CHANDIGARH UNIVERSITY
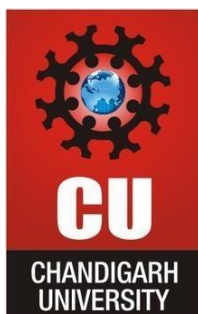## UNIVERSITY INSTITUTE OF NGINEERING
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Submitted By:	Submitted To:
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Subject Name	Internet of Things Lab
Subject Code	20CSP-358
UID	20BCS3115
Branch	CSE
Semester	6

Experiment – 1.2

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Semester: 06   **Date of Performance:** 24/02/2023
Subject Name: Internet of Things Lab   **Subject Code:** 20CSP-358

1. Aim/Overview of the practical:

Identification of different sensors used in IoT applications.

2. Task to be done:

To study hardware related to IoT and understand and identify different sensors used in IoT.

3. Sensors:

- Sensor is a device which detects changes in an environment or measures physical property, record, indicates or respond to it.

- It can be embedded in various types of objects or environments to gather data and transmit it to other devices or systems over a network.

- The sensor attains a physical parameter and converts it into a signal suitable for processing (e.g. electrical, mechanical, optical) the characteristics of any device or material to detect the presence of a particular physical quantity.

- The output of the sensor is a signal which is converted to a human-readable form like changes in characteristics, changes in resistance, capacitance, impedance etc.

- Sensors in IoT are essential components as they enable the collection of real-time data, which can be analyzed and used to make informed decisions, automate processes, and optimize various operations.

- They are often used in industrial automation, environmental monitoring, healthcare, and smart homes, among other applications.

- Some common examples of IoT sensors include temperature sensors used in HVAC systems, motion sensors in security systems, and water level sensors in smart irrigation systems.

- The data gathered by these sensors can be analyzed using machine learning algorithms to detect patterns and anomalies, predict future events, and generate insights that can be used to improve efficiency, safety, and overall performance.
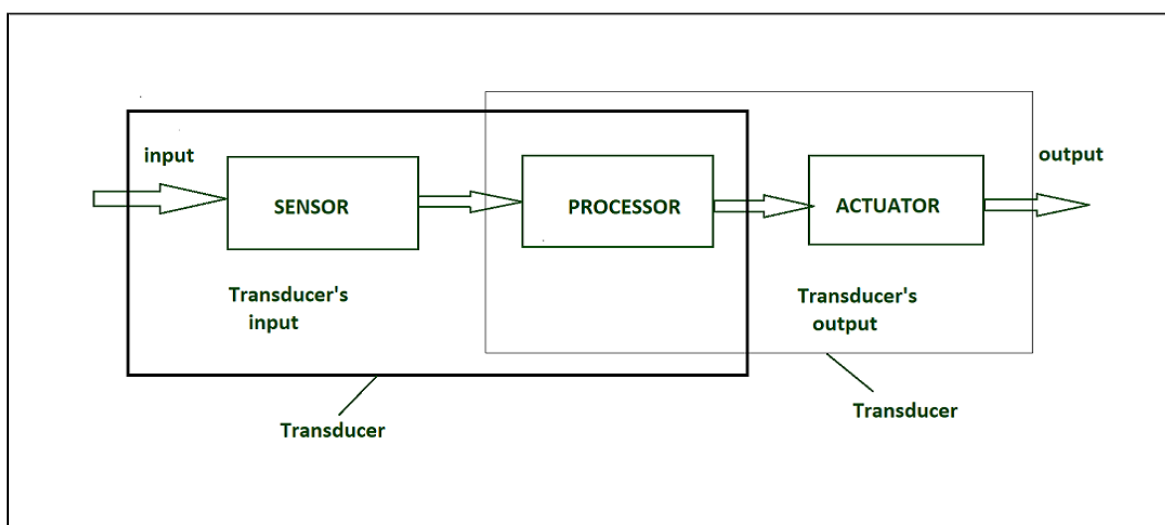
IOT Hardware

Classification of sensor –

- Passive & Active
- Analog & digital
- Scalar & vector

1. **Passive Sensor –**
   Can not independently sense the input. Ex- Accelerometer, soil moisture, water level and temperature sensors.

