PERIYAR MANIAMMAI INSTITUTE OF SCIENCE & TECHNOLOGY • PMIST •

PERIYAR MANIAMMAI

INSTITUTE OF SCIENCE & TECHNOLOGY

(Deemed to be University)

Established Under Sec. 3 of UGC Act, 1956 • NAAC Accredited

think • innovate • transform

NAME : D.AFREEN

REG NO : 122011012780

BRANCH : B.TECH CSE

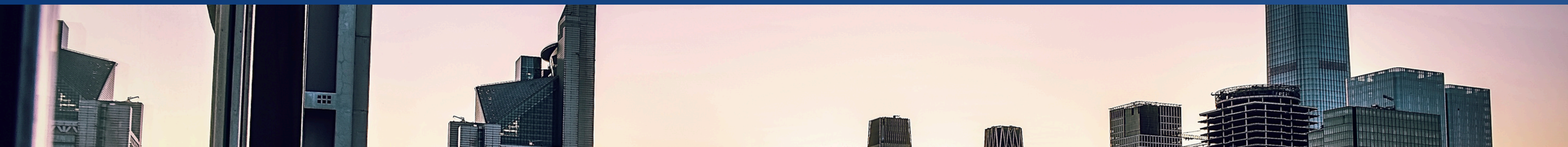
CLASS : III YR “A” SEC

TOPIC : ANY 5 TYPES OF SENSOR

TABLE OF CONTENT

INTRODUCTION

Sensors are devices that detect and measure physical quantities like temperature, pressure, light, motion, or sound, and convert them into electrical signals that can be processed by electronic systems. They act as the "eyes and ears" of many modern technologies, from smartphones and cars to industrial machinery and medical devices. They are essential components in data acquisition, automation, and control systems. The output of a sensor is typically an electrical signal (voltage or current) that is proportional to the measured quantity. This signal can then be used for display, recording, or further processing.



Temperature Sensor

Temperature sensors are among the most commonly used sensors in IoT devices, designed to measure the degree of hotness or coldness of an object or environment. These sensors operate on various principles, including thermocouples, resistance temperature detectors (RTDs), and thermistors. Thermocouples measure temperature based on the Seebeck effect, which states that a temperature difference between two dissimilar electrical conductors or semiconductors creates a voltage difference between them. RTDs, on the other hand, rely on the principle that the electrical resistance of a metal changes with temperature. Thermistors are semiconductor devices whose resistance changes significantly with temperature.

Humidity Sensors

Humidity sensors measure the amount of moisture in the air. These sensors are crucial in applications where maintaining specific humidity levels is critical, such as in agriculture, HVAC systems, and weather monitoring. There are two main types of humidity sensors: capacitive and resistive. Capacitive humidity sensors measure humidity by detecting changes in the dielectric constant of a polymer film placed between two electrodes. As humidity changes, the polymer absorbs or releases water vapor, altering its dielectric constant and the sensor's capacitance. Resistive humidity sensors, conversely, measure changes in the electrical resistance of a hygroscopic material, such as a salt or conductive polymer.

Motion Sensors

Motion sensors detect movement in a specific area. These sensors are commonly used in security systems, smart lighting, and activity monitoring. There are several types of motion sensors, including passive infrared (PIR) sensors, ultrasonic sensors, and microwave sensors. PIR sensors detect changes in infrared radiation caused by the movement of warm objects, such as humans or animals. Ultrasonic sensors emit high-frequency sound waves and measure the time it takes for the waves to bounce back, detecting movement based on changes in the reflected signal. Microwave sensors, similar to radar, emit microwave radiation and detect changes in the frequency of the reflected signal caused by moving objects.

Light Sensors

Light sensors, also known as photo sensors or light detectors, measure the intensity of light. These sensors are used in a wide range of applications, including automatic lighting control, ambient light detection in mobile devices, and solar energy monitoring. There are several types of light sensors, including photoresistors, photodiodes, and phototransistors. Photoresistors, also known as light-dependent resistors (LDRs), change their electrical resistance based on the amount of light they are exposed to. Photodiodes and phototransistors are semiconductor devices that generate an electrical current when exposed to light.

