

Internet of Things

IO 404 I

Sensors

Sensors

- ❖ What is a sensor?
- ❖ Types of sensors
- ❖ How to use?
- ❖ Where to use?

What is a sensor?

- ❖ A device that can measure a physical quantity and convert it into a signal
 - Which can be read by an instrument or observer
- ❖ an input device which provides an output (signal) with respect to a specific physical quantity (input).
- ❖ A Sensor is a device that receives and response to a signal.
- ❖ A Sensors sensitivity indicates how much the sensors output changes when the measured quantity changes

Classification of sensors

Active and passive

- ❖ **Active** sensor require an external excitation signal or a power signal.
- ❖ **Passive** sensor do not require any external power signal and directly generates output response

Classification of sensors

Based on Means of detection used in the sensor

- ❖ Electric
- ❖ Biological
- ❖ Chemical
- ❖ Radioactive

Classification of sensors

Based on conversion phenomena(input and output)

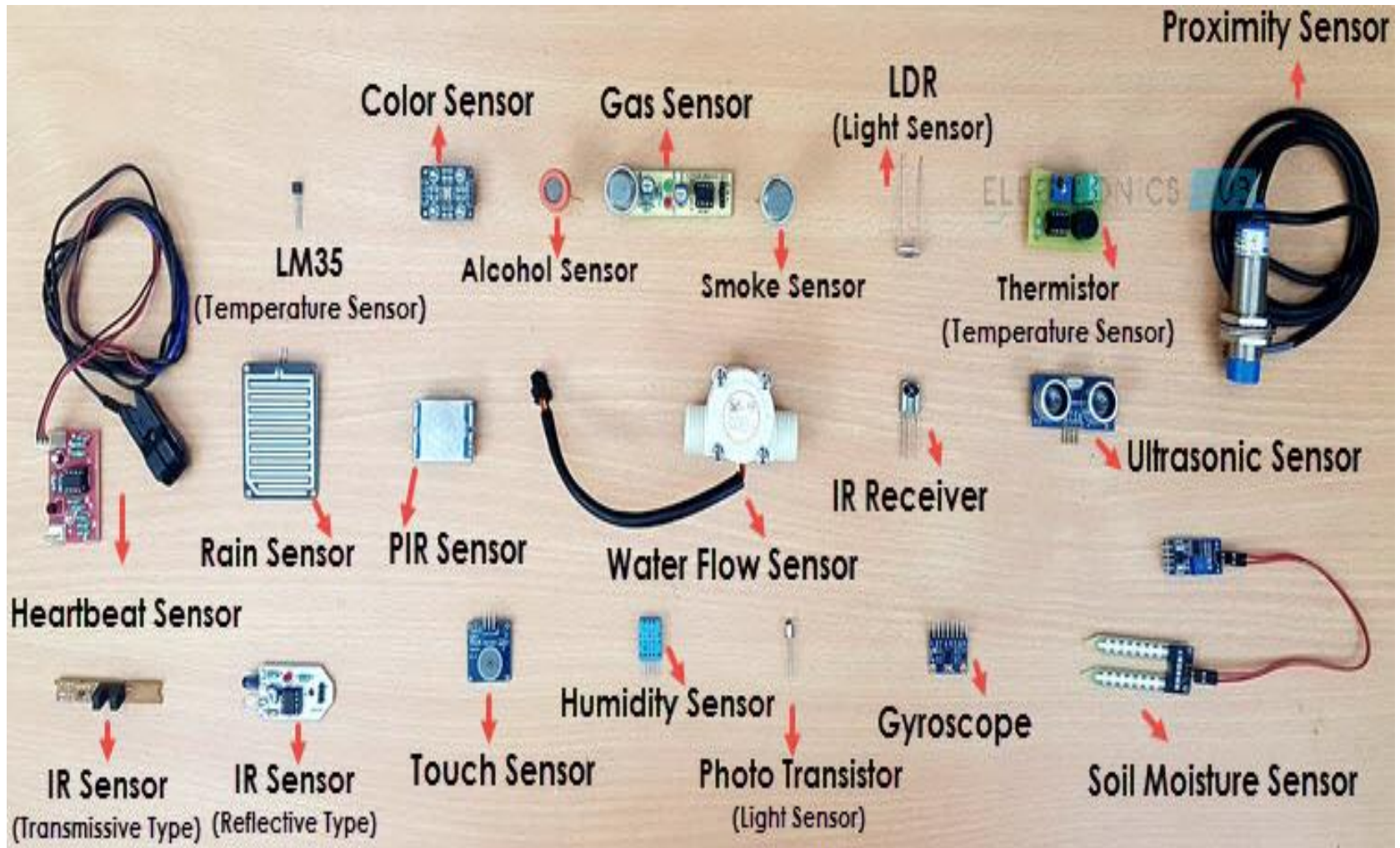
- ❖ Photoelectric
- ❖ Thermoelectric
- ❖ Electrochemical
- ❖ Electromagnetic
- ❖ Thermoptic

Classification of sensors

Analog and digital sensors

- ❖ **Analog sensor** produce an analog output (usually voltage or other like resistance) with respect to quantity being measured
- ❖ **Digital sensor** work with discrete or digital data.
 - Data is digital in nature which is used for conversion and transmission

