Assignment No.8

Title- Detecting the Object using ultrasonic radar.

*Theory-

1.Ultrasonic Sensor-

An ultrasonic sensor is a proximity sensor that is used to measure the distance of a target or object. It detects the object by transmitting ultrasonic waves and converts the reflected waves into an electrical signal.

These sound waves travel faster than the speed of the sound that humans can hear. It has two main components: the transmitter & receiver. The transmitter emits the sound using a piezoelectric crystal, and the receiver encounters the sound after it has travelled to and from the target.

2.Servo Motor-

The servo motor is a simple DC motor that can be controlled for specific angular rotation with the help of additional servomechanism. This motor will only rotate as much we want and then stop. The servo motor is a closed-loop mechanism that uses positional feedback to control the speed and position.

The servo motor is unlike a standard electric motor which starts and stops according to the power input. According to the signal, the servo motor will work.

Hardware List-

- Arduino uno
- Ultrasonic Sensor
- Jumper wires
- Servo Motor
- Breadboard

Software List-

- Arduino IDE
- The processing foundation processing

Procedure-

1. connect vcc of servomotor(red wire) and vcc of ultrasonic sensor to 5v of Arduino.
2. connect the gnd of ultrasonic sensor and servo(black wire) to ground of the Arduino.
3. connect trig and echo pin of ultrasonic sensor to 8 and 7 of arduino.
4. connect signal pin of servo to pin 9 of arduino.
5. connection with arduino nano for nano users.
6. connect vcc of servomotor(red wire) and vcc of ultrasonic sensor to 5v of arduino
7. connect the gnd of ultrasonic sensor and servo(black wire) to ground of the arduino
8. connect trig and echo pin of ultrasonic sensor to D10 and D11 of arduino nano.

9. connect signal pin of servo to pin D12 of arduino nano.

10. In the code just change pins to D10, D11, D12.

Working-

Radio waves or microwaves are radiated out from the radar into free space. Some of these waves are intercepted by reflecting objects. These intercepted radio waves hit the target and are reflected in many different directions. Some of these waves can be directed back toward the radar, where they are received and amplified.

If these waves are received again at their origin, then it means an object is in the propagation direction. The modern radar system is very advanced and used in highly diverse applications such as Air traffic control, Air-defence system, radar Astronomy, Antimissile System, Outer space Surveillance system, and many more.

Arduino Souce Code-

```
// Includes the Servo library
#include <Servo.h>.
// Defines Trig 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;
```

```arduino
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
  }
```
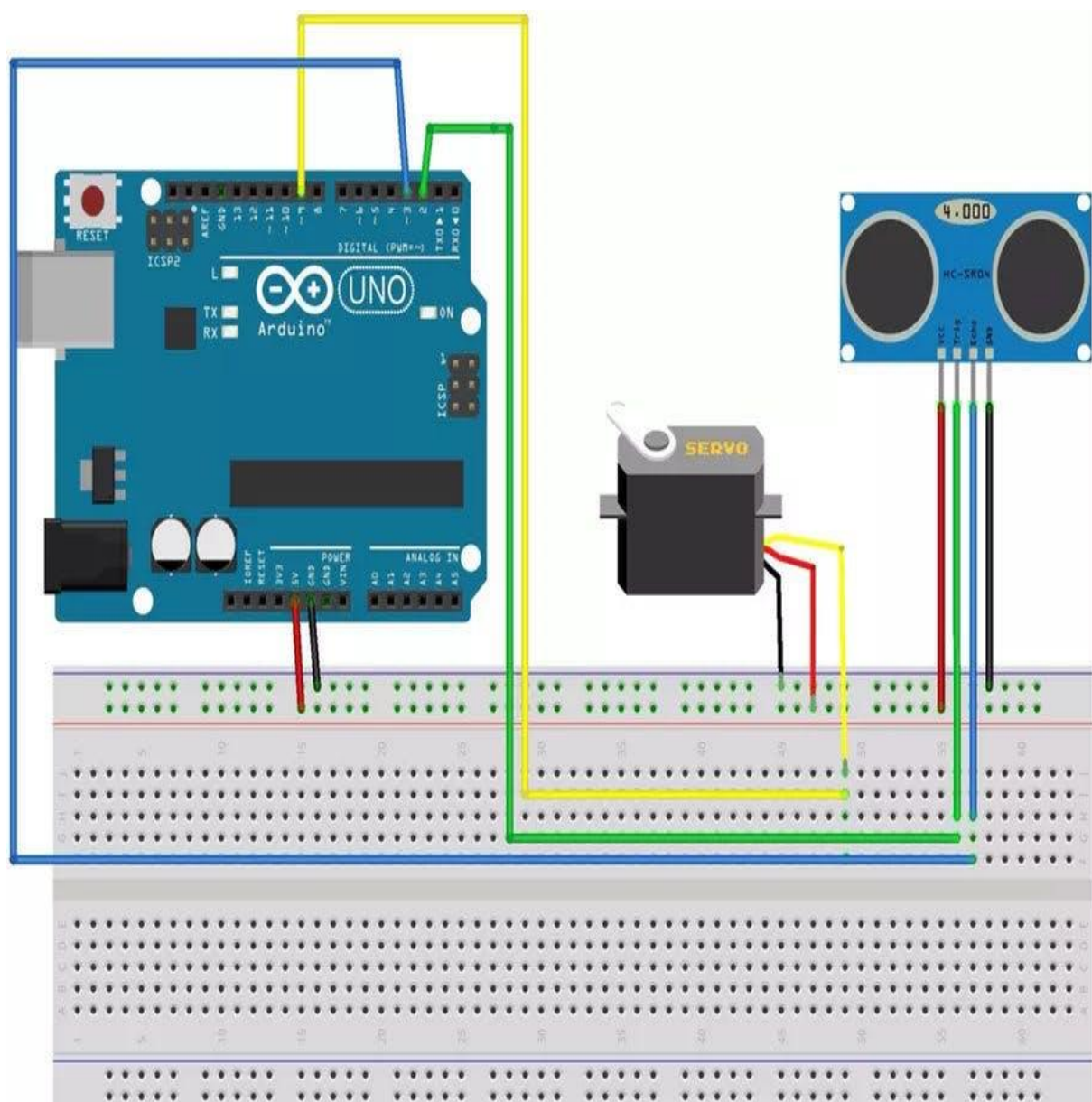
```
// Repeats the previous lines from 165 to 15 degrees
for(int i=165;i>15;i--){
mySies.write(i);
delay(30);
distance = calculateDistance();
Serial.print(i);
Serial.print(",");
Serial.print(distance);
Serial.print(".");
 }
}
// Function for calculating the distance measured by the
Ultrasonic sensor
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;
}
```

Ultrasonic Radar System