Pressure Sensor

Pressure sensors measure the force per unit area applied to a surface. These sensors are used in various applications, including industrial process control, medical devices, and automotive systems. There are several types of pressure sensors, including piezoresistive, capacitive, and piezoelectric sensors. Piezoresistive pressure sensors measure changes in electrical resistance caused by pressure-induced strain in a silicon diaphragm. Capacitive pressure sensors measure changes in capacitance caused by the deflection of a diaphragm under pressure. Piezoelectric pressure sensors generate an electrical charge when subjected to pressure.

WORKING PRINCIPLE OF TEMPERATURE SENSOR

Temperature sensors are pivotal in various IoT applications, including smart homes, industrial automation, healthcare, and environmental monitoring.

In smart homes, they regulate HVAC systems for energy efficiency and comfort. Industrial processes rely on them to maintain optimal temperatures for production.

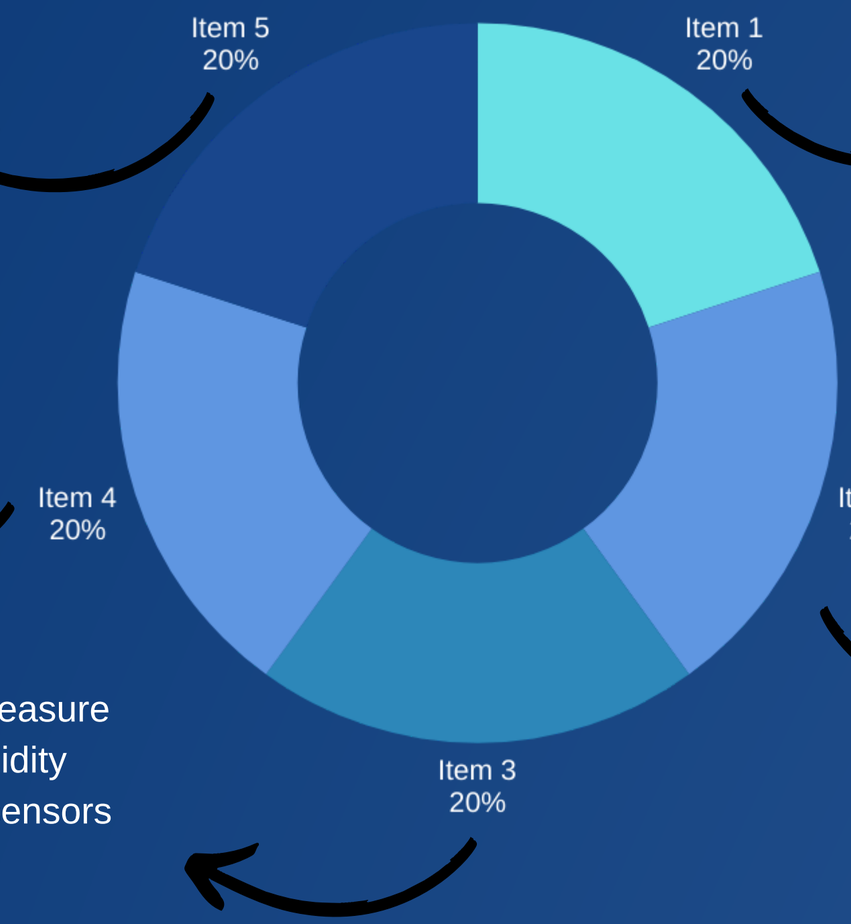
Healthcare uses them for patient monitoring, and environmental monitoring benefits from their ability to track climate changes.

WORKING PRINCIPLE OF HUMIDITY SENSOR

Humidity sensors play a crucial role in IoT applications, including environmental monitoring, HVAC systems, and industrial process control.