2. **Active Sensor –**
   Independently sense the input. Example- Radar, sounder and laser altimeter sensors.

3. **Analog Sensor –**
   The response or output of the sensor is some continuous function of its input parameter. Ex- Temperature sensor, LDR, analog pressure sensor and analog hall effect.

4. **Digital sensor –**
   Response in binary nature. Design to overcome the disadvantages of analog sensors. Along with the analog sensor, it also comprises extra electronics for bit conversion. Example – Passive infrared (PIR) sensor and digital temperature sensor(DS1620).

5. **Scalar sensor –**
   Detects the input parameter only based on its magnitude. The answer for the sensor is a function of magnitude of some input parameter. Not affected by the direction of input parameters.
   Example – temperature, gas, strain, color and smoke sensor.

6. **Vector sensor –**
   The response of the sensor depends on the magnitude of the direction and orientation of input parameter. Example – Accelerometer, gyroscope, magnetic field and motion detector sensors.

4. <u>Different type of sensors used in IOT :</u>
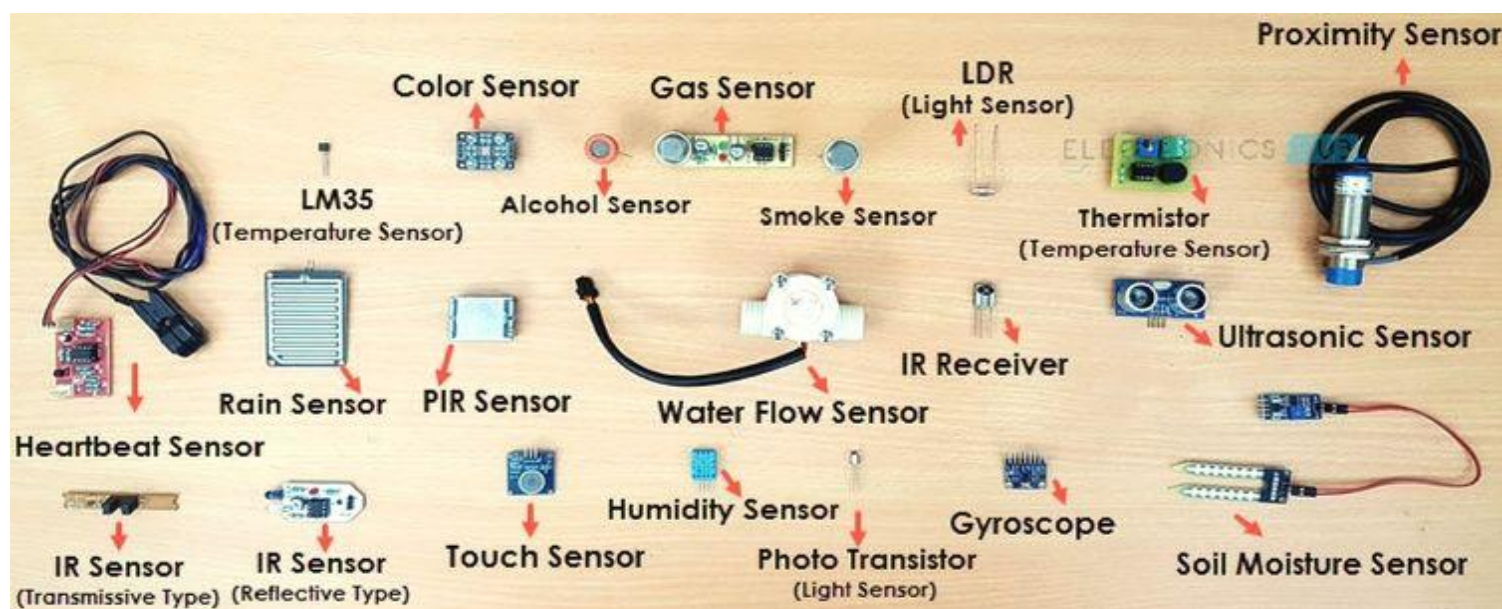
5. Description about a few sensors :

- Ultrasonic Sensor:

  An ultrasonic sensor is a type of electronic sensor that measures distances using ultrasonic waves. It works by emitting high frequency sound waves and then measuring the time it takes for the waves to bounce back after hitting an object. By calculating the time it takes for the waves to return, the distance between the sensor and the object can be determined.