Types of sensors



Types of sensors

Temperature

Proximity

IR

Pressure

Light

Ultrasonic

Smoke gas and alcohol

Touch

Color

Humidity

Position

Microphone

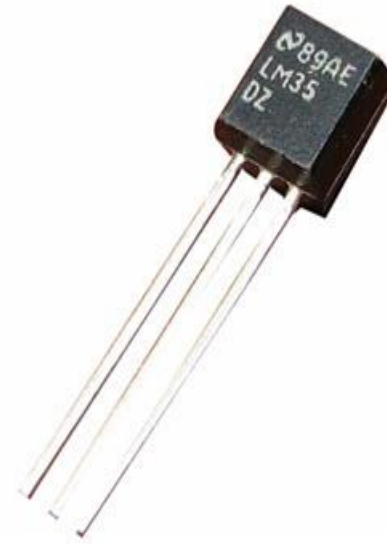
Flow and level

Touch

Types of sensors

Temperature Sensor

senses the temperature i.e., it measures the changes in the temperature.



LM35 - Temperature Sensor IC



10KΩ NTC Thermistor

Proximity Sensor

a non-contact type sensor that detects the presence of an object.



Inductive Proximity Sensor

Types of sensors

Infrared (IR)

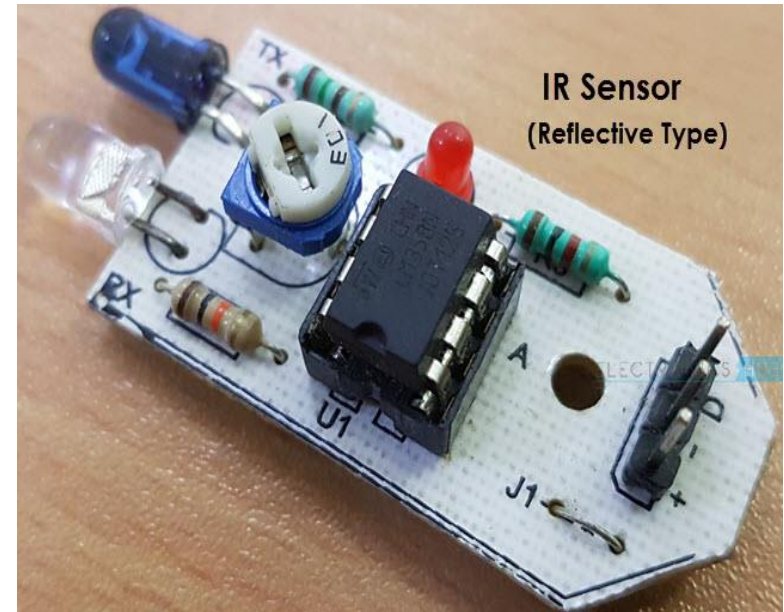
light based sensor that are used in various applications like Proximity and Object Detection

- Used in taps as well

Reflective:

transmitter and detector are positioned adjacent to each other facing the object

Transmissive: transmitter and detector are positioned facing each other



Types of sensors

Ultrasonic

- a non-contact type device used to measure distance as well as velocity of an object
- works based on the properties of the sound waves with frequency greater than that of the human audible range.

Light (photo) Sensor

- A simple Light Sensor available today is the Light Dependent Resistor.
- Its resistance is inversely proportional to the intensity of the ambient light

And many more (self exploration)



Project ideas

- **Plant water sensor**

- sensor registered to cloud service
- sensor is placed into the soil of plant pot for moisture readings
- cloud has details of plant type, soil type, water requirement etc
- from readings determine if any action required
- update is sent to user mobile app.
- Data is stored and notifications are there as well

Project ideas

- **Weather reporting system**
 - rain-temperature-humidity sensors
 - via microcontroller to web server using Wifi
 - live update
 - set threshold values and alerts for notification
- **Smart door**
- **Air pollution monitoring system**
 - sensors to monitor 5 components for Air Quality Index
 - ozone, carbon monoxide, sulfur dioxide, nitrous oxide, and particulate matter
 - plus a gas sensor (for gas leakages or flammable gases).
Temperature and humidity sensors can also be included

Project ideas

- **Smart parking system**

- IR sensor to monitor entire area during runtime and provide you an image
- plus, open car parking gate only if vacant slots are there

- **Smart traffic management system**

- To offer free pathways to emergency vehicles [by flashing a green light for such vehicles]
- also able to identify and monitor violators even at night

Project ideas

- **Smart cradle system**
 - humidity and temperature of infants beds
 - surveillance camera attached to the cradle will continue to send footage of the infant to the parents
 - health algorithm as well based on sensor data about health of infants and alerts
- **Smart gas leakage detector bot**
 - bot with GPS sensor
 - bot uses IOTgecko to receive and display any gas leakage alert and its location over the IoT network

Project ideas

- **Street light monitoring**
 - LDR sensors for movement detection
- **Liquid level monitoring system**
 - ultrasonic, conductive and float sensor
 - apart from liquid level, also used to track the usage of specific chemicals and detect leak in pipelines
 - Water quality
- **Health monitoring system**
- **And ...**