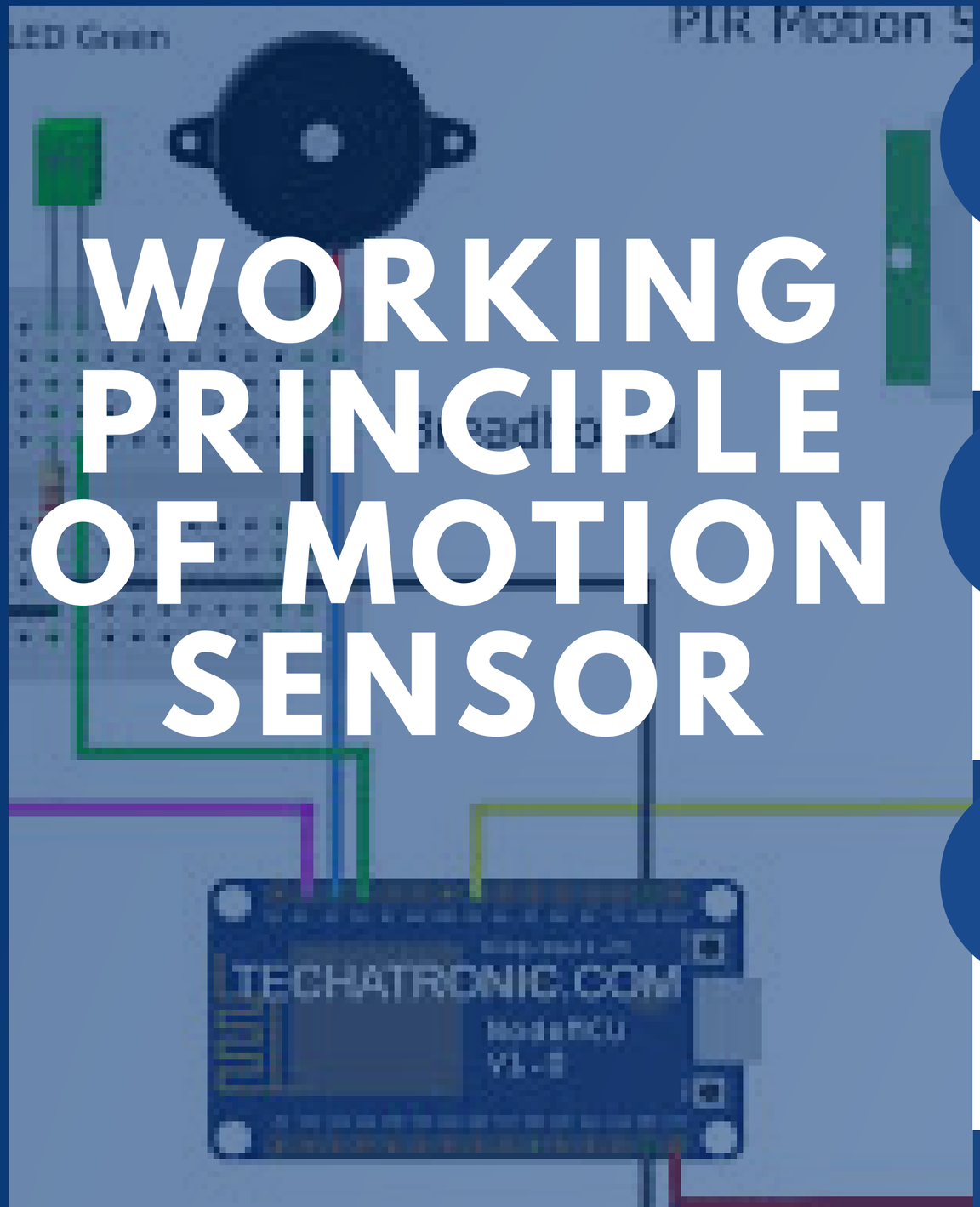
They monitor humidity in greenhouses to optimize plant growth, regulate HVAC systems for comfortable indoor environments, and ensure optimal conditions in industrial storage facilities to prevent damage to sensitive materials

Capacitive humidity sensors measure capacitance changes with humidity variations. Resistive humidity sensors measure resistance changes



Thermal conductivity humidity sensors measure changes in thermal conductivity of air. Each type offers a different method for detecting moisture levels.

Consider a smart HVAC system. A humidity sensor monitors the indoor humidity levels. If the humidity is too high, the sensor signals the air conditioning system to increase its cooling output, reducing moisture and preventing mold growth.



WORKING PRINCIPLE OF MOTION SENSOR

01

Motion sensors are integral to IoT applications such as security systems, automated lighting, and presence detection.

