Project 2

Sensors

Objectives:

- Understand how to use the Arduino IDE
- Understand basic Arduino commands and code structure
- Understand concepts related to inputs and outputs using the IR and Ultrasonic sensors to turn on and off LEDs
- Understand simple coding logic and design

Get into groups of 3 or 4 and complete the following exercises.

Group Members

_____

_____

_____

_____

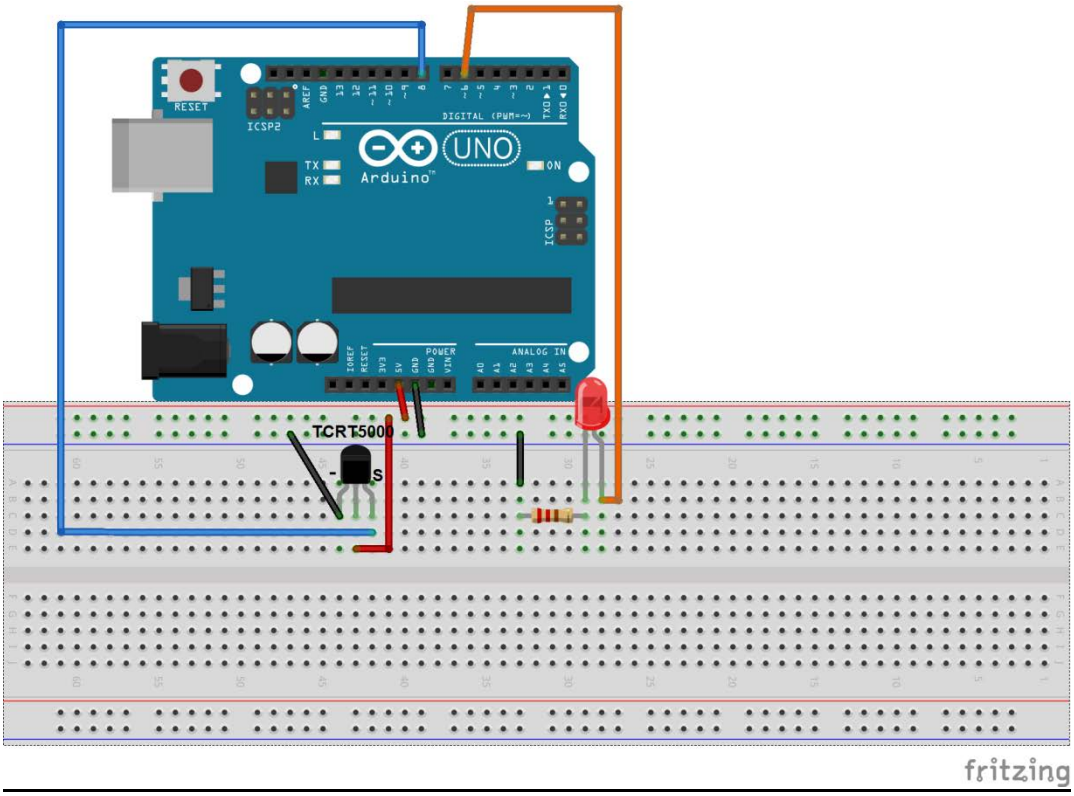
_____

Line Detection

This exercise will demonstrate how to set up an IR sensor and turn an LED on when the sensor is over the color white.

Supplies Needed:

- 1x Arduino
- 1x Breadboard
- 7x jumper wires
- 1x IR sensor
- 1x 1k resistor
- 1x LED



```
/*  TCRT5000 infrared/optical tracking sensor project
 *  project tutorial http://osoyoo.com/?p=474
 */

int Led = 6 ;// connect LED to arduino D6
```

```
int input_pin = 8; // connect TCRT5000 module S pin to arduino D8
int val ;// define numeric variables val
void setup ()
{
pinMode (Led, OUTPUT) ;// define LED as output interface
pinMode (input_pin, INPUT) ;// define Tracking sensor output interface
}
void loop ()
{
val = digitalRead (input_pin) ;
if (val == HIGH) // When the Tracking sensor detects a signal, LED flashes
{
digitalWrite (Led, HIGH);
}
else
{
digitalWrite (Led, LOW);
}
}
```

