

Introduction of sensor:

A sensor is an electronic device that detects changes in the environment and converts them into electrical signals that a microcontroller such as the CPX can understand.
How its work.

How Sensors Work

A. Based on Operation

Sensors can be classified into two types based on their operation:

1. Passive Sensors

Passive sensors do not emit any energy. They only detect changes that already exist in the environment.

Working Principle

- CPX provides voltage to the sensor circuit.
- Environmental changes affect the sensor's resistance or electrical properties.
- The voltage at the signal pin changes.
- The signal is sent to the CPX.
- CPX reads the voltage value and processes it using Python.

CPX provides voltage → Sensor resistance changes → Voltage at signal pin changes → CPX reads the value.

Examples

- Light Sensor (LDR)
- Soil Moisture Sensor
- Temperature Sensor
- Sound Sensor

Example: Soil Moisture Sensor

- Dry soil → High resistance → Different voltage at signal pin
- Wet soil → Low resistance → Different voltage at signal pin
- CPX reads the voltage change and determines the moisture level.

2. Active Sensors

Active sensors emit energy and detect the response from the environment.

Working Principle

- CPX provides power to the sensor.
- The sensor emits energy such as infrared light or sound waves.
- The energy reflects from an object.

- The sensor detects the reflected energy.
- The sensor converts the detection into an electrical signal.
- The signal is sent to the CPX.
- CPX reads and processes the signal.

CPX provides power → Sensor emits energy → Reflection is detected → Sensor converts it into an electrical signal → CPX reads the signal.

Examples

- IR Obstacle Sensor
- Ultrasonic Sensor
- LiDAR

Example: IR Sensor

IR LED emits infrared light → Object reflects the light → Receiver detects the reflection → Sensor generates a signal → CPX reads the signal and identifies the object.

B. Based on Output

1. Analog Sensors

- CPX supplies voltage to the sensor.
- The sensor's electrical property (such as resistance) changes based on environmental conditions.
- This change causes the voltage at the signal pin to vary.
- The varying voltage is sent to the CPX.
- The CPX reads the voltage through its Analog-to-Digital Converter (ADC).
- The ADC converts the voltage into a numerical value.
- The program uses this value to make decisions.

CPX Voltage → Sensor Resistance Changes → Signal Voltage Changes → ADC → Numerical Value → Program Decision.

Example: Light Sensor, Soil Moisture Sensor, Temperature Sensor.

2. Digital Sensors

- .CPX supplies power to the sensor
- The sensor monitors a specific condition
- The condition is either detected or not detected.
- The sensor generates a digital signal.
- HIGH (1) = Condition detected.
- LOW (0) = Condition not detected.
- The digital signal is sent to the CPX.

- The CPX reads the HIGH or LOW value.
- The program processes the signal.
- The robot performs the programmed action.

CPX Power → Condition Detected/Not Detected → HIGH (1) or LOW (0) Signal → CPX Reads Signal → Program Decision

Example: Push Button, PIR Motion Sensor, IR Obstacle Sensor.