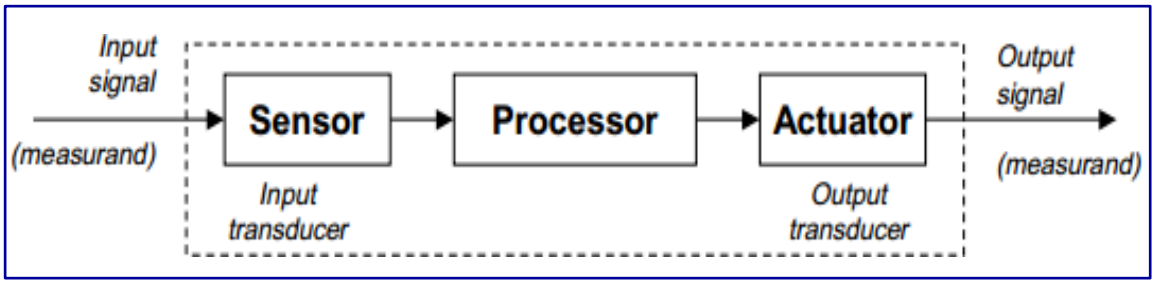
Sensors and Transducers:

What is a Transducer:

- A device that converts a signal from one physical form to a corresponding signal having a different physical form.
- Transducer is a converter of any one type of energy into another.
- Transducers may be used as actuators in various systems.
- An example of a transducer is a **loudspeaker**, which converts an electrical signal into a variable magnetic field (acoustic waves).

➢ **Physical form:** mechanical, thermal, magnetic, electric, optical, chemical…



➢ **Transducers:** sensors and actuators

➢ Sensor: an input transducer (i.e., a microphone)

➢ Actuator: an output transducer (i.e., a loudspeaker)

What is a Sensor?

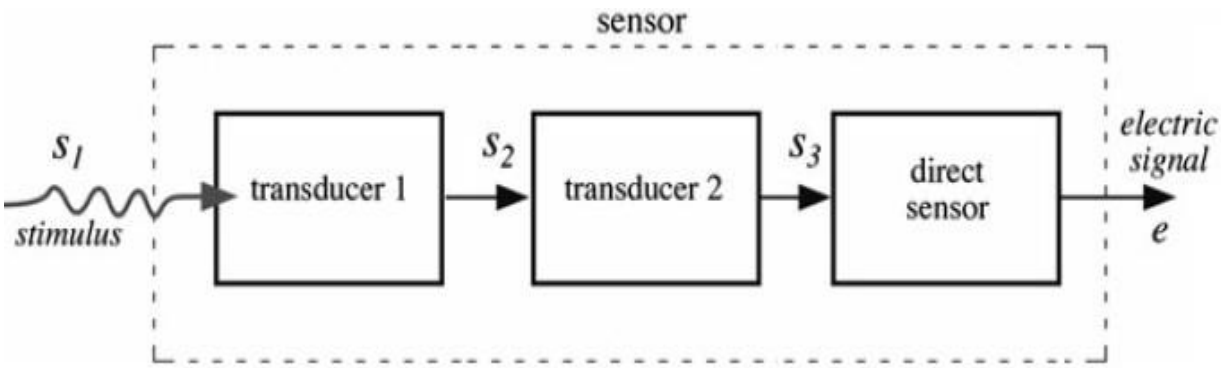
➢ A device that receives and responds to a signal or stimulus.

➢ The **sensor** converts any type of energy into electrical energy.

- It is a transducer whose purpose is to sense or detect some c/cs of its environs.
- It is a transducer used to detect