4. IR Sensor:

An **infrared sensor** is an electronic device, that emits in order to sense some aspects of the surroundings. An **IR sensor** can measure the heat of an object as well as detects the motion or object itself.
(700 nm to 1 mm wavelength)

WHAT IT HAS:

IR Sensor or Infrared Sensor has two main parts. IR Transmitter and IR Receiver. The work of IR transmitter or Infrared transmitter is to transmit the infrared waves whereas the work of IR receiver is to receive these infrared waves. IR receiver constantly sends digital data in the form of 0 or 1 to Vout pin of the sensor.

i) **IR Transmitter (IR LED):**
An IR LED (infrared light emitting diode) is a solid state lighting (SSL) device that emits light in the infrared range of the electromagnetic radiation spectrum.

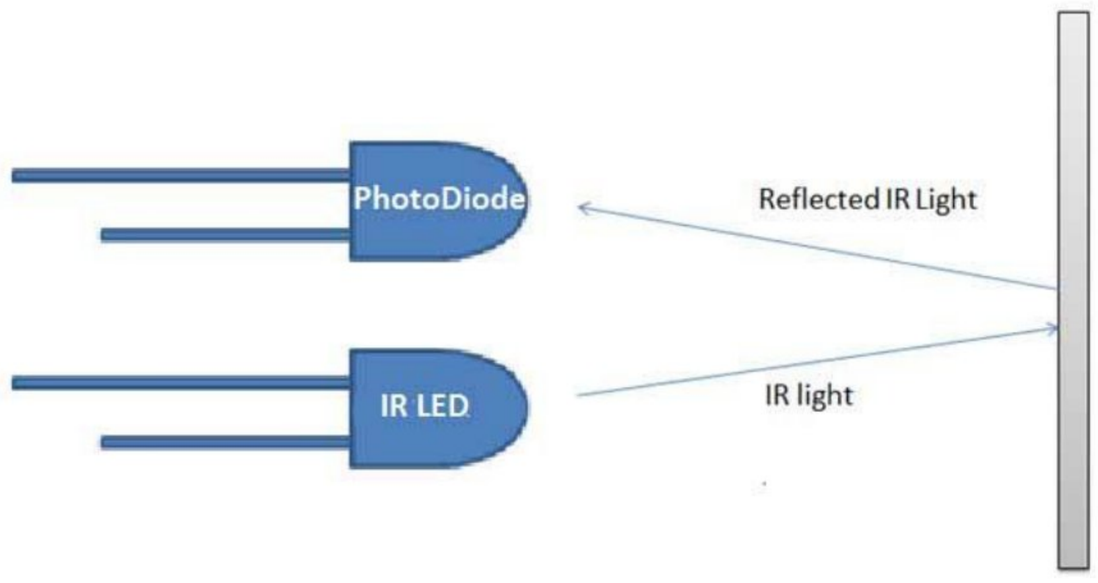
ii) IR Receiver (IR Photodiode):

The IR photodiode is sensitive to the IR light emitted by an IR LED. The photo-diode's resistance and output voltage change in proportion to the IR light received.

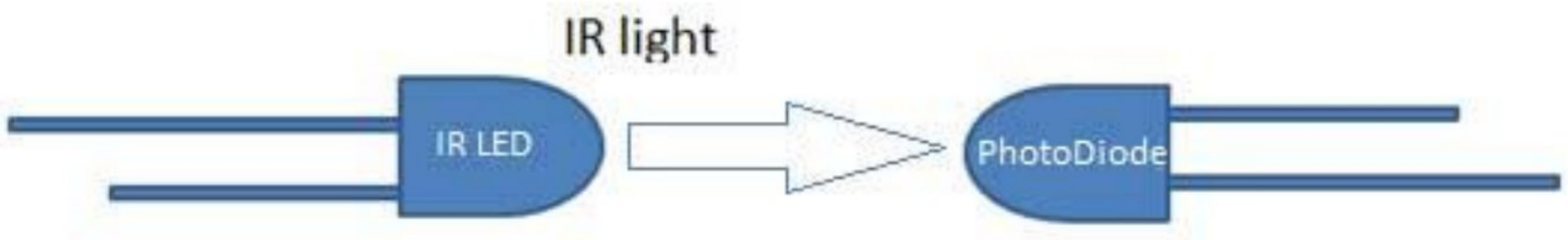
This is the underlying working principle of the IR sensor. Both are collectively known as a photo-coupler or an opto-coupler.

