

# Chapter 15

## Using Ultrasonic Sonar Sensor with Arduino

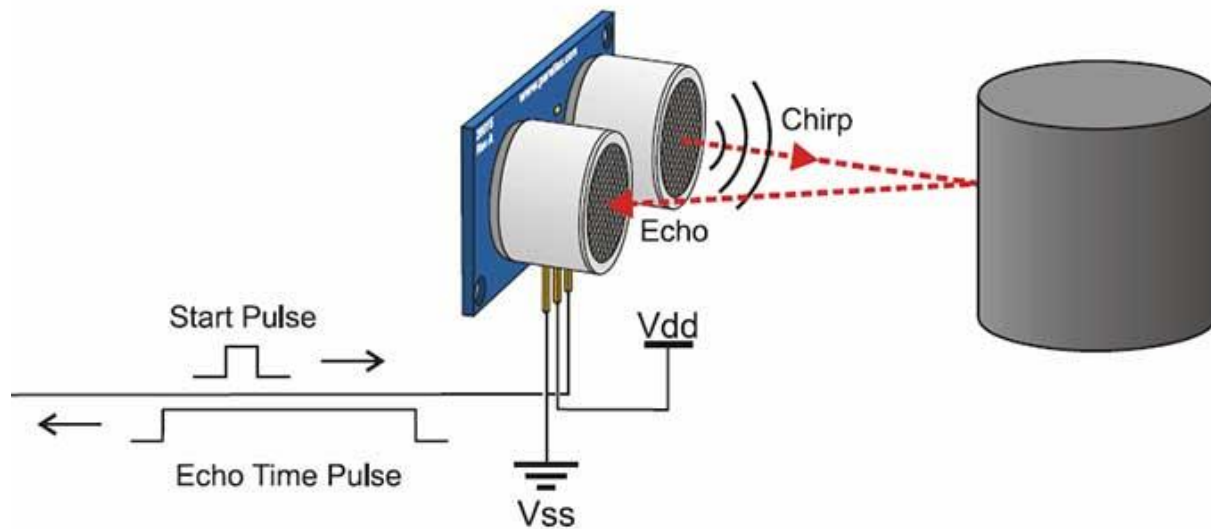
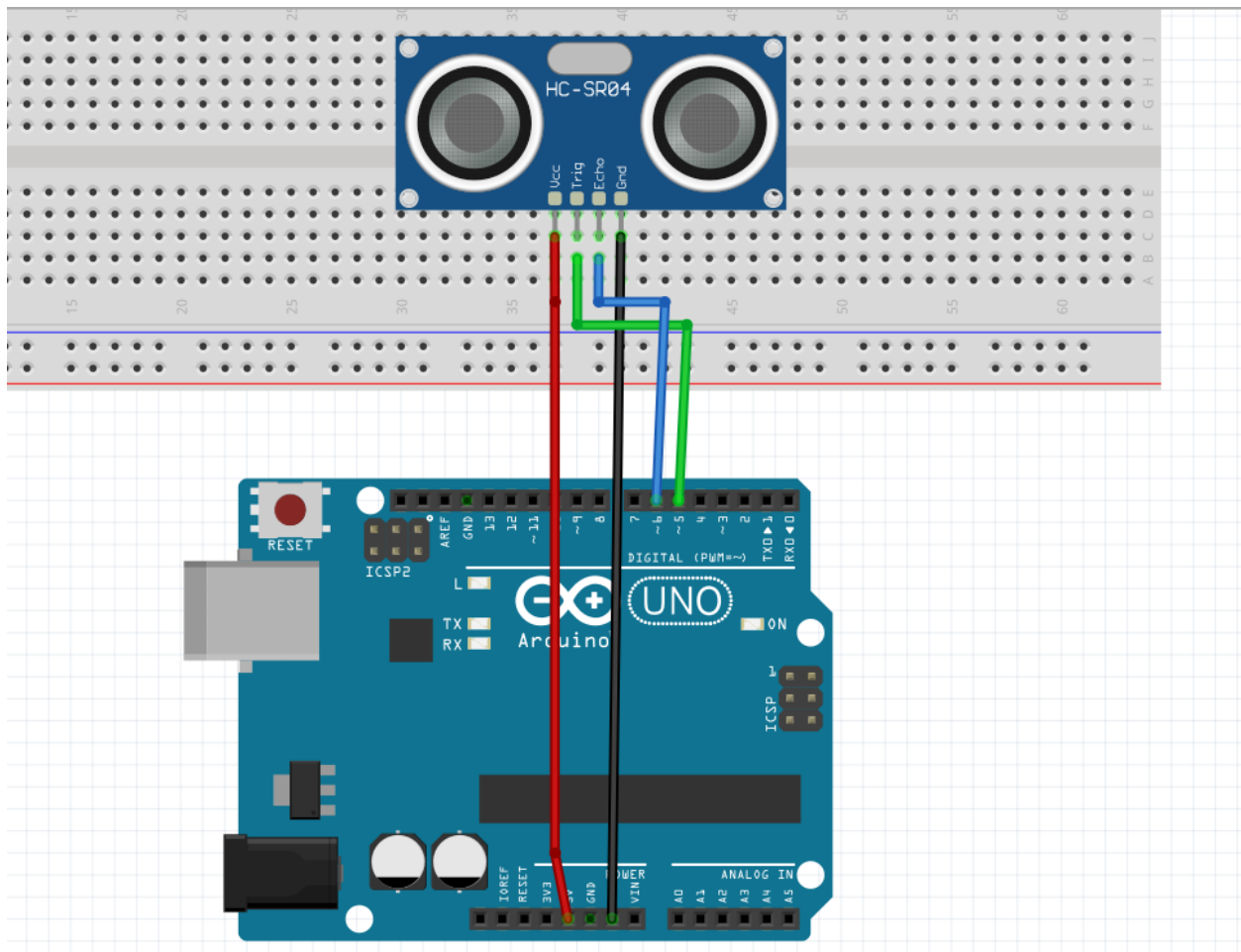


