



# **SNS COLLEGE OF TECHNOLOGY**

**Coimbatore-35  
An Autonomous Institution**



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## **DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

**19EET304/ IOT FOR ELECTRICAL SCIENCES**  
III YEAR VI SEM

**UNIT 4 – ACTIVATION DEVICES**

**TOPIC 7 – IR control**

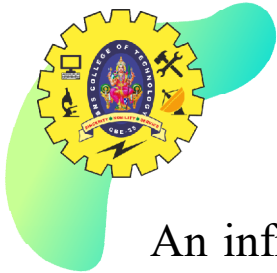


**Consider an example,**



**Explain the process**



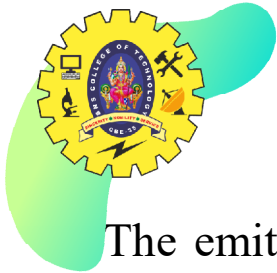


## What is an IR Sensor

An infrared (IR) sensor a proximity sensor, or a ‘nearness’ sensor senses whether there is an object near it or not. The IR stands for Infrared sensor. Infrared is the light out of our visible spectrum.

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. These types of sensors measure only infrared radiation, rather than emitting it that is called a passive IR sensor. Usually, in the infrared spectrum, all the objects radiate some form of thermal radiation.





## IR Sensor

The emitter is simply an IR LED ([Light Emitting Diode](#)) and the detector is simply an IR photodiode . Photodiode is sensitive to IR light of the same wavelength which is emitted by the IR LED.

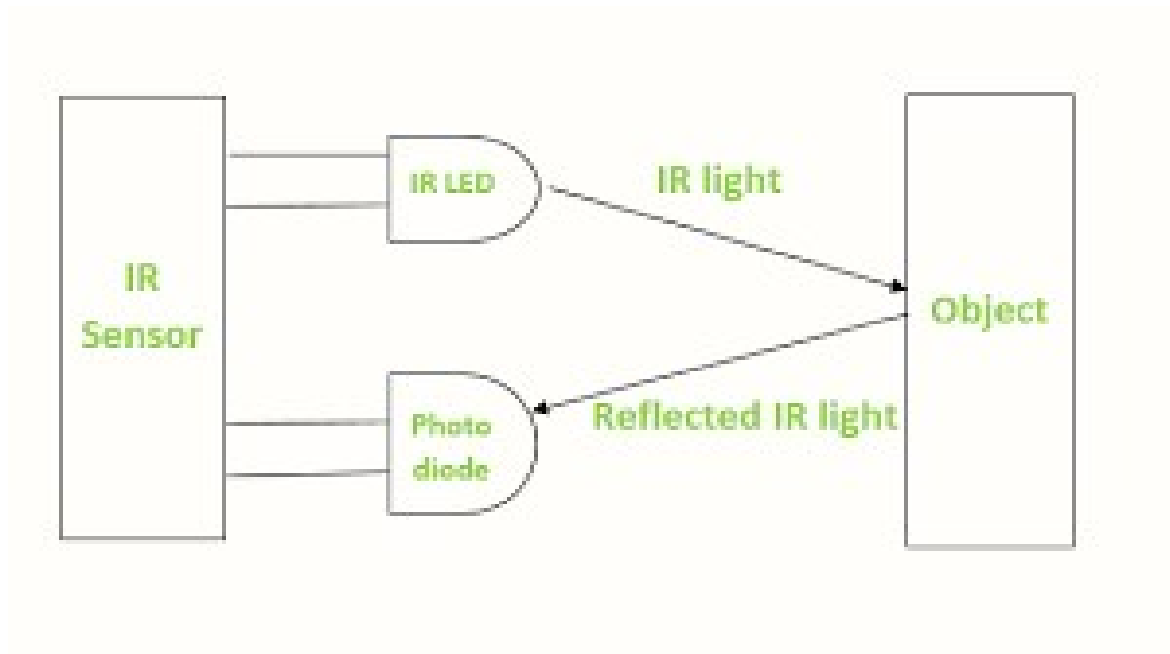
When IR light falls on the photodiode, the resistances and the output voltages will change in proportion to the magnitude of the IR light received.

