2019 Sec 4 Advanced Physics Arduino Lesson ( )

Use of Ultrasonic Sensor

Name: _____ ( ) Class: _____ Date: _____

Objectives: At the end of this lesson, you would be able to

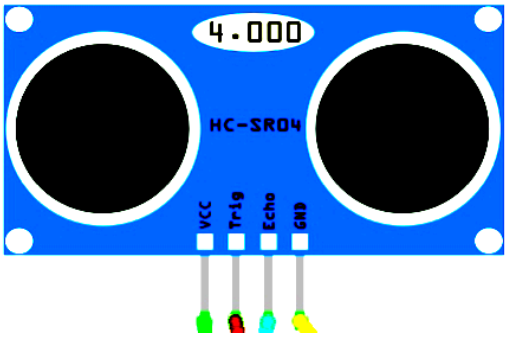
1. Apply basic circuitry to the Arduino microcontroller and other basic hardware
2. Write sketches for ultrasonic sensor circuits

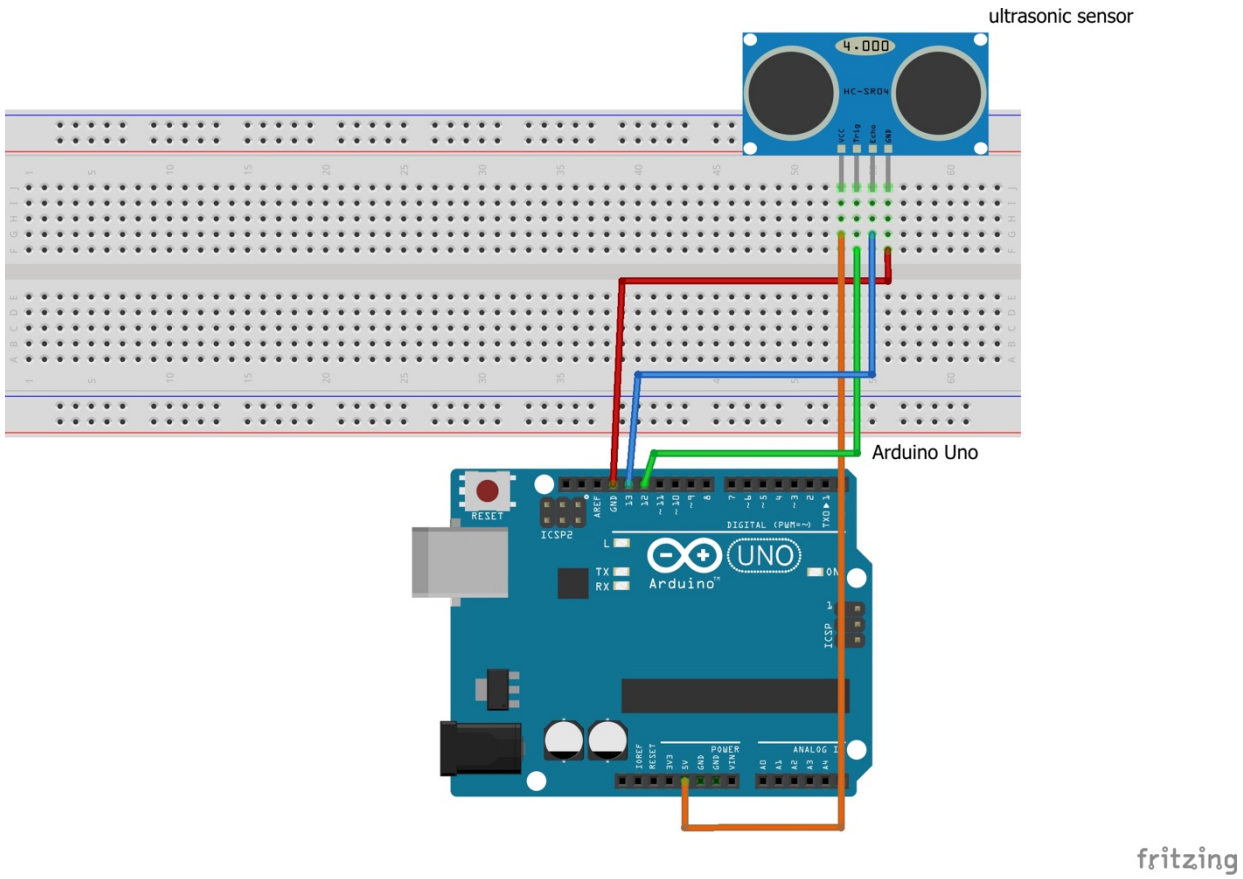
Apparatus:

- 01 Arduino UNO microcontroller
- 01 USB cable
- 03 LEDs (red, green, yellow)
- 01 breadboard
- 06 jumper wires
- 03 resistors (1 kΩ)

New item:

- 01 HC-SR-4 ultrasonic sensor





Above diagram created with fritzing.org software

Assignment: Ultrasonic sensor

Connect the circuit shown in the diagram on the previous page.

Write a sketch to set up a ultrasonic sensor which provides continuous readings of the distance detected using ultrasonic echoes.

1. Connect ultrasonic sensor to microprocessor:
- GND to GND
- VCC to 5 V
- Trig to digital pin 12
- Echo to digital pin 13

2. Write a sketch to include:
- Initialize digital pin 12 as the trigger pin (output) to activate a 40 kHz sound
- Initialize digital pin 13 as the echo pin (input) to detect the returning echo

The ultrasonic sensor produces 8 sonic bursts and detects the returning echo.

The time duration t is measured to calculate distance between the sensor and the obstacle.

Show the calculation used.

3. Verify and upload the sketch.

4. Click on the "**serial monitor**" icon (top right corner) to open another window.

- Select "9600 baud" (bottom right corner menu).
- View changes in the distance readings by moving the sensor towards/away from a flat hard surface.

Sample sketch

```
const int TRIG_PIN = 12;
const int ECHO_PIN = 13;

void setup() {
  // put your setup code here, to run once:
Serial.begin(9600);
pinMode(TRIG_PIN, OUTPUT);    //trigger pin activates the 40 kHz sound (very high
frequency)
pinMode(ECHO_PIN, INPUT);     //echo pin detects the returning echo
}

void loop() {
  // put your main code here, to run repeatedly:
long duration, distanceCm;
digitalWrite(TRIG_PIN, LOW);
delayMicroseconds(2);
digitalWrite(TRIG_PIN, HIGH);
delayMicroseconds(10);
digitalWrite(TRIG_PIN, LOW);
duration = pulseIn(ECHO_PIN,HIGH);   //duration of pulse from High to Low, pulseIn returns
                                      a value in microseconds

distanceCm = (duration*0.034)/2;          //formula to find a distance in cm
Serial.print(distanceCm);
Serial.print(" cm");
Serial.println();
delay(500);
}
```