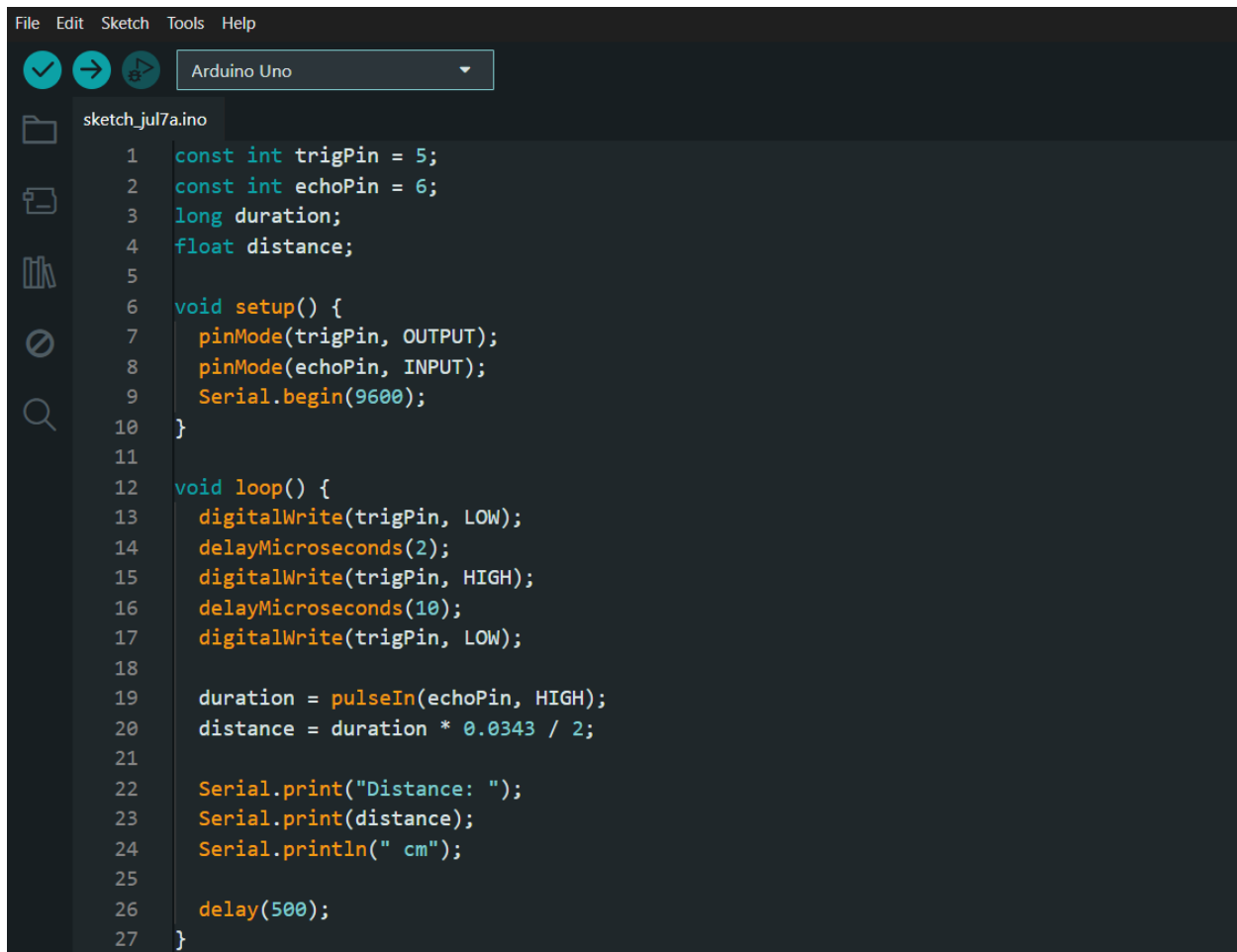
Fig 15.1: A ultrasonic distance sensor in work.