  Ultrasonic sensors are commonly used in robotics, automation, and measurement applications. They can detect the presence, position, and distance of objects and are often used in environments where other sensors, such as infrared or optical sensors, may not work well due to factors such as low visibility or high levels of dust or smoke. Ultrasonic sensors are also popular in automotive applications, such as parking assistance systems and collision avoidance systems.

- Light Sensor:

  A light sensor, also known as a photo sensor, is an electronic device that detects the presence or absence of light and measures the intensity of light in its surrounding environment. It works by converting light energy into an electrical signal that can be processed by other electronic devices.

Light sensors are used in a variety of applications, such as-

1. Automatic lighting systems: Light sensors can be used to automatically turn on lights when the ambient light level drops below a certain threshold, such as during dusk or dawn.

2. Security systems: Light sensors can be used to detect unauthorized entry into a building or other secured area by detecting changes in light levels.

3. Energy efficiency: Light sensors can be used to control the amount of artificial light used in a building, reducing energy consumption and costs.

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- Smoke sensor:

A smoke sensor, also known as a smoke detector, is an electronic device that senses the presence of smoke particles in the air. It works by detecting the small particles generated by smoke through the use of an optical or ionization sensor.

Smoke sensors are commonly used in homes, offices, and public buildings as a means of detecting fires and alerting occupants to the danger. They are often integrated with fire alarm systems and can be wired or wireless, depending on the application. Smoke sensors are also used in industrial settings, such as factories and warehouses, to detect fires and protect valuable equipment and products.

- Pressure sensor:

A pressure sensor is an electronic device that detects and measures pressure in gases or liquids. It works by converting the applied pressure into an electrical signal that can be measured and processed by other electronic devices.

Pressure sensors are used in a variety of applications, such as:

1. Industrial automation: Pressure sensors are used to monitor and control pressure in hydraulic and pneumatic systems, as well as in manufacturing processes.

2. Automotive: Pressure sensors are used to measure various pressures in a vehicle, such as tire pressure, engine oil pressure, and fuel pressure.

3. Medical devices: Pressure sensors are used in medical devices, such as blood pressure monitors and respirators, to measure and control pressure.

4. Environmental monitoring: Pressure sensors are used in weather stations and environmental monitoring systems to measure barometric pressure and altitude.

- Humidity sensor:

A humidity sensor is an electronic device that measures the amount of moisture or water vapor in the air. It works by detecting changes in the electrical properties of a material, such as capacitance or resistance, due to the presence of moisture.

Humidity sensors are used in a variety of applications, such as:

1. HVAC systems: Humidity sensors are used to monitor and control humidity levels in heating, ventilation, and air conditioning (HVAC) systems to maintain comfortable and healthy indoor environments.

2. Agriculture: Humidity sensors are used in greenhouses and other agricultural settings to monitor humidity levels and control irrigation systems.

3. Food storage and processing: Humidity sensors are used in food storage and processing facilities to monitor and control humidity levels, which can affect the quality and shelf life of food products.

4. Weather monitoring: Humidity sensors are used in weather stations and environmental monitoring systems to measure humidity levels and provide accurate weather forecasts.


- Temperature Sensor:

A temperature sensor is an electronic device that measures temperature and converts it into an electrical signal that can be measured and processed by other electronic devices. Temperature sensors work by detecting changes in the physical or electrical properties of materials as temperature changes.

Temperature sensors are used in a variety of applications, such as:

1. Heating, ventilation, and air conditioning (HVAC) systems: Temperature sensors are used to monitor and control the temperature of indoor environments, such as homes, offices, and commercial buildings.

