

# Internet of Things Laboratory

## Assignment 9

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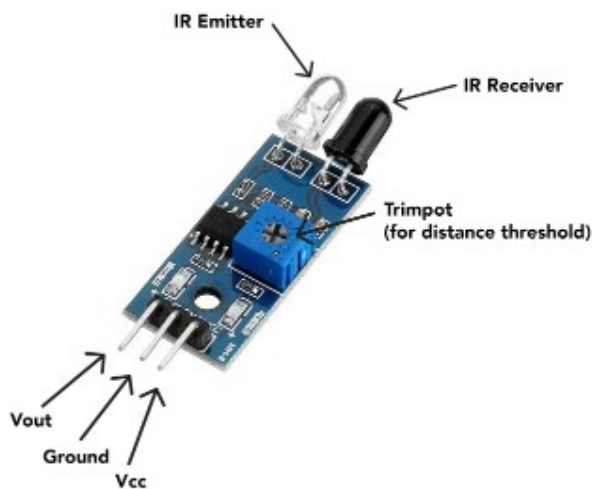
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**Problem Statement:** Understanding and connectivity of Raspberry-Pi circuit with IR sensor. Write an application to detect obstacles and notify user using LED's.

### 1. How to interface Rpi with IR sensor?

The IR (infrared) sensor is mostly used to detect the motion of the objects in the surroundings as well as the detection of the presence of the objects.

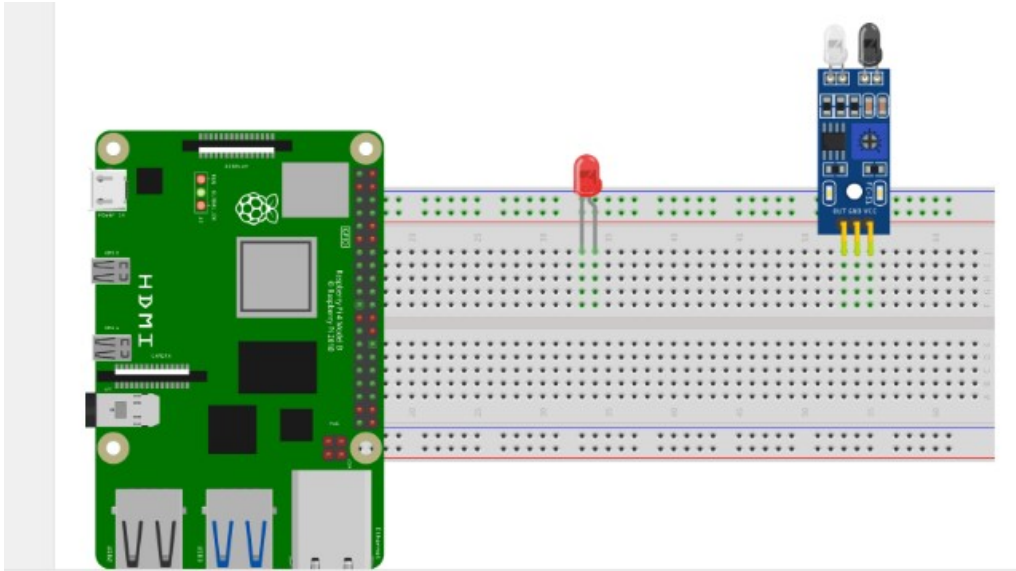


### IR sensor

The IR sensor is an electronic module which contains the transmitter and the receiver, the transmitter emits the infrared radiation which hits the obstacles and is reflected back by that obstacle which is detected by the receiver of the module and it changes the output to High.

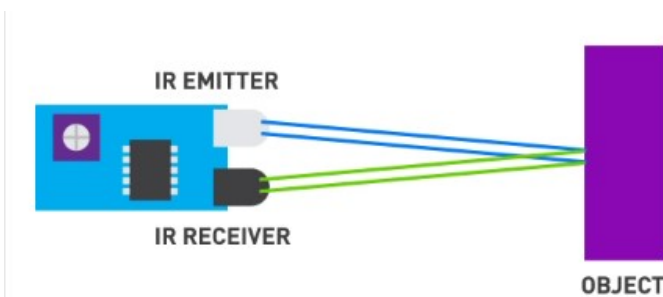
This sensor has three terminals, one is Vcc connected to the 5 volts, the other is the Ground which is connected to the ground terminal, and the last one is of output, through which we can find out the output of the IR sensor.