There are five basic elements used in a typical infrared detection system: an infrared source, a transmission medium, optical component, infrared detectors or receivers and signal processing. Infrared lasers and Infrared LED's of specific wavelength used as infrared sources.





# IR Sensor





## A Digression on Infrared Radiations



Infrared radiation works on the lower end of the electromagnetic spectrum and is therefore invisible to the human eye. The infrared section of the electromagnetic spectrum is found between the visible waves and the microwaves. The infrared wavelength is between  $0.75$  and  $1000\mu\text{m}$  and is separated into three regions:

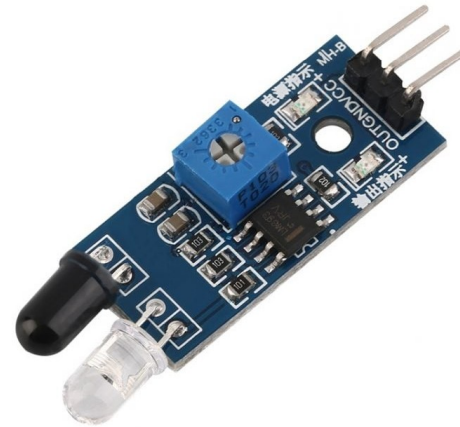
- Near-infrared - from  $0.75$  to  $3\mu\text{m}$
- Mid-infrared - from  $3$  to  $6\mu\text{m}$
- Far-infrared - higher than  $6\mu\text{m}$



## Types of IR Sensor

There are two types of IR sensors are available and they are,

- Active Infrared Sensor
- Passive Infrared Sensor



## Active Infrared Sensor


Active infrared sensors consist of two elements: infrared source and infrared detector.

Infrared sources include the LED or infrared laser diode. Infrared detectors include photodiodes or phototransistors.

The energy emitted by the infrared source is reflected by an object and falls on the infrared detector.



## Passive Infrared Sensor

A decorative graphic on the left side of the slide, consisting of a yellow gear with a blue center containing a portrait, surrounded by various icons like a lightbulb, a book, and a gear. The gear is set against a green and blue abstract background.


Passive infrared sensors are basically Infrared detectors. Passive infrared sensors do not use any infrared source and detector. They are of two types: quantum and thermal.

Thermal infrared sensors use infrared energy as the source of heat. Thermocouples, pyroelectric detectors and bolometers are the common types of thermal infrared detectors.

Quantum type infrared sensors offer higher detection performance. It is faster than thermal type infrared detectors. The photo sensitivity of quantum type detectors is wavelength dependent.




## IR Sensor Working Principle



There are different types of infrared transmitters depending on their wavelengths, output power and response time. An IR sensor consists of an IR LED and an IR Photodiode, together they are called as PhotoCoupler or OptoCoupler.

### IR Transmitter or IR LED

Infrared Transmitter is a light emitting diode (LED) which emits infrared radiations called as IR LED's. Even though an IR LED looks like a normal LED, the radiation emitted by it is invisible to the human eye.



## IR Receiver or Photodiode

Infrared receivers or infrared sensors detect the radiation from an IR transmitter. IR receivers come in the form of photodiodes and phototransistors. Infrared Photodiodes are different from normal photo diodes as they detect only infrared radiation. Below image shows the picture of an IR receiver or a photodiode