2. Industrial processes: Temperature sensors are used in various industrial processes, such as manufacturing and chemical processing, to monitor and control temperature.

3. Medical devices: Temperature sensors are used in medical devices, such as thermometers and incubators, to measure and control temperature.

4. Food processing and storage: Temperature sensors are used in food processing and storage facilities to monitor and control temperature, which can affect the quality and safety of food products.

5. Automotive: Temperature sensors are used in automobiles to measure various temperatures, such as engine coolant temperature and ambient air temperature, to ensure optimal performance and safety.
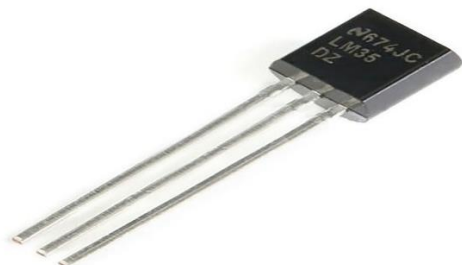
- Motion detection sensor:

  A motion detection sensor, also known as a motion sensor or motion detector, is an electronic device that detects movement in its surrounding environment. It works by detecting changes in infrared radiation, sound waves, or other physical parameters in the environment caused by the movement of objects or people.

Motion detection sensors are used in a variety of applications, such as:

1. Security systems: Motion detection sensors are used in security systems, such as burglar alarms and surveillance cameras, to detect unauthorized movement and trigger an alarm or alert.

2. Lighting control: Motion detection sensors can be used to automatically turn on lights when a person enters a room, and turn them off when the person leaves.

3. Energy efficiency: Motion detection sensors can be used to control the operation of heating, ventilation, and air conditioning (HVAC) systems in buildings, reducing energy consumption and costs.

4. Automatic doors: Motion detection sensors are used in automatic doors to detect the presence of a person and open or close the door accordingly.

5. Robotics: Motion detection sensors are used in robotics to detect the movement of objects and people, enabling the robot to respond and react accordingly.

- Image sensor:

An image sensor is an electronic device that captures images and converts them into digital signals. It is commonly used in digital cameras, smartphones, and other imaging devices.The main function of an image sensor is to convert light into electrical signals that can be processed and stored as image files. Image sensors consist of an array of light-sensitive pixels that detect the amount of light that falls on them. Each pixel generates an electrical charge that is proportional to the intensity of the light it receives.

Some of the common uses of image sensors:

1. Digital cameras and camcorders: Image sensors are used in digital cameras and camcorders to capture still images and video.

2. Security cameras: Image sensors are used in security cameras to capture images and video of surveillance areas.

3. Medical imaging: Image sensors are used in medical imaging equipment, such as X-ray machines, CT scanners, and MRI scanners, to capture images of the human body.

4. Robotics: Image sensors are used in robotics to provide visual feedback to control systems, allowing robots to navigate and interact with their environment.

5. Automotive: Image sensors are used in automotive applications, such as lane departure warning systems, collision avoidance systems, and backup cameras.
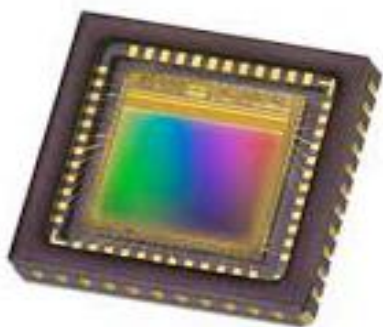

- Infrared sensor:

An infrared sensor is an electronic device that can detect and measure infrared radiation, which is a type of electromagnetic radiation with longer wavelengths than visible light. Infrared sensors are commonly used in a wide range of applications, including security systems, automation and control systems, and environmental monitoring.

Some common applications of infrared sensors include:

1. Security systems: Infrared sensors are used in security systems to detect motion and trigger alarms.

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2. Environmental monitoring: Infrared sensors are used to measure temperature, humidity, and other environmental parameters.