**A little theory:** The ultrasonic sonar uses ultrasonic sound to measure distance. It has a sound transmitter and a sound receiver. These two are connected with two pins on the board. Their trig pin and the echo pin. The sound transmitter sends a ultrasonic burst and the receiver calculates the times of sound travelling. Then from this time we can calculate the distance if we know the velocity of time.

Build this circuit below:



Now upload this code:



```
File Edit Sketch Tools Help
sketch_jul7a.ino
1  const int trigPin = 5;
2  const int echoPin = 6;
3  long duration;
4  float distance;
5
6  void setup() {
7    pinMode(trigPin, OUTPUT);
8    pinMode(echoPin, INPUT);
9    Serial.begin(9600);
10 }
11
12 void loop() {
13   digitalWrite(trigPin, LOW);
14   delayMicroseconds(2);
15   digitalWrite(trigPin, HIGH);
16   delayMicroseconds(10);
17   digitalWrite(trigPin, LOW);
18
19   duration = pulseIn(echoPin, HIGH);
20   distance = duration * 0.0343 / 2;
21
22   Serial.print("Distance: ");
23   Serial.print(distance);
24   Serial.println(" cm");
25
26   delay(500);
27 }
```

So far, we have only learned int and char data types. But see in this code there are some different data types used. Why we are using float, long these data types instead of int? Find it. Try writing this same code with int datatype.

In this code there is a built in function named **pulseIn()**. This **pulseIn()** function can calculate how many microseconds a pin has stayed in HIGH state. The echoPin stays in high state as long as the sound is travelling. This echoPin goes low as soon as the sound comes back after reflection. There is a problem with this pulseIn(). It makes the code wait until it completes the duration calculation. There are solutions for this problem but you have to learn on your own.

### Timing Diagram of ultrasonic distance sensor:

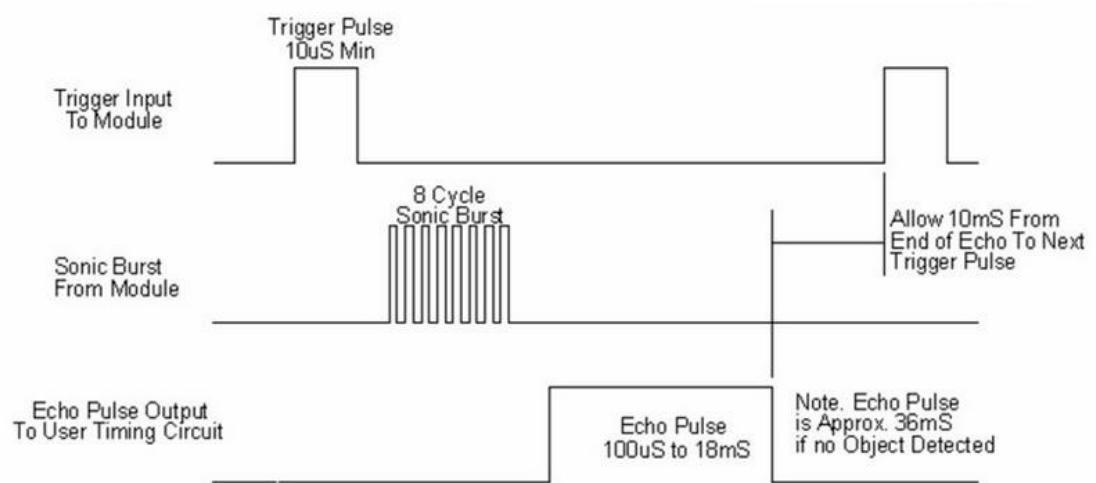


Figure-4: Timing Diagram

### **Assignment 07:**

1. Instead of writing code inside void loop write a user defined function that will do the calculation of measuring distance.
2. Find the reason why  $\text{distance} = \text{duration} * 0.343/2$  (cm)?
3. Make that same auto gate opening project but now using ultrasonic sensor instead of IR sensor. When someone arrives at the gate a servo will automatically open and close the gate.
4. Connect a LED and ultrasonic sensor to Arduino. Upload blinking program but the blink rate will depend upon how far the object is from the sonar. If the object is near sonar the LED will blink at very fast rate. If the object is far the LED will blink slowly.
5. List 20 sensor name, their task and price in Bangladesh that you can use with Arduino.