HOW IT WORKS:

Indirect Incidence:
In indirect incidence, both the diodes are placed side by side, if there is an object in front of IR sensors, the transmitted infrared waves from IR transmitter reflects from that object and is received by the IR receiver. IR sensor gives 0 in this condition. Whereas, if there is no object in front of the IR sensor, the transmitted infrared waves from IR transmitter is not received by the IR receiver. And IR sensor gives 1 in this condition.

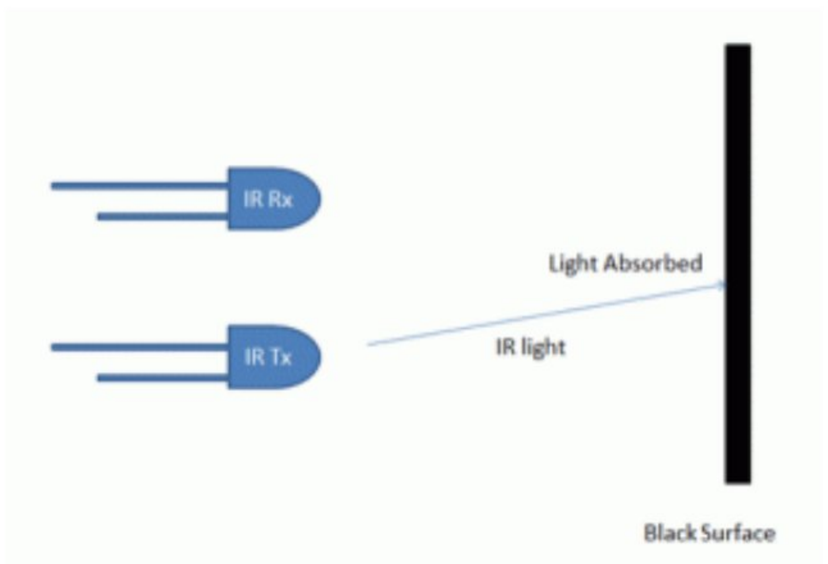


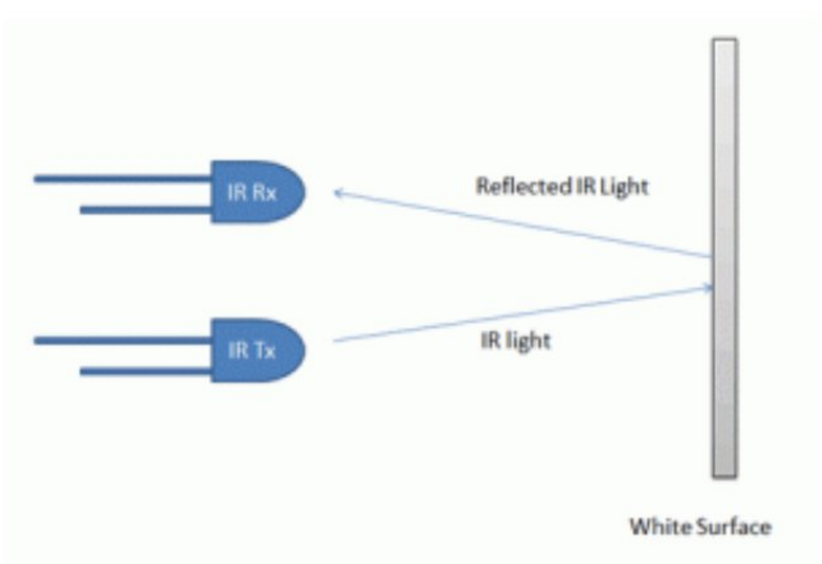
Direct Incidence:
In direct incidence, the IR LED is placed in front of a photodiode with no obstacle in between. This creates an invisible line of IR radiation between the IR LED and the photodiode. Now, if an opaque object is placed obstructing this line, the radiation will not reach the photodiode and will get either reflected or absorbed by the obstructing object. This mechanism is used in object counters and burglar alarms.



FOR WHITE AND BLACK BACKGROUND:

IR Sensors can also be used to distinguish between **white** (reflective) and **black** (non-reflective) object.
If the object is reflective, (White or some other light color), then most of the radiation will get reflected by it, and will get incident on the photodiode.
If the object is non-reflective, (Black or some other dark color), then most of the radiation will get absorbed by it, and will not become incident on the photodiode.

