SNS COLLEGE OF TECHNOLOGY

Coimbatore-35

An Autonomous Institution

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Chennai

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

19ECT213- IoT SYSTEM ARCHITECTURE

II ECE / IV SEMESTER

UNIT 1 – OVERVIEW OF INTERNET OF THINGS

TOPIC 2 –Various Sensors and Sensing Techniques

TRANSDUCER

A transducer is any physical device that converts one form of energy into another.

There are two kinds of transducers;
    1. Actuators
    2. Sensors

Actuator

Actuator is a device that converts the electrical signals into the physical events or characteristics. It takes the input from the system and gives output to the environment.

For example, Motors and Heaters are some of the commonly used actuators.

Rotary actuator: It produces a rotary motion or torque. e.g. stepper motor, servo motor.
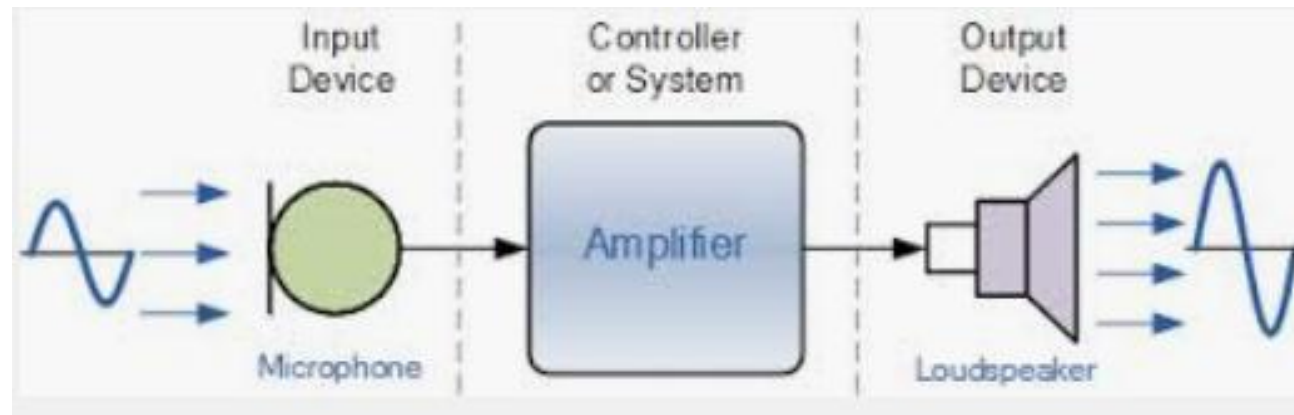
Linear Actuators: Linear actuator converts rotary motion into linear motion.

Sensors

A device that converts variations in a physical quantity, such as pressure or brightness, into an electrical signal, or vice versa.

A microphone is a sensor that takes vibration energy (sound waves), and converts it to electrical energy

SENSORS

A **Sensor** converts the physical parameter (for example: temperature, blood pressure, humidity, speed, etc.) into a signal which can be measured electrically.

PROXIMITY SENSORS

Ultrasonic Sensor

Gas Sensor

Color Sensor

PIR Sensor

Accelerometer

Potentio-meter

IR Sensor

Flex Sensor

LDR

Thermistor

Rain Sensor

IR Transmitter

Photodiode (IR Receiver)

LM35 (Temperature Sensor)

Micro-phone

Hall Sensor

- An ultrasonic sensor - device that uses sound waves above the range of human hearing (ultrasonic) to measure distance, detect objects, and track movement.

- Gas Sensor- a device used to detect the presence and/or concentration of specific gases in an environment.

TYPES OF SENSORS

SENSOR & its Application

| S.No	Sensor	Applications	Technology
1.	Inertial sensors	Industrial machinery, automotive, human activity	MEMS and Gyroscope
2.	Speed Measuring Sensor	Industrial machinery, automotive, human activity	Magnetic, light
3.	Proximity sensor	Industrial machinery, automotive, human activity	Capacitive, Inductive, Magnetic, Light, Ultrasound
4.	Occupancy sensor	Home/office monitoring	PassiveIR, Ultrasound most common
5.	Temperature/humidity sensor	Home/office HVAC control, automotive, industrial	Solid state, thermocouple
6.	Light sensor	Home/office/industrial lighting control	Solid state, photocell, Photo resistor, photodiode

