# SENSOR

Sensors are electrical and electronics devices, sensors are used to sense or measure parameters like temperature, pressure, humidity, noise, voice, sound, gas, moisture, acidity, light, intensity and convert into electrical signals. Sensors are sophisticated devices that are frequently used to detect and respond to electrical or optical signals. Types of sensors are available:

1. Temperature sensors
2. Proximity sensor
3. Pressure sensor
4. Water quality sensor
5. Chemical sensor
6. Gas sensor
7. Smoke sensor
8. IR sensor and etc…

**Temperature Sensor:** is useful in the application of sensing, measuring and control of heat energy by way converting heat parameter into corresponding changes in its resistance, if we apply a dc +5v to a temperature sensor, in surrounding room temperature of the sensor it gives output example +4.5v. if the heat increase or decrease  the resistance value of the temperature sensor will also change either increase or decrease based on that the sensor output analog voltage will increase or decrease. Using this output analog signal is converted into digital in the micro controller and temperature will monitor and controlled.

**Temperature sensor LM 35**

**Proximity Sensor:** are useful to detect the presence of object in the coverage area of the proximity sensor. it will detect the motions of human or movements of the object.
For example, for reversing of car alarm.

# Types of Proximity sensors:

1.**Capacitive sensors**: it detects both metallic as well as nonmetallic objects. it uses dielectric field from air in and around the object, so small objects are detected from very large area

2. **Ultrasonic sensors:** this are emitting or transmit ultrasonic waves to fall on the object and the ultrasonic waves return back to receiver section of the sensor, based on the time taken to receive return ultrasonic waves the distance will be measured and object will be detected

3. **Photoelectric Sensors:** this sensor is emitting light beam, when the light falls on the object It will return back to sensor receiver based on that the sensor analog output signal will change. Based on the changes in the sensor output the alarm or any circuit will switch on in a security system.

**Pressure Sensors:** this sensor is used to measure and control the level of the pressure in pipes and furnace control etc. Based on the pressure fall on the sensor, its characteristic will change due to that the analog output of sensor will change i.e. either current or voltage will change. Then the pressure level will be controlled by increase or decrease to maintain the targeted pressure level corresponding changes in the sensor analog output in any control system.

**Water quality sensor:** it detects the water quality for home and industrial applications.

## Types of Water sensor:

**1.Organic carbon sensor:** this sensor is useful for measuring organic element in the water.

**2.Chlorine residual sensor:** are useful for measuring chlorine content in the water.

**3.Conductivity sensor:** these sensors are useful to find out conductivity of the water by measuring the total ironic concentrations in the water.

**4.PH Sensor**: is using to measure PH level in the dissolved water, it will measure the acidic or alkaline content of the water.

**5.Oxygen-Reduction potential sensor**: using for find out reaction level of oxidation and reduction occurring in the solution.

**Chemical sensors:** are for monitoring industrial environmental parameters, process control, harmful chemical detection in intentionally or accidentally happen, explosive and radioactive detection, laboratory and Pharma industries.

# Types of chemical sensors:

1. Zinc oxide nanorad sensor
2. Potentiometric sensor
3. PH glass electrode
4. Non dispersive infrared sensor
5. Hydrogen sulfide sensor
6. Fluorescent chloride sensor
7. Electrochemical gas sensor
8. Chemiresistor
9. Chemical field – effect transistor

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## Gas sensors: Types of gas sensors are:

1. Hygrometer
2. Gas detector
3. Electrochemical gas sensor
4. Ozone monitor
5. Oxygen sensor
6. Nitrogen oxide sensor
7. Air pollution sensor
8. Hydrogen sensor
9. Catalytic lead sensor
10. Carbon monoxide detector
11. Breathalyzer
12. Carbon dioxide sensor

Gas sensors are used to detect different gases in industries and chemical plants. Gas sensors are used in monitoring hazardous gas in coal mines, oil and gas industries, research in chemical laboratory, paints, plastic rubber industries.

## Smoke sensors: it detects the presence of smoke, gases and flame surrounding, by the way it detects fire and gas incidences in the industries, office, home.

# Types of the smoke sensor:

**1.Optical smoke sensor:** using light scatter principal it detects the smoke in the coverage area of the sensor.

**2.Ionization smoke sensor:** uses to detect molecules in the chemical reactions and based on that it triggers the alarm to alert the people**.**

**IR Sensors:** infrared sensor, which emits IR signal in the coverage area of the sensor and detect the object or measure the different parameters like heat by the way of infrared radiation. The IR sensors are useful to measure blood flow and blood pressure in Healthcare industries, for switching like wireless bell ,  in Tv remote.

**Level sensors:** are useful to measure different liquid levels. The application of level sensor is in Tsunami warning, sea level monitoring, water reservoirs, Compressor, Industrial and medical equipment, Pharma industries. These sensors are useful to measure the level of liquid in the open or closed system or amount of fluids.

# Two types of level sensor:

1.   **Point level sensor**: This sensor is for detect the targeted level at above or below level f  From the reference level of the liquid.
2.
   **Continuous level sensor:** This sensor is measuring or detecting the level of liquid for example in vehicle petrol or diesel level in the tank

**Image sensor:** are useful to detect images and capture optical image into electronic files in camera applications.

**Types of image sensor:**
1.
   **Charge-coupled device.**
2.
   **Complementary metal-oxide (CMOS) Semiconductor.**
   Image sensors are useful to replace human monitoring in many industries like driverless car, Automated manufacturing industries**.**

**Motion detection sensor:** it detects the motions of any object or human beings. It converts motions into analog signal i.e. electrical signal.

**Types of motion sensor:**

**1.(PIR) Passive Infrared:** Based on the body heat it detects the motions of human or human being is detected.

**2.Ultrasonic sensor:** ultrasonic waves are used to detect motions.

**3.Microwave:** it uses the radio waves to detect the motions or movements of the object or human beings.

**Accelerometer sensor:** this sensor is working based on the object vibrations, tilting and acceleration will generate electrical signals as output from the sensor. This sensor application is in aircraft and aviation industries, movement detection, home appliances, automatic control systems, measurement of vibrations.

**Types of Accelerometer sensors**:
1.Piezoelectric accelerometers: are useful to measure vibrations, shock and pressure. This sensor designed based on the piezoelectric sensing principle.

**GYROSCOPE SENSORS**: is to sense or measure the angular velocity. It is a measurement of speed of rotation around an axis.
Application of Gyroscope sensor are game controllers, cellular, camera devices, Robotics control, helicopter, vehicle control, car industries. These sensors are classified based on their working principle, power, range of sensing output type and conditions of working environment.

**Types of GYROSCOPE SENSORS:**
1.
   **OPTICAL GYROSCOPES**
2.
   **MEMS (Micro-Electro-mechanical system) GYROSCOPES**
3.
   **Vibrating structure GYROSCOPE**
4.
   **Rotary gyroscope**

This sensor is most useful to help athletes for improving the efficiency of their movements. Mostly gyroscope sensor is combined with accelerometers.

**HUMIDITY SENSOR:** This sensor is for measuring the amount of water vapor in air atmosphere or gases. This sensor very useful in air conditions system control**.**

**OPTICAL SENSORS:** Which is used to convert quantity of light rays into electrical signals. Optical sensor applications are in pharma industries, aeroscope, healthcare, mining, door control in elevator system, safety and security systems, oil and gas industries.

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