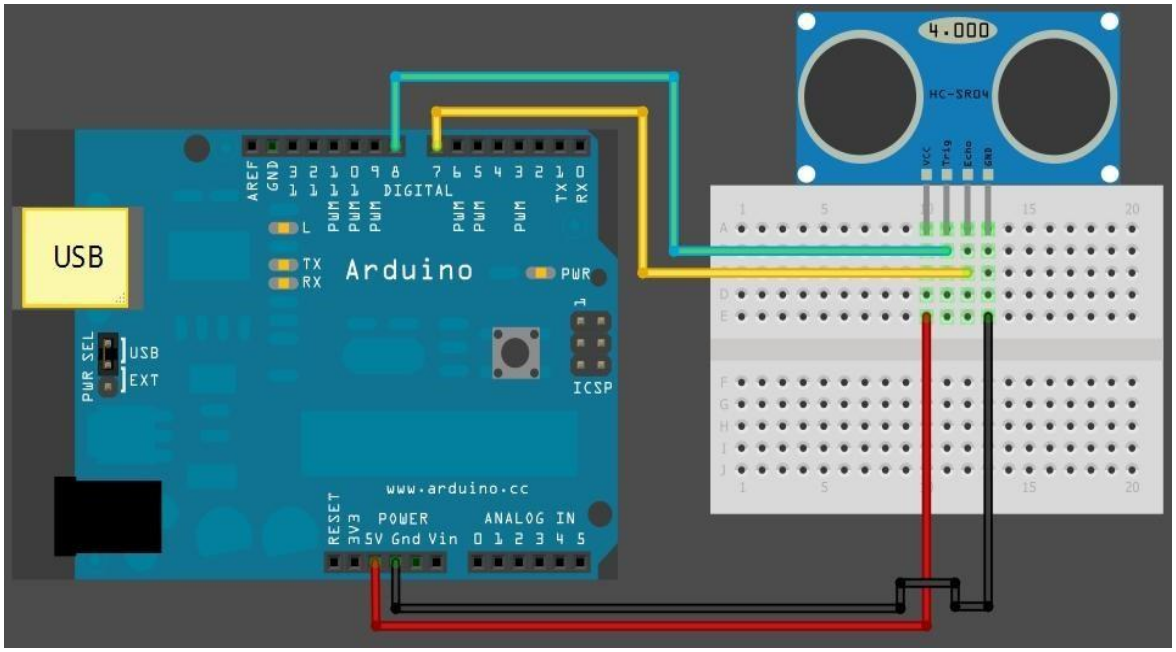
PROJECT FILE

(APPLIED PHYSICS)

PROJECT NAME:

SONAR (MADE WITH HELP OF ULTRASONIC SENSOR AND ARDUINO)



EQUIPMENT USED:

Arduino(UNO), ultrasonic sensor ,pin to pin wires , pin to hole wires ,arduino to laptop connector(USB type-B), bread board,laptop(for coding arduino)

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PROCEDURE:

1) **First of all get all get all the equipment required for the experiment/project.**

2) **Now, connect the wires properly for a functional arduino.**

3) **Put the ultrasonic sensor on bread board and connect its ground wire to the ground of arduino.**

4) **Connect echo pin of sensor to the seventh pin of arduino.(this works on the principle of pulse modulation)**

5) **Connect trigger(trig)pin of sensor to the 8th pin of arduino.**

6) **Connect VCC pin of sensor to the 5V section/hole of arduino.**

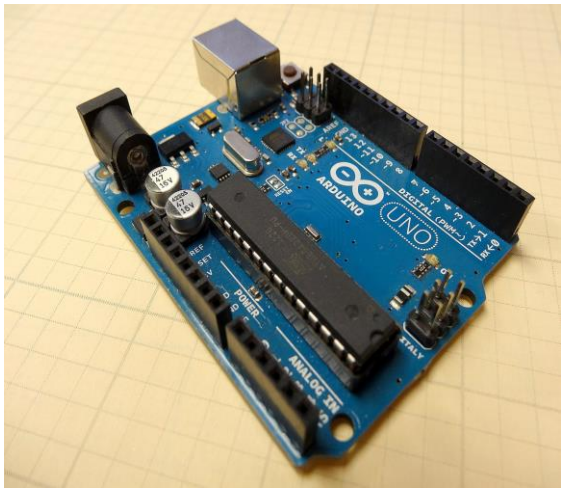
7) **Now, connect the laptop to the arduino and open the arduino sketch coding tab and code code the arduino and then upload it in arduino.**

