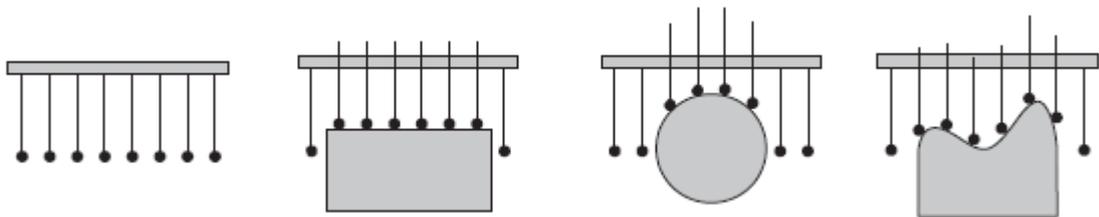


PROXIMITY SENSORS :

A proximity sensor is a device used to detect whether an object is near another object without touching it. It works by sensing the presence of an object before physical contact happens. Because it does not require contact, it is called a non-contact sensor.

This type of sensing is very useful in many applications. For example, it can be used to measure the speed of a rotating machine part (rotor) or to help a robot detect obstacles while moving. By knowing that an object is nearby, the system can take action such as slowing down, stopping, or changing direction. There are different types of proximity sensors based on how they detect objects. Some common types include magnetic sensors, eddy current sensors, Hall-effect sensors, optical sensors, ultrasonic sensors, inductive sensors, and capacitive sensors. Each type works using a different principle to detect nearby objects.



becomes active and sends a signal. These sensors are commonly used to turn circuits ON or OFF or to measure the speed and number of rotations of a motor shaft or wheel.

For example, in a mobile robot, the distance travelled by the robot can be calculated by counting how many times the wheel rotates. A magnet is fixed on the wheel (or wheel shaft) and the magnetic sensor is placed on the robot body (chassis). Every time the wheel rotates and the magnet passes near the sensor, the sensor detects it and sends a signal. By counting these signals, the system can calculate the number of rotations and determine how far the robot has moved.

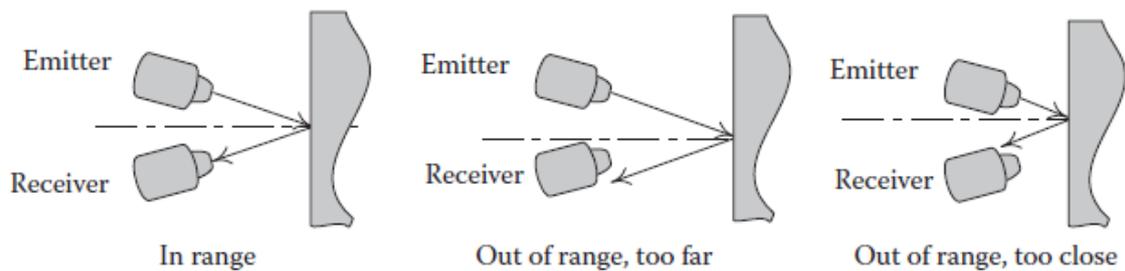
Magnetic proximity sensors are also used for safety purposes. For instance, in many machines, a magnetic sensor is placed on a door or cover. If the door is opened, the sensor detects the change and sends a signal to stop the moving or rotating parts, which helps prevent accidents.

2. Optical proximity:

Optical proximity sensors consist of an emitting light source (either internal to the sensor, or external to it) and a receiver, which senses the presence or absence

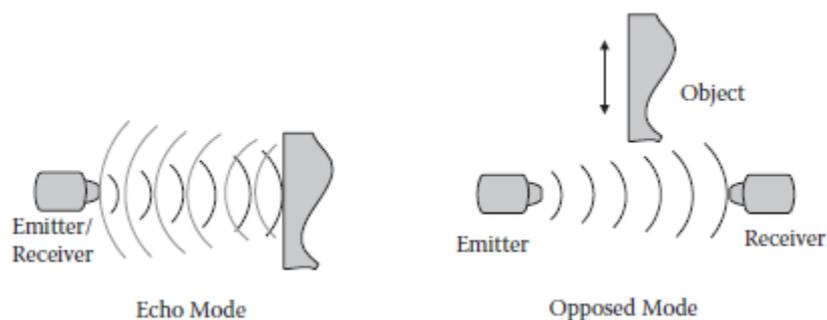
of light. The receiver is usually a phototransistor, and the emitter is usually an LED. The combination of the two creates a light sensor, and is used in many applications,

including optical encoders. As a proximity sensor, it is set up such that the light emitted by the emitter is not reflected to the receiver unless an object is within range. Unless a reflective object is within the range of the switch, the light is not seen by the receiver and, therefore, there is no signal.



3. ultrasonic sensor:

An ultrasonic sensor works by sending high-frequency sound waves from an emitter. It operates in two modes: opposed mode and echo mode. In opposed mode, a receiver is placed opposite the emitter to detect the sound wave. In echo mode, the receiver is near or inside the emitter and detects the sound waves reflected from an object. If the sound wave reaches the receiver, the sensor produces a signal, otherwise there is no signal. Ultrasonic sensors have a blind zone near the emitter, where objects cannot be detected. They also do not work well with materials like rubber or foam, because these materials do not reflect sound waves properly.



4. Inductive sensor :

An inductive sensor is used to detect metal objects. It contains a coil with a ferrite core, an oscillator, a detector, and a solid-state switch. When a metal object comes close to the sensor, the oscillation strength decreases. The detector senses this change and turns OFF the switch. When the metal object moves away from the sensor, the switch turns ON again. These sensors are commonly used to detect metal parts in machines and automation systems.

5. Capacitive Sensor:

A capacitive sensor detects objects that have a dielectric constant greater than 1.2. When such an object comes close to the sensor, it increases the capacitance of the circuit. This change activates an internal oscillator, which sends an output signal. Because of this, the sensor can detect the presence of objects within a certain range. Capacitive sensors can detect non-metal materials such as wood, liquids, and chemicals.

6. Eddy current sensor:

An eddy current sensor is used to detect conductive materials like metals. It usually has two coils. One coil produces a changing magnetic field. When a metal object comes close to the sensor, eddy currents are created in the metal, which produce another magnetic field in the opposite direction. This reduces the total magnetic field. The second coil measures this change, and the amount of change shows how close the metal object is. Eddy current sensors are also used for nondestructive testing, such as detecting cracks, holes, or measuring the thickness of materials.