EXPERIMENT-1

INTRODUCTION TO IOT

AIM: Briefly describe the Basics of the Internet of Things: Sensors, Actuators, IoT architecture, and Gateway.

What is IoT?

The Internet of Things (IoT) is a network of interconnected physical objects embedded with sensors, software, and other technologies, enabling them to collect and exchange data over the Internet. This technology enhances efficiency, productivity, and decision-making by automating processes and providing real-time insights across various applications, such as smart homes, wearable health monitors, industrial equipment, smart cities, and healthcare. Despite its benefits, IoT faces security vulnerabilities, privacy concerns, interoperability issues, and the need for scalable infrastructure to manage vast data volumes.

Describe the Architecture and Gateway of IoT.

IoT Architecture

IoT architecture consists of several layers, including the device layer with sensors and actuators for data collection, the communication layer using protocols and networks like Wi-Fi and Bluetooth, the gateway layer where IoT gateways aggregate and preprocess data, the data processing layer with edge and fog computing to reduce latency, the cloud layer for storage and advanced analytics on platforms like AWS IoT and Google Cloud IoT, and the application layer which provides user interfaces and applications for insights and control.

IoT Gateway:

An IoT gateway is a critical component that aggregates data from multiple devices, performs initial processing and filtering, translates between different communication protocols, ensures security through encryption and authentication, manages network connectivity, and provides local storage and edge analytics, acting as a bridge between edge devices and the cloud to enable seamless and secure IoT operations.

What is a sensor?

A sensor is a device that detects and measures the physical properties of the environment and converts these measurements into signals that can be read and interpreted by electronic systems or humans. Sensors are critical components in many technologies, including the Internet of Things (IoT), where they gather data about various parameters such as temperature, humidity, pressure, motion, light, and more.

Describe the following sensors.

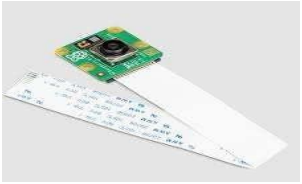
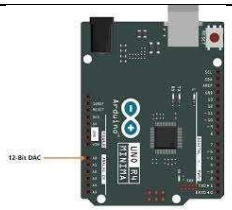
SENSOR	DESCRIPTION	PIN DIAGRAM
Temperaturesensor	A temperature sensor is a device that measures temperature and converts it into a signal that can be read by an observer or by an instrument. These sensors are essential in numerous applications, ranging from household appliances to industrial processes and environmental monitoring.	
LDR	A Light Dependent Resistor (LDR), also known as a photoresistor, is a type of resistor whose resistance varies significantly with the amount of light falling on its surface. LDRs are widely used in various applications that require light sensing and control.	
DHT II	The DHT series are low-cost, digital temperature and humidity sensors. The DHT11 and DHT22 (also known as AM2302) are the most common sensors in this series, widely used in hobbyist projects, weather stations, and other applications requiring environmental monitoring	
Ultrasonic	An ultrasonic sensor is a device that measures the distance to an object by using sound waves. It emits an ultrasonic wave and measures the time the echo returns after bouncing off the object. This time interval is then used to calculate the distance to the object. Ultrasonic sensors are commonly used for distance measurement, object detection, and ranging applications.	

What is an actuator?

An actuator is a component of a system that is responsible for moving or controlling a mechanism or system. It converts energy into mechanical motion, which can be used to perform tasks such as opening or closing a valve, movinga mechanical arm, adjusting a throttle, or controlling the position of various components in machinery.

Describe the following

TYPE	DESCRIPTION	PIN DIAGRAM
DC Motor	A DC (Direct Current) motor is an electric motorthat operates on DC power, converting electrical energy into mechanical motion. These motorsare widely used in various applications due to their simplicity, reliability, and ease of control.	
Servo Motor	A servo motor is a type of rotary actuator or motor that allows for precise control of angular position. It is designed to provide accurate control of angular or linear position, velocity, and acceleration. Servo motors are widely used in various applications where precise control of movement is required, such as robotics, CNC machines, camera autofocus systems, and radio-controlled vehicles.	
LED	A light-emitting diode (LED) is a semiconductordevice that emits light when an electric current passes through it. LEDs are widely used in various applications due to their efficiency, durability, and compact size.	
Switch	A switch is a fundamental electrical component used to control the flow of electricity within a circuit. It allows for the opening or closing of an electrical path, thereby controlling the operation of devices or systems.	
Relay	A relay is an electromechanical switch that operates using an electromagnet to mechanicallyopen or close electrical contacts. It allows a low-power signal to control a higher-power circuit, providing isolation between the control circuit and the load circuit.	

Raspberry pie camera	The Raspberry Pi Camera refers to the camera modules specifically designed for use with Raspberry Pi single-board computers. These cameras are compact, high-resolution cameras that connect directly to the Raspberry Pi's camera port	
DAC	DAC stands for Digital-to-Analog Converter. It is a device or circuit that converts digital signals (binary numbers) into analog signals (continuous voltage or current levels).	
Raspberry Pi 4B+	The Raspberry Pi 4 Model B+ is a single-board computer (SBC) developed by the Raspberry Pi Foundation. It builds upon the previous models with enhanced performance, connectivity options, and capabilities. Here are the key features and modes of the Raspberry Pi 4 B+	
Arduino Uno	The Arduino Uno is a popular microcontroller board based on the ATmega328P microcontroller chip. It's widely used in the maker and hobbyist communities for various electronic projects due to its ease of use, versatility, and extensive community support.	

Steps to execute code in Arduino IDE

Board: Use a USB cable to connect your Arduino board to your computer.

Write Your Code: Open the Arduino IDE and write your program (sketch) in the editor. This involves coding the instructions you want the Arduino to perform.

Verify and Compile: Click on the verify button (checkmark icon) to check your code for errors and compile it into a format that the Arduino can understand.

Upload to Arduino: Once verified and compiled successfully, click on the upload button (right arrow icon). This will transfer your code from the computer to the Arduino board, where it will start running immediately.

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