TYPES OF SENSORS

7.	Power (current) sensor	Home/office/industrial powermonitoring/control Technology	Coil (Faraday's law), Hall effect
8.	Air/fluid pressure sensor	Industrial monitoring/control, automotive, agriculture	Capacitive, Resistive
9.	Acoustic sensor	Industrial monitoring/control, human interface	Diaphragm condenser
10.	Strain sensor	Industrial monitoring/control, civil infrastructure	Resistive thin films
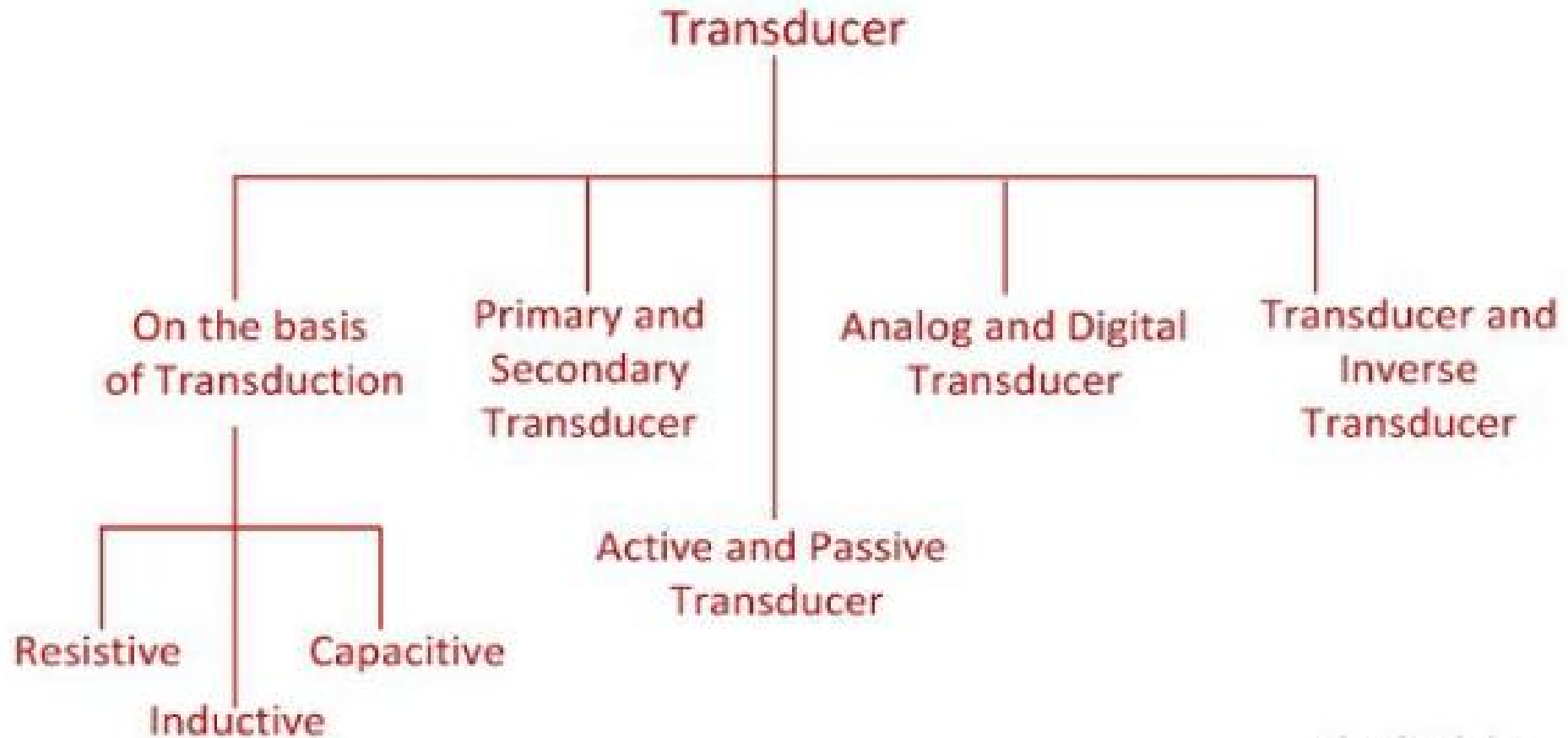
BASED ON TRANSDUCTION

The transducer is classified by the transduction medium. The transduction **medium may be resistive, inductive or capacitive** depends on the conversion process that how input transducer converts the input signal into resistance, inductance and capacitance respectively.

PRIMARY & SECONDARY TRANSDUCER

Primary Transducer – The transducer consists the mechanical as well as the electrical devices. The mechanical devices of the transducer change the physical input quantities into a mechanical signal. This mechanical device is known as the primary transducers.

Secondary Transducer – The secondary transducer converts the mechanical signal into an electrical signal. The magnitude of the output signal depends on the input mechanical signal.