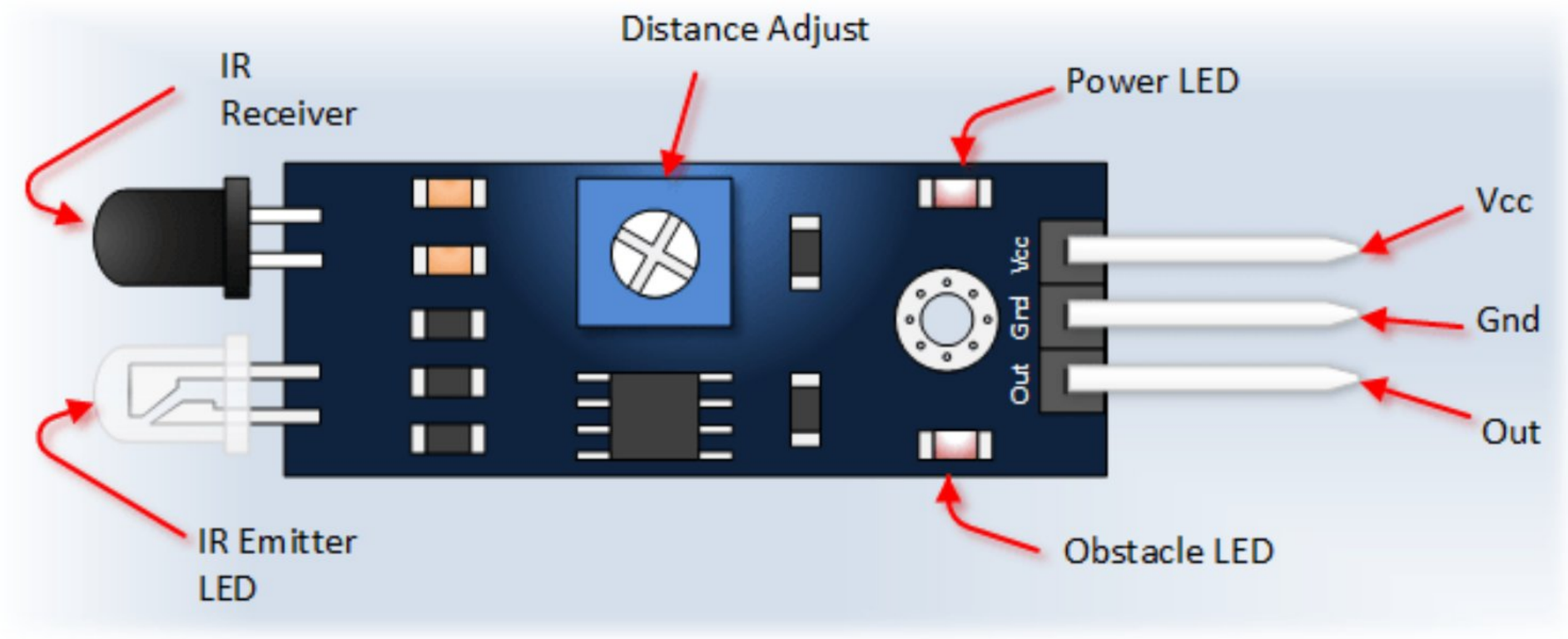




APPLICATION:

- Proximity Sensor/Detector
- Line Following Robot
- Item Counter
- Burglar Alarm
- IR Music Transmitter and Receiver

IR SENSOR MODULE PINOUT:

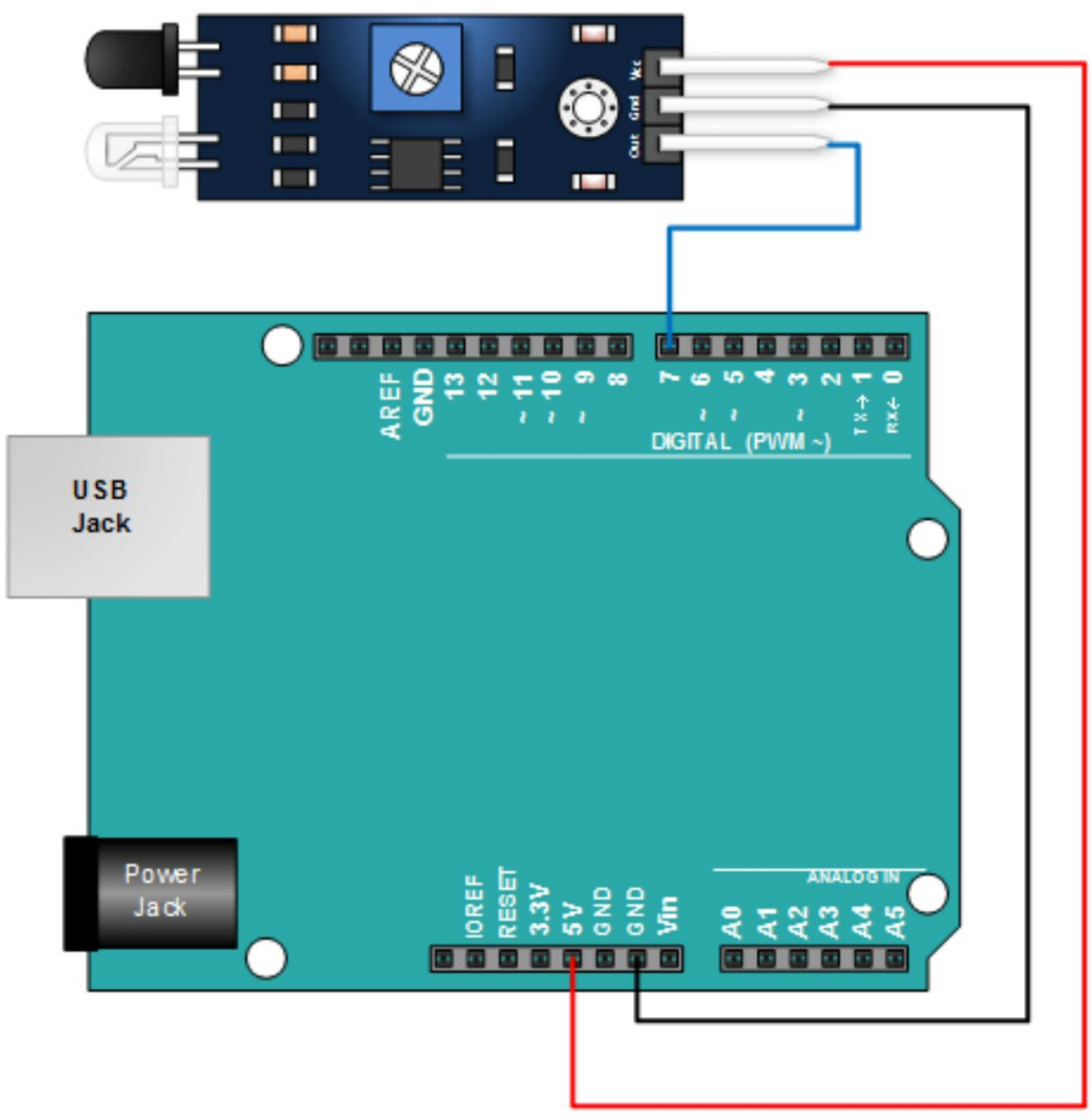


5.Obstacle Detector by IR Sensor interfaced with Arduino

Components:

- Arduino Uno
- USB cable
- Breadboard
- IR Sensor Module
- Jumper wires

Circuit Diagram:



Code:

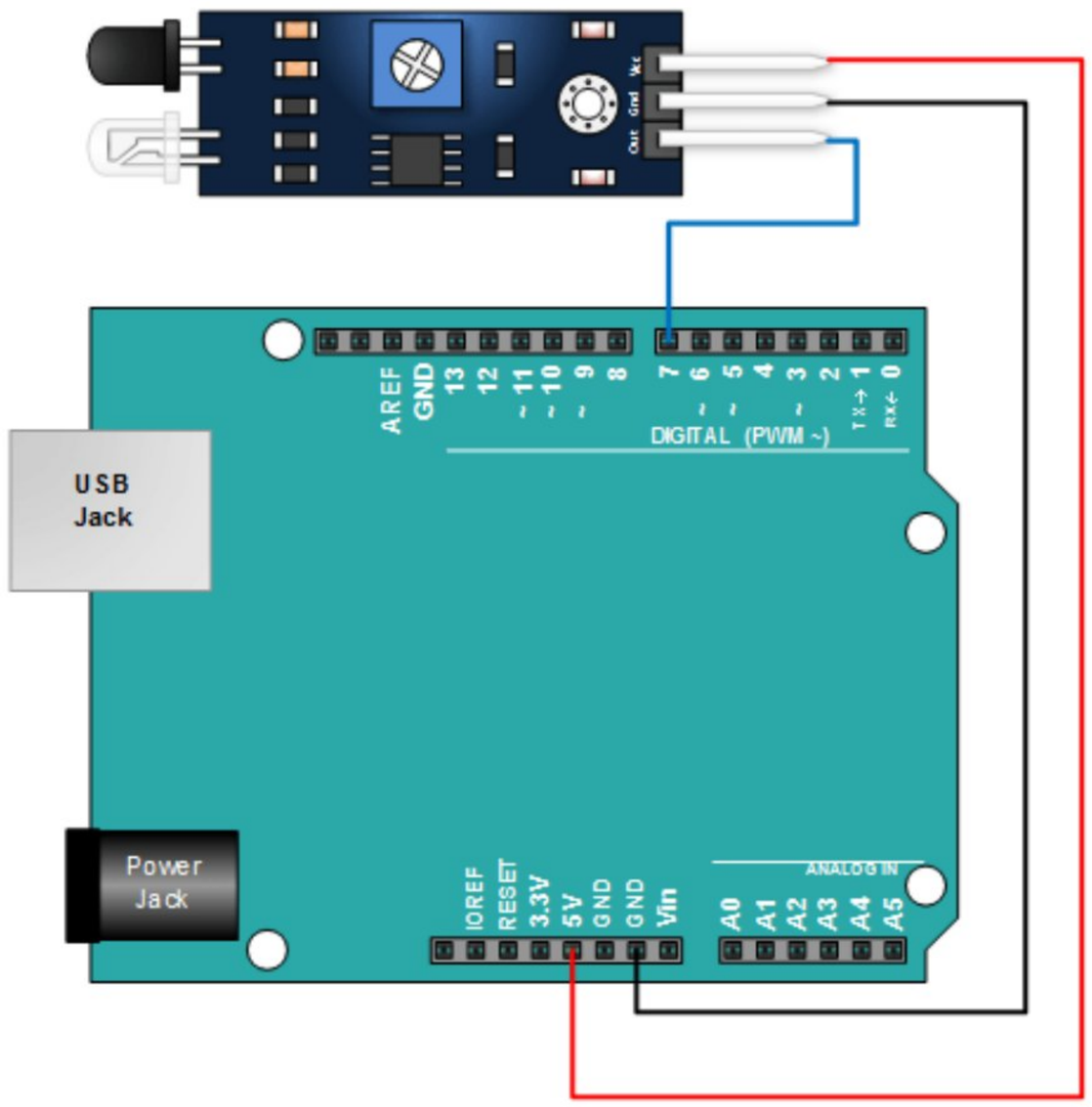
```
int LED = 13; // Use the onboard Uno LED
int isObstaclePin = 7;  // This is our input pin
int isObstacle = HIGH;  // HIGH MEANS NO OBSTACLE

void setup() {
  pinMode(LED, OUTPUT);
  pinMode(isObstaclePin, INPUT);
  Serial.begin(9600);
}

void loop() {
  isObstacle = digitalRead(isObstaclePin);
  if (isObstacle == LOW)
  {
    Serial.println("OBSTACLE!!, OBSTACLE!!");
    digitalWrite(LED, HIGH);
  }
  else
  {
    Serial.println("clear");
    digitalWrite(LED, LOW);
  }
  delay(200);
}
```

6.Black Line Detection by IR Sensor and Arduino

Components:

- Arduino Uno
- USB cable
- Breadboard
- IR Sensor Module
- Jumper wires

Circuit Diagram:



Code:

```
void setup() {
// put your setup code here, to run once:
pinMode(13,INPUT);
Serial.begin(9600);
}
void loop() {
// put your main code here, to run repeatedly:
int value=digitalRead(13);
if(value == HIGH){
Serial.println("black line.");
}
else if(value == LOW){
Serial.println("White or No Black line.");
}
}
```