02

These sensors enhance security by detecting unauthorized entry, conserve energy by activating lights only when needed, and improve user experience by automating responses to movement.

03

PIR sensors detect changes in infrared radiation emitted by objects within their field of view. Ultrasonic sensors emit sound waves and measure the time it takes for them to bounce back, calculating distance and detecting movement.

WORKING PRINCIPLE OF LIGHT SENSOR

Light sensors are vital in IoT applications like smart lighting, automated blinds, and environmental monitoring

Smart streetlights adjust brightness based on ambient light levels, saving energy. Automated blinds optimize natural light usage, reducing the need for artificial lighting.

Photodiodes convert light into electrical current, with the current being proportional to light intensity. Photoresistors change resistance based on light levels

Ambient light sensors provide digital outputs corresponding to ambient light, often including infrared filtering and automatic gain control for improved accuracy.

WORKING PRINCIPLE OF PRESSURE SENSOR

Humidity sensors are essential in IoT applications where moisture control is critical, such as in agriculture, HVAC systems, and pharmaceutical manufacturing. In agriculture, these sensors are used to monitor soil moisture levels, helping farmers optimize irrigation and reduce water waste.

Pharmaceutical manufacturing relies on humidity sensors to maintain precise environmental conditions, ensuring the quality and stability of drugs. Museums and art galleries also use humidity sensors to protect sensitive artifacts from damage caused by excessive moisture or dryness.

By continuously monitoring humidity levels, IoT systems can provide real-time feedback and automated control, improving efficiency and reducing costs. For example, in a data center, humidity sensors can help prevent condensation and corrosion, protecting sensitive equipment from damage.

