance = sonar.ping_cm();
Serial.print(distance);
Serial.println("cm");
if(distance<10)
{segmentDisplay.displayHex(distance , false);
digitalWrite(led , HIGH);
delay(20);
digitalWrite(led , LOW);
}
}
}

```



Arduino based Proximity Warning System: Wiring diagram

Photo of the Working Setup:

	
Arduino based Proximity Warning Setup	Arduino Board
	
SONAR mounted on Servo Motor	7Segment LED Display

**Some Applications of the device:**

- 1) First-hand training on interfacing of Arduino with various devices like servo motor, SONAR, 7 segment display etc
- 2) Work as a proximity sensor, which can be mounted on devices
- 3) The LED can be replaced with Sound Alarm. This can help in dark environments. It might help blind persons.

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*Note: This is part of my **Home Project** done under the guidance of my Papa, Dr. Jogy George.*