We can interface the IR sensor with the Raspberry Pi by the following method:  
For making the circuit following the below circuit diagram, first we will place the Raspberry Pi 4, IR sensor, and a LED on the breadboard:



- Connect the cathode of the LED with the ground of Raspberry Pi 4
- Connect the anode of LED with GPIO24(BCM 18)
- Connect the Vcc of the IR sensor with 5V of Raspberry Pi 4.
- Connect the ground of the IR sensor with the ground of Raspberry Pi 4.
- Connect the output of the IR sensor with the GPIO 23(BCM 16)

## 2. How do IR sensors detect objects?



The IR sensor is an electronic module which contains the transmitter and the receiver. The transmitter emits the infrared radiation which hits the obstacles and is reflected back by that obstacle which is detected by the receiver of the module and it changes the output to High.

The transmitter/emitter is simply an IR LED (Light Emitting Diode) and the receiver/detector is simply an IR photodiode. Photodiode is sensitive to IR light

of the same wavelength which is emitted by the IR LED. When IR light falls on the photodiode, the resistances and the output voltages will change in proportion to the magnitude of the IR light received.

### **3. Write advantages of IR sensors.**

The advantages of Infrared Sensor are-

- Their low power requirements make them suitable for most electronic devices such as laptops, telephones, PDAs.
- They are capable of detecting motion in presence/ absence of light almost with same reliability.
- They do not require contact with object to for detection.
- There is no leakage of data due to beam directionality IR radiation.
- They are not affected by corrosion or oxidation.
- They have very strong noise immunity.

### **4. Differentiate IR with PIR sensor. Are both same or not? Justify.**

- An IR sensor(or active IR sensor) is an Infrared Sensor, which is a sensor that uses infrared technology, chips and a transmitter to determine whether the light that the transmitter is emitting is from an object or a person. This is also good for security purposes.  
PIR stands for Passive Infrared Sensor is a sensor that uses infrared technology to remember the infrared image of the surrounding area and notices any changes, which would be caused by motion.
- The IR sensors detect whether the light from the transmitter is emitted by an object or a person. Whereas, the PIR sensors detect changes in the levels of energy around the area.
- If the PIR sensor is installed towards the changing environment, it may let off a false alarm due to the change in the way the air flows; however, IR sensors must be installed facing the motion.
- IR sensors are usually only installed on the outside of properties, whereas PIR sensors are usually installed inside.
- PIR sensors don't actually emit the infrared; objects give the sensor infrared rays. This differs from IR sensors, which do actually infrared.
- IR sensors are typically used to detect proximity whereas PIR sensors are typically used to detect motion.

## **Python code for interfacing IR sensor with Raspberry Pi:**

```
import RPi.GPIO as GPIO
#importing the library of RPi.GPIO

import time
#importing the library of time

sensor = 16
#declaring BCM pin 16 which is GPIO 23 of Raspberry Pi

led = 18
#declaring BCM pin 18 which is GPIO 24 of Raspberry Pi

GPIO.setmode(GPIO.BOARD)
#declaring the BCM mode of pins

GPIO.setup(sensor,GPIO.IN)
#set the behaviour of sensor as input

GPIO.setup(led,GPIO.OUT)
#set the behaviour of led as output

try:
    while True: #initiated a infinite while loop

        if GPIO.input(sensor):
            GPIO.output(led, False)
            #led turned on
            while GPIO.input(sensor):
                #checking input on sensor again
                time.sleep(0.2)
        else:
            GPIO.output(led,True)
            #led turned off if there is no input on sensor

except KeyboardInterrupt:
    #if any key is pressed on keyboard terminate the program

GPIO.cleanup()
#cleanup the GPIO pins for any other program use
```