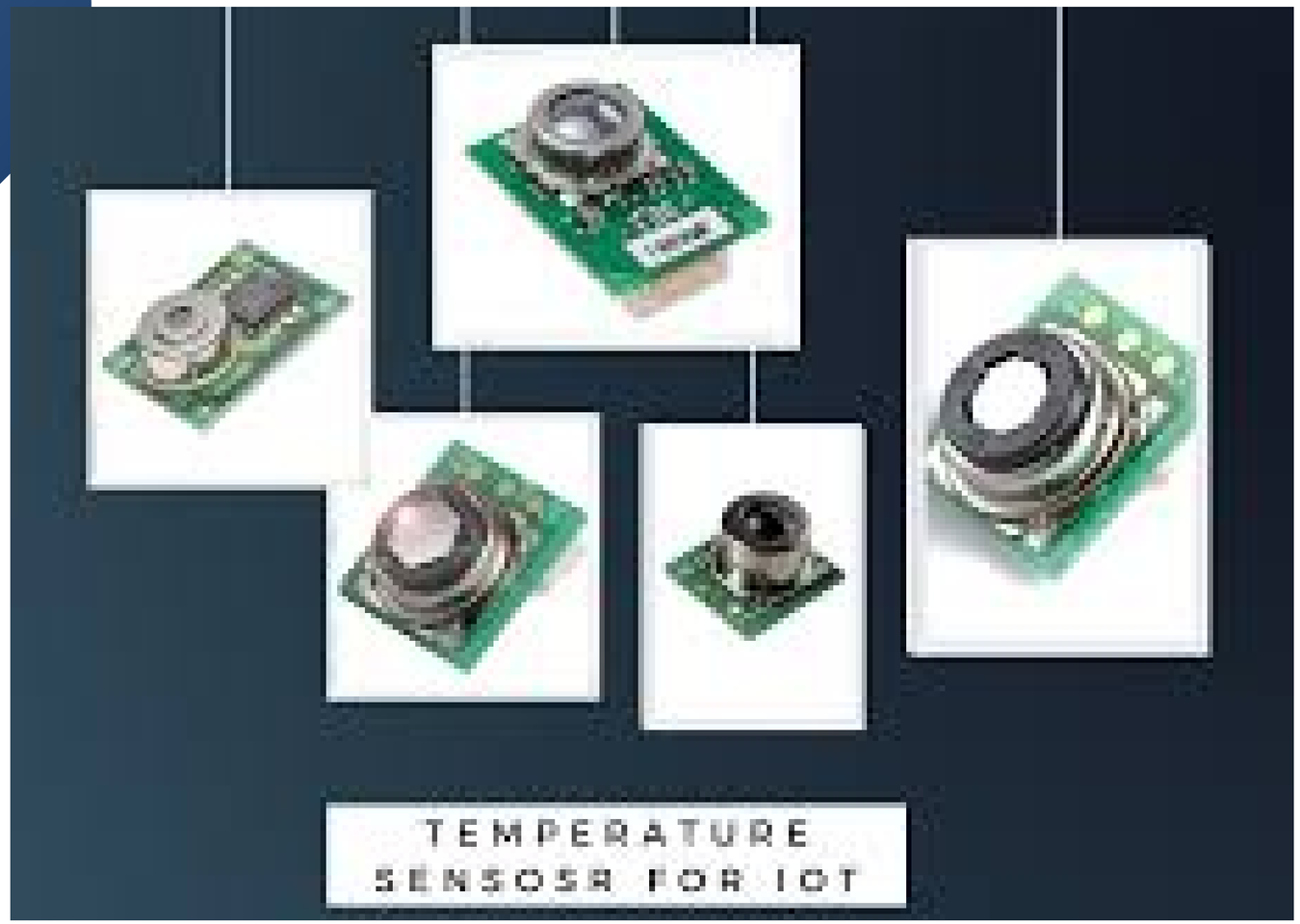
APPLICATION OF TEMPERATURE SENSOR

Application:

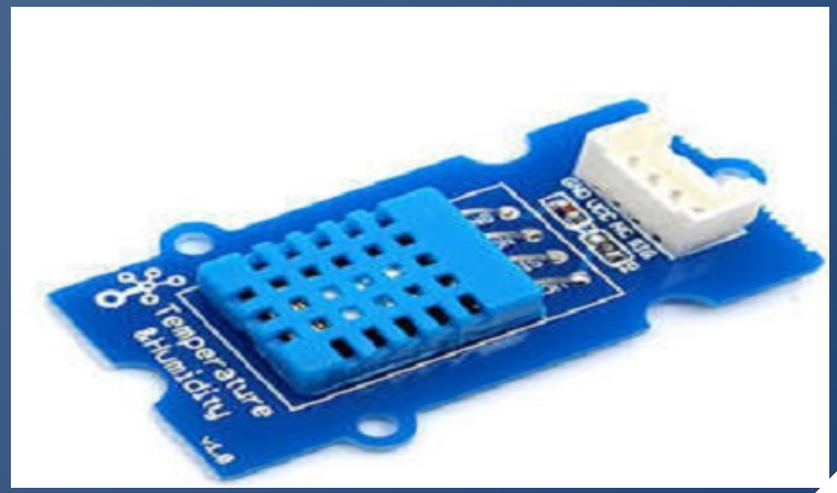
Smart Homes: Adjusting heating and cooling systems automatically for energy efficiency.

Healthcare: Monitoring body temperature in medical devices like wearable health trackers.

Agriculture: Managing temperature in greenhouses for optimal crop growth



APPLICATION OF HUMIDITY SENSOR



Smart Agriculture Application: In agriculture, humidity sensors help monitor soil and atmospheric moisture levels. This data is used to automate irrigation systems, ensuring that crops receive the ideal amount of water. This not only enhances crop health but also conserves water, making farming more sustainable.

APPLICATION OF MOTION SENSOR

- Security: Detecting intruders in homes or businesses through motion detection.
- Smart Homes: Automating tasks like turning on lights or adjusting climate control when motion is detected.
- Healthcare: Fall detection in elderly care or patients with mobility issues.

APPLICATION OF LIGHT SENSOR

Light sensors are used in smart homes and commercial buildings to automatically adjust lighting based on ambient light levels. For example, outdoor streetlights can be programmed to turn on at dusk and off at dawn, saving energy. In homes or offices, the lights automatically adjust in intensity or turn off when natural light is sufficient.

Back to Agenda

APPLCAION OF PRESSURE SENSOR

1. Smart Home Automation

2.Healthcare Monitoring

3.Industrial Equipment Monitoring

THANK YOU