PROXIMITY SENSORS:

Proximity sensors are devices that indicate when one object is close to another object. The distance can be anywhere between several millimeter and several feet .

- Practically they are also used to detect the presence or absence of the work part.
- It is also used for sensing the presence of human beings in the robot cell.

some of these sensors can also be used to measure the distance between the object and the sensor, and these devices are called **range sensors**.

Proximity and range sensors are usually located on the wrist or end effector since they are the moving parts.

Some of the techniques used for designing proximity and range sensors are

- Optical devices
- Acoustics
- Electric field techniques.
- Optical proximity sensors

These sensors are designed using visible or invisible (infra red) light sources. Infrared sensors may be active or passive.

Active IR sensors: This type of sensors send out an infra red beam and respond to the reflection of the beam from the target. The infrared reflectance sensor using an incandescent light source is a common device that is commercially available. By using this sensors the presence as well as the position of the object can be found. The distance between the sensors and the object can be found by knowing the time difference between the send signal and the echo signal received.

Passive IR sensors:

These sensors are simply used to detect the presence of infrared radiations in the environment. They are mostly used in security systems.

Another optical approach is using collimated light beams and a linear array of light sensors. The light from the light source is allowed to fall on the object. The light get reflected from the surface of the object, the location of the object can be determined from the position of its reflected beam on the sensor array.

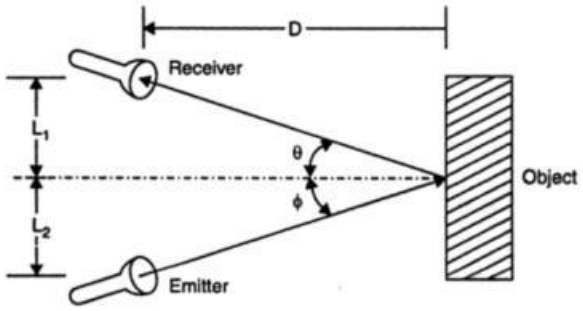
The distance between the object and the sensor is calculated using the formula

X=0.5 y tan(A)

Where x is the distance of the object from the sensor

Y is the lateral distance between the light source and the reflected light beam.

Triangulation method can be used to find the range of a sensor which is shown below.



Distance,

$$D = \frac{(L_1 + L_2) \tan\theta \cdot \tan\phi}{\tan\theta + \tan\phi}$$