Electronics Lesson 6

Overview

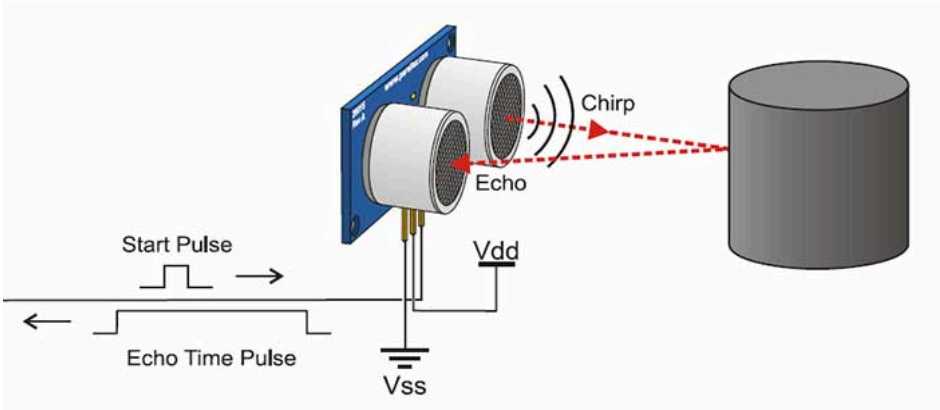
In this lesson students will learn how create a motion detector.

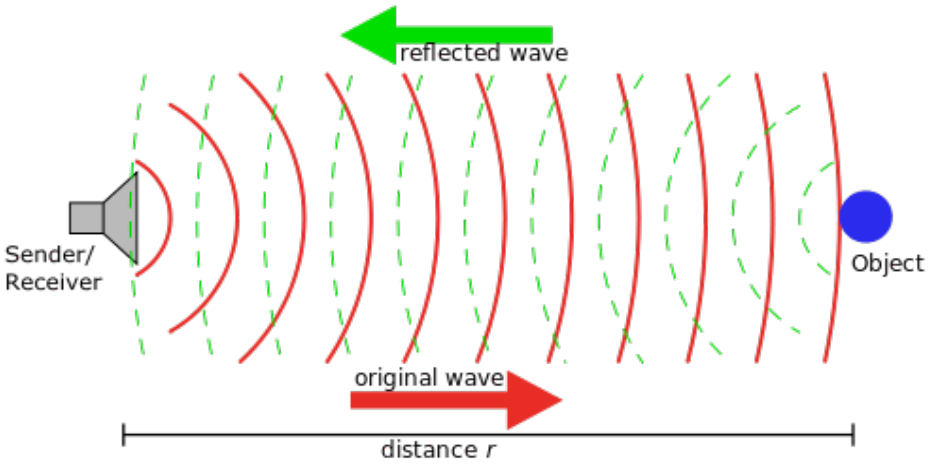
Plan

1. Ultrasonic Sensor
2. Activity: Motion Sensor
3. Free Play

Big Concept #1: Ultrasonic Sensor

Instructor: The Ultrasonic Sensor sends out a high-frequency sound pulse and then times how long it takes for the echo of the sound to reflect back. The sensor has 2 openings on its front. One opening transmits ultrasonic waves, (like a tiny speaker), the other receives them, (like a tiny microphone).

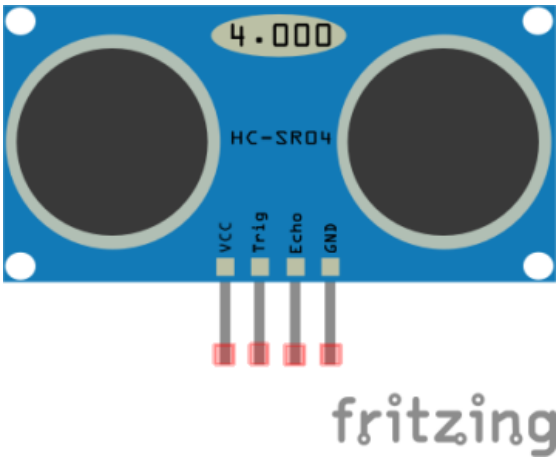




To students: Can anyone give me examples where you can use this ultrasonic sensor?

Expected Answer: Home security systems, detecting a baby in a mother's stomach…

Instructor: Show class ultrasonic sensor. There are 4 pins. First pin is to receive electricity. Second pin is to send the ultrasonic wave. Third pin is to listen for the ultrasonic wave. Fourth pin is for ground.