## IR Receiver or Photodiode



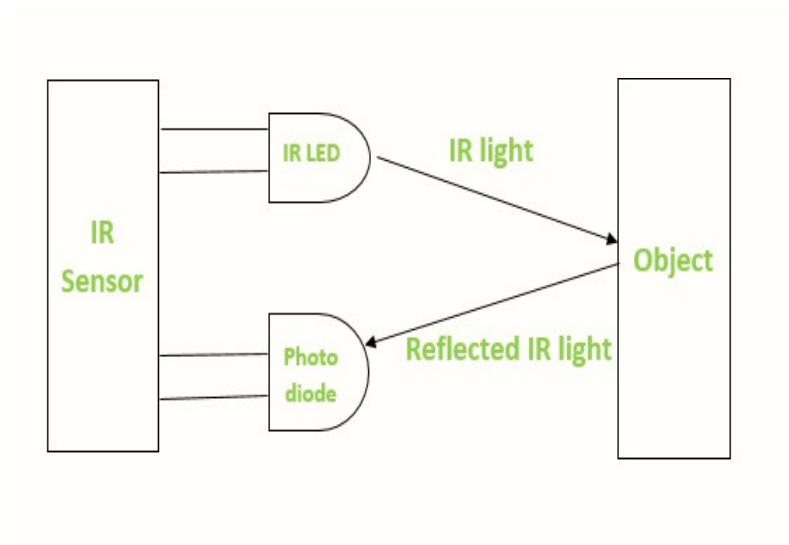
Different types of IR receivers exist based on the wavelength, voltage, package, etc. When used in an infrared transmitter – receiver combination, the wavelength of the receiver should match with that of the transmitter.

The emitter is an IR LED and the detector is an 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.



## IR Receiver or Photodiode

When the IR transmitter emits radiation, it reaches the object and some of the radiation reflects back to the IR receiver. Based on the intensity of the reception by the IR receiver, the output of the sensor defines.





## ASSESSMENT - 1

How its working



## Applications of IR Sensor



IR sensors use in various projects and also in various electronic devices. They all are as follow,

### Night Vision Devices

An Infrared technology implemented in night vision equipment if there is not enough visible light available to see unaided. Night vision devices convert ambient photons of light into electrons and then amplify them using a chemical and electrical process before finally converting them back into visible light.





## Radiation Thermometers

IR sensors are used in radiation thermometers to measure the temperature. The measurement depends upon the temperature and the material of the object, and these thermometers have some of the following features:

- Measurement without direct contact with the object
- Faster response
- Easy pattern measurements



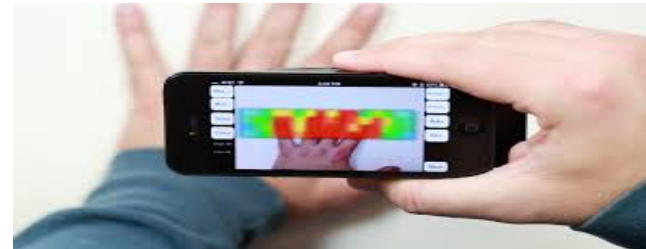




## Infrared Tracking & IR Imaging Devices

An Infrared tracking or Infrared homing, is a missile guidance system which operates using the infrared electromagnetic radiation emitted from a target to track it.

IR image device is one of the major applications of IR waves, primarily by virtue of its property that is not visible. It uses for thermal imagers, night vision devices etc.