3. Medical applications: Infrared sensors are used in medical applications, such as non-contact thermometers and glucose monitors.
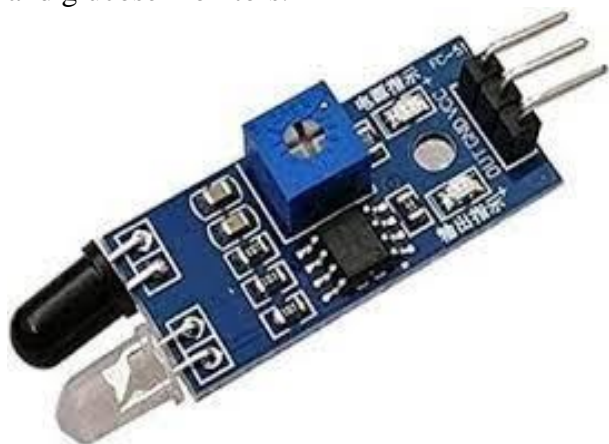

- Color sensor:

A color sensor is an electronic device that detects and measures the intensity of different wavelengths of light in order to determine the color of an object. Color sensors are commonly used in a variety of applications, such as color matching, color sorting, and color analysis.

Some common applications of color sensors include:

1. Color matching: Color sensors are used in the printing industry to match colors of printed materials to a reference standard.

2. Color sorting: Color sensors are used in food processing and manufacturing to sort products by color, such as sorting fruits by ripeness or vegetables by quality.

3. Color analysis: Color sensors are used in scientific research and product development to analyze the color of materials and products, such as in the textile or paint industry.
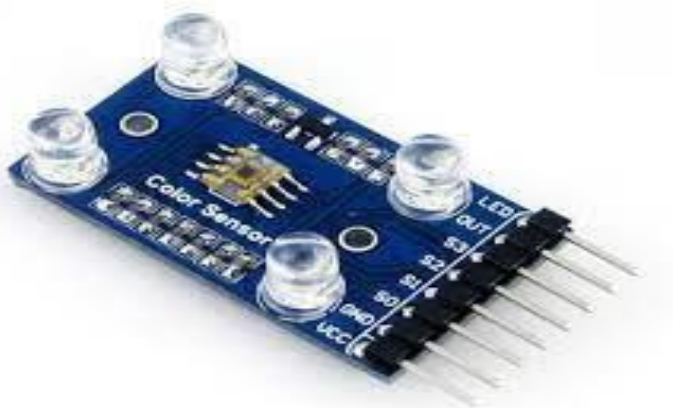
- <u>Alcohol sensor:</u>

An alcohol sensor is a device that detects the presence and level of alcohol in a person's breath, blood, or saliva. Alcohol sensors are commonly used in law enforcement, workplace safety, and personal safety applications to prevent alcohol-related accidents and incidents.

Some common applications of alcohol sensors include:

1. Law enforcement: Alcohol sensors are used by police officers to measure the BAC of drivers suspected of driving under the influence of alcohol.

2. Workplace safety: Alcohol sensors are used in workplaces, such as construction sites and factories, to prevent alcohol-related accidents and ensure employee safety.

3. Personal safety: Alcohol sensors are used by individuals to monitor their own BAC levels and prevent drunk driving or other alcohol-related incidents.

4. Medical applications: Alcohol sensors are used in medical applications, such as monitoring alcohol withdrawal symptoms in patients undergoing alcohol detoxification.

- <u>Touch sensor:</u>

A touch sensor is an electronic device that detects the presence or touch of a person's finger or other object on a surface. Touch sensors are commonly used in a wide range of applications, including consumer electronics, automotive, medical devices, and industrial control systems.

Some common applications of touch sensors include:

1. Consumer electronics: Touch sensors are used in smartphones, tablets, and other electronic devices to provide touch screen interfaces for user input.

2. Automotive: Touch sensors are used in automotive displays and controls, such as touch screens and touch-sensitive buttons.

3. Medical devices: Touch sensors are used in medical devices, such as infusion pumps and patient monitors, to provide touch screen interfaces and other forms of user input.

4. Industrial control systems: Touch sensors are used in industrial control systems, such as factory automation and process control, to provide touch-sensitive controls and interfaces for operators.