Activity 1: Motion Detector

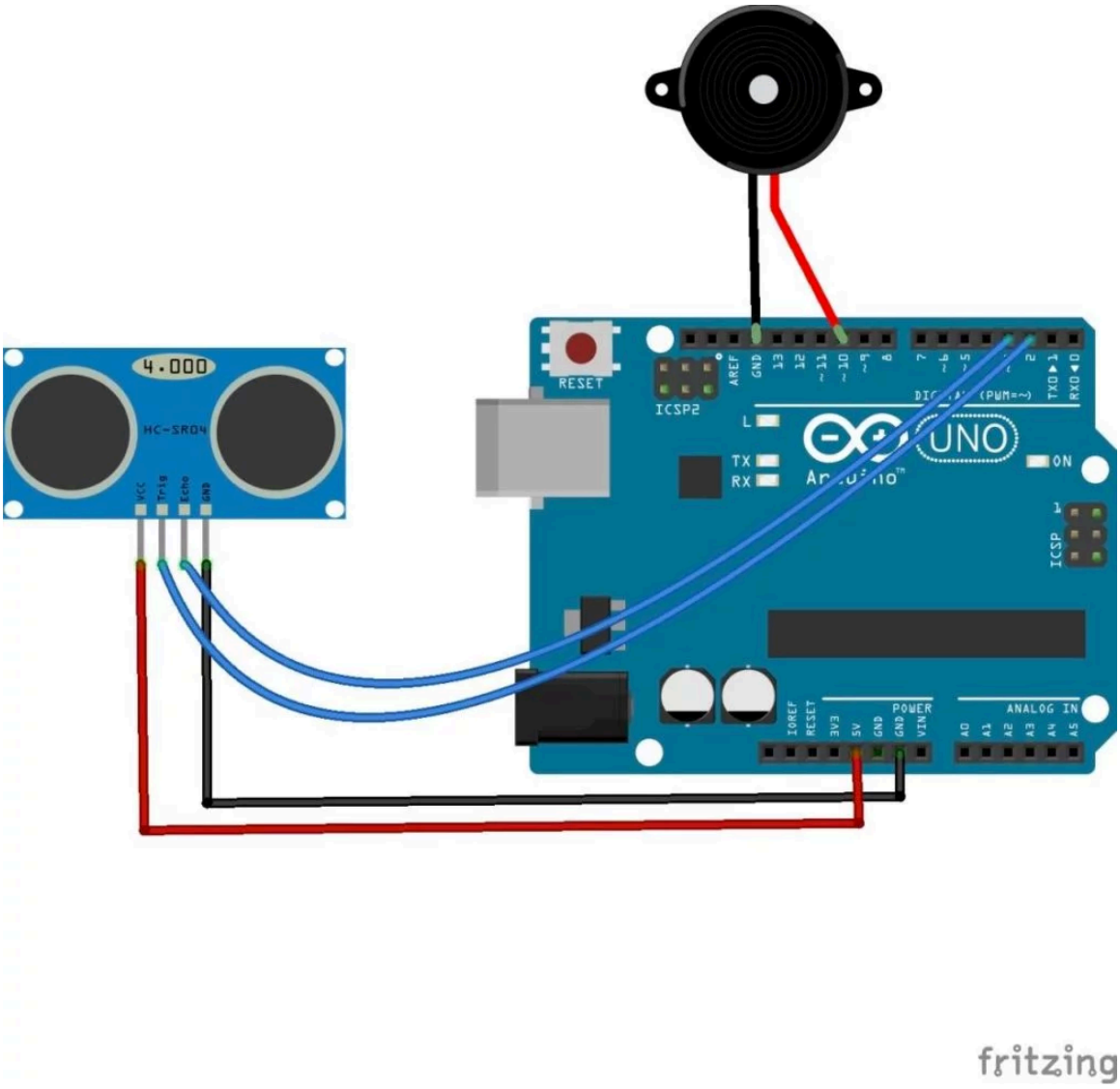
Setup computers. Distribute worksheets and download code, if no worksheets write the code on the board.

1. Have students fill in the blank

Expected Answer:

Layout:

Note: buzzer can be switched out with a red led.



Code:

```
int trigger_pin = 2;

int echo_pin = 3;

int red_led = 9;

int time;

int distance;

void setup ( ) {
  // Initialize serial communication:
  Serial.begin (9600);

  // This pin will send an ultrasonic wave
  pinMode (trigger_pin, OUTPUT);

  // This pin will listen for the ultrasonic wave
  pinMode (echo_pin, INPUT);

  // Set this pin to output electricity
  pinMode (red_led, OUTPUT);
}

void loop ( ) {
  // Send ultrasonic wave for 10 microseconds
  digitalWrite (trigger_pin, HIGH);

  delayMicroseconds (10);

  digitalWrite (trigger_pin, LOW);

  // Returns the length of time that it took for the echo pin to go from LOW to HIGH
  time = pulseIn (echo_pin, HIGH);

  // Convert the time to distancce
  distance = (time * 0.034) / 2;

  if (distance <= 10)  {
    //Intruder!!!
    digitalWrite (red_led, HIGH);

    delay (500);
  } else {
    digitalWrite (red_led, LOW);

    delay (500);
  }
}
```

Big Concept #2: Free Play

Instructor: Use your imagination and what you learned from the last six classes to build something!