## Application Areas

Climatology

Meteorology

Photobiomodulation

Flame Monitors

Gas detectors

Water analysis

Moisture Analyzers

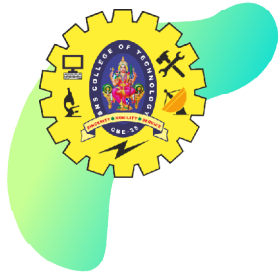
Anesthesiology testing

Petroleum exploration

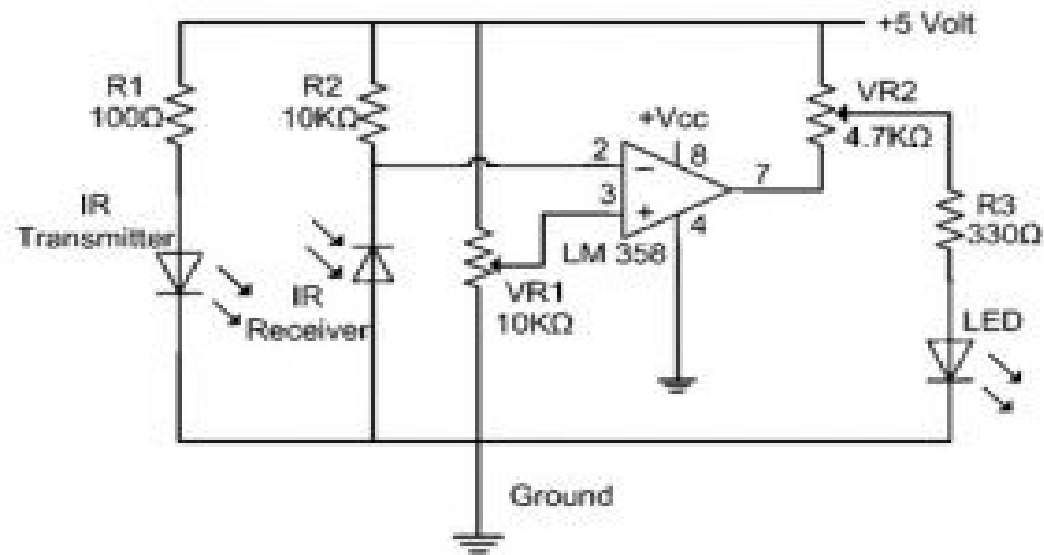
Rail safety

Gas Analyzers





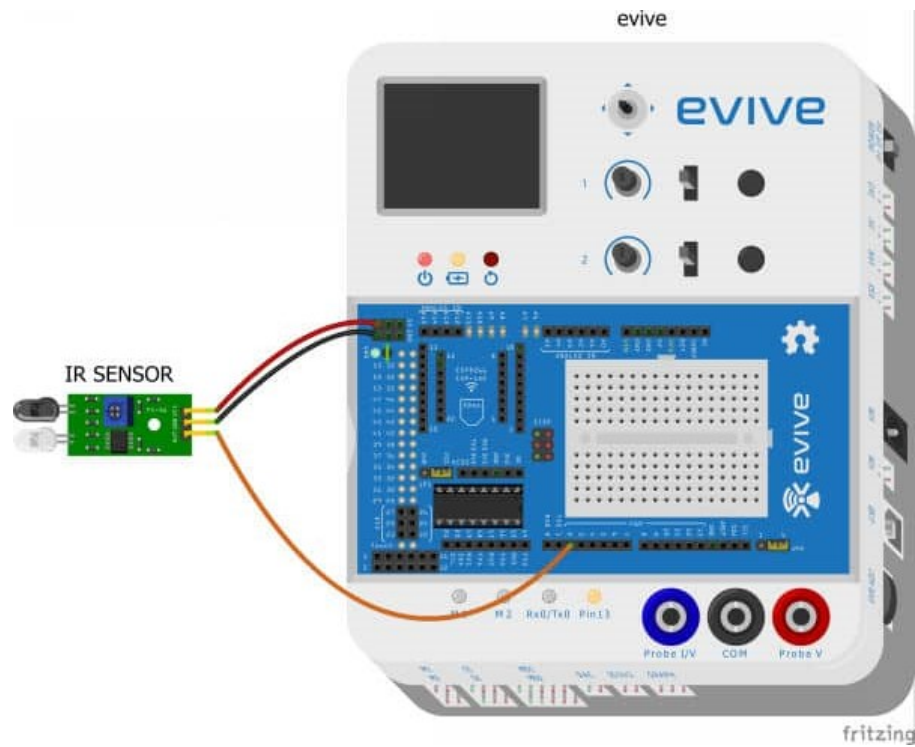
# IR Sensor Circuit Diagram





## ASSESSMENT - 2

### Find the Process





# References



- <https://thestempedia.com/tutorials/what-is-an-ir-sensor/#:~:text=The%20IR%20transmitter%20continuously%20emits,case%20of%20the%20IR%20sensor.>
- <https://robu.in/ir-sensor-working/>
- <https://www.elprocus.com/infrared-ir-sensor-circuit-and-working/>
- <https://electricalfundablog.com/infrared-sensor/>





*Thank You*