Changing It Up

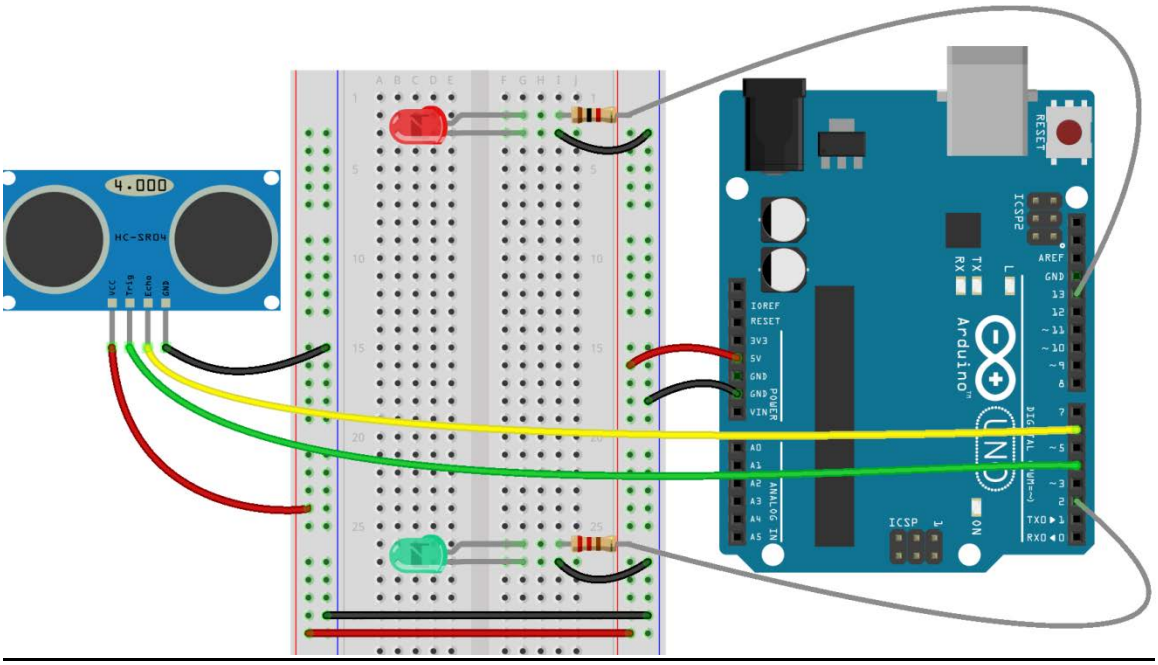
Now that you know how to manipulate the LED with the IR sensor, with your group, make the LED turn off when the sensor is over the color white. Could this code be written differently? On a separate piece of paper, write down what you would change about the code.

Measuring Distance

This exercise will demonstrate how to set up an IR sensor and turn an LED on when the sensor is over the color white.

Supplies Needed:

- 1x Arduino
- 1x Breadboard
- 7x jumper wires
- 1x Ultrasonic sensor
- 2x 1k resistor
- 2x LED



```
/*
 HC-SR04 Ping distance sensor]
 VCC to arduino 5v GND to arduino GND
 Echo to Arduino pin 13 Trig to Arduino pin 12
 Red POS to Arduino pin 11
 Green POS to Arduino pin 10
 560 ohm resistor to both LED NEG and GRD power rail
 More info at: http://goo.gl/kJ8Gl
 Original code improvements to the Ping sketch sourced from Trollmaker.com
 Some code and wiring inspired by http://en.wikiversity.org/wiki/User:Dstaub/robotcar
 */
#define trigPin 13
#define echoPin 12
#define led 11
#define led2 10
void setup() {
  Serial.begin (9600);
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);
  pinMode(led, OUTPUT);
  pinMode(led2, OUTPUT);
}

void loop() {
  long duration, distance;
  digitalWrite(trigPin, LOW);  // Added this line
  delayMicroseconds(2); // Added this line
  digitalWrite(trigPin, HIGH);
```

```
//  delayMicroseconds(1000); - Removed this line
  delayMicroseconds(10); // Added this line
  digitalWrite(trigPin, LOW);
  duration = pulseIn(echoPin, HIGH);
  distance = (duration/2) / 29.1;
  if (distance < 4) {  // This is where the LED On/Off happens
    digitalWrite(led,HIGH); // When the Red condition is met, the Green LED should turn off
  digitalWrite(led2,LOW);
}
  else {
    digitalWrite(led,LOW);
    digitalWrite(led2,HIGH);
  }
  if (distance >= 200 || distance <= 0){
    Serial.println("Out of range");
  }
  else {
    Serial.print(distance);
    Serial.println(" cm");
  }
  delay(500);
}
```

Changing It Up

Change the code so that one LED turns on when something is close to the sensor, but turns off 5 inches away from the sensor, and the second LED turn on only when something is 7 inches or further from the sensor. On a separate piece of paper record your results and findings

Describe some successes and challenges working on this exercise. What worked? What did not work? Are there any suggestions you have for this exercise to make it better?