8) **Now the whole process completes and put a scale on the end of Ultrasonic sensor to verify that it works well and good.**

9) **At last, it gives reading of distance from itself of any object infront of it.(in cm, for this particular program)**

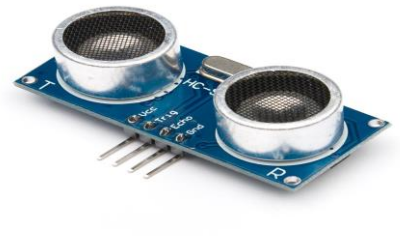
(IT WORKS ON THE TRANSMIT & RECEIVING OF THE WAVES.)

What is ARDUINO?



- **Arduino is an open-source electronics platform based on easy-to use hardware and software. Arduino boards are able to read inputs light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online.**
- **You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.**

What is ultrasonic sensor?



- **An ultrasonic sensor is a type of electronic equipment that emits ultrasonic sound waves and converts the reflected sound into an electrical signal to determine the distance of a target item. Ultrasonic waves travel quicker than audible sound (i.e. the sound that humans can hear). The transmitter, which generates sound using piezoelectric crystals and the receiver, which encounters the sound after it has travelled to and from the target, are the two primary components of ultrasonic sensors.**

- **Ultrasonic sensors are mostly utilized as proximity sensors. They can be found in self-parking technology and anti-collision safety systems in automobiles. In addition to robotic obstacle detection systems, ultrasonic sensors are used in manufacturing technology. Ultrasonic sensors are less susceptible to interference from smoke, gas, and other airborne particles than infrared (IR) sensors in proximity detection applications (though the physical components are still affected by variables such as heat).**

- **Ultrasonic sensors are also utilized as level sensors in closed containers to detect, monitor, and manage liquid levels such as vats in chemical factories. Most notably, ultrasonic technology has allowed the medical profession to create images of interior**

organs, spot malignancies, and monitor the health of new born in the womb.

Principle of ULTRASONIC SENSORS:

- **Ultrasonic sensors operate by emitting a sound wave at a frequency that is above the range of human hearing. To receive and transmit ultrasonic sound, the sensor's transducer functions as a microphone. Like many others, our ultrasonic sensors use a single transducer to send a pulse and receive the echo.**

- **The sensor calculates the distance to a target by measuring the time elapsed between delivering and receiving the ultrasonic pulse. This module's operation is straightforward. It emits a 40kHz ultrasonic pulse that travels through the air and, if it encounters an obstruction or object, bounces back to the sensor. The distance can be estimated by multiplying the travel time by the speed of sound.**

CODE USED:

```
// Includes the Servo library
#include <Servo.h>.
// Defines Tirg and Echo pins of the Ultrasonic Sensor
const int trigPin = 10;
const int echoPin = 11;
// Variables for the duration and the distance
long duration;
int distance;
Servo myServo; // Creates a servo object for controlling the servo motor
void setup() {
  pinMode(trigPin, OUTPUT); // Sets the trigPin as an Output
  pinMode(echoPin, INPUT); // Sets the echoPin as an Input
  Serial.begin(9600);
  myServo.attach(12); // Defines on which pin is the servo motor attached
}
void loop() {
  // rotates the servo motor from 15 to 165 degrees
  for(int i=15;i<=165;i++){
```

```
  myServo.write(i);
  delay(30);
  distance = calculateDistance();// Calls a function for calculating the distance measured by the Ultrasonic sensor for each degree

  Serial.print(i); // Sends the current degree into the Serial Port
  Serial.print(","); // Sends addition character right next to the previous value needed later in the Processing IDE for indexing
  Serial.print(distance); // Sends the distance value into the Serial Port
  Serial.print("."); // Sends addition character right next to the previous value needed later in the Processing IDE for indexing
  }
  // Repeats the previous lines from 165 to 15 degrees
  for(int i=165;i>15;i--){
  myServo.write(i);
  delay(30);
  distance = calculateDistance();
  Serial.print(i);
  Serial.print(",");
  Serial.print(distance);
  Serial.print(".");
  }
}
// Function for calculating the distance measured by the Ultrasonic sensor
int calculateDistance(){

  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  // Sets the trigPin on HIGH state for 10 micro seconds
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
  duration = pulseIn(echoPin, HIGH); // Reads the echoPin, returns the sound wave travel time in microseconds
  distance= duration*0.034/2;
  return distance;
}
```