The Bourdon's Tube is the primary transducer, and the L.V.D.T is called the secondary transducer.
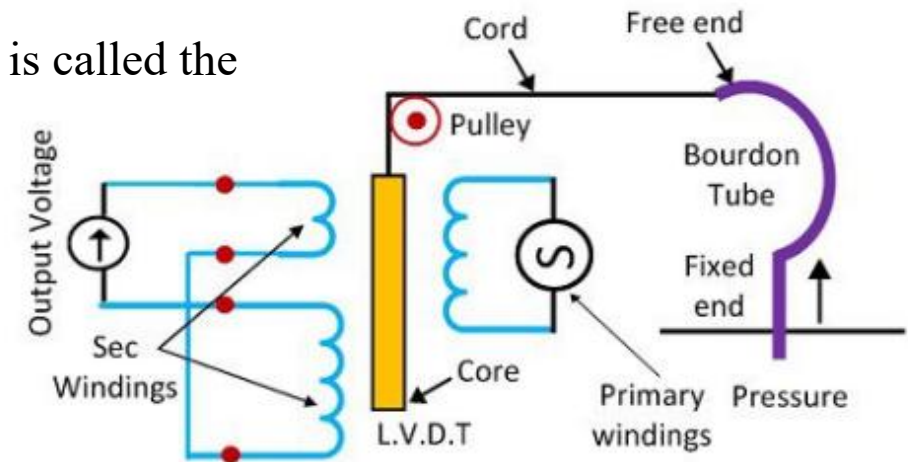

Bourdon's Tube

ACTIVE & PASSIVE TRANSDUCER

Active Transducer – The transducer which does not require the external power source is known as the active transducer. Such type of transducer develops theirs owns voltage or current, hence known as a self-generating transducer. The output signal is obtained from the physical input quantity.

Passive Transducer – The transducer which requires the power from an external supply source is known as the passive transducer. They are also known as the external power transducer. The capacitive, resistive and inductive transducers are the example of the passive transducer.
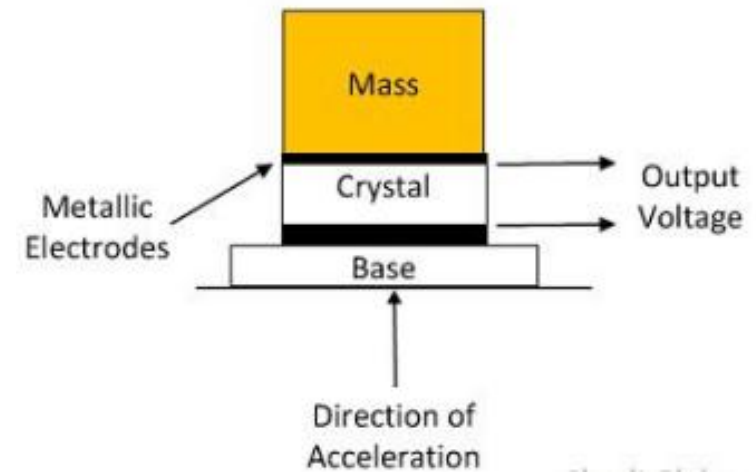
➢This transducer is known as the accelerometer which converts the acceleration into an electric voltage.
➢This transducer does not require any auxiliary power source for the conversion of physical quantity into an electrical signal.

The transducer can also be classified by their output signals. The output signal of the transducer may be continuous or discrete.

TRANSDUCER & INVERSE TRANSDUCER

Transducer – The device which converts the non-electrical quantity into an electric quantity is known as the transducer.

Inverse Transducer – The transducer which converts the electric quantity into a physical quantity, such type of transducers is known as the inverse transducer. The transducer has high electrical input and low non-electrical output.

Transducer

Inverse Transducer

Test Your Knowledge

Guess the name of this sensor and uses?

Test Your Knowledge

- The city of Dublin is hosting The Olympics. The city has built a huge sports complex called Olympics Park, where all the sport events are being held. For public facilitation the sports complex has one big car park for the citizens attending any of the sport events. The car park is facilitated with an automated ticketing system, which displays the number of vehicles parked and the number of vacancies available. These numbers are automatically updated on entrance or exit of any vehicle. Even though at the main entrance it is shown that vacancies are available, every driver has to drive for a very long time to find a suitable/empty space, resulting in waste of time and money/resources. Citizens also want to park closest to their favourite sports facility. The smart car parking system is equipped with individual sensors at all car parking spaces. The users therefore have a mobile app available for the smart car parking system, which integrates real time sensor information of the car parking space, its GPS locations and combines it with the user profiles to find a suitable place while considering the user's sport interest, event starting time, tickets purchased/seat numbers etc.

- **List the sensors used ?**
- **Establish the Connectivity?**
- **What are the IoT "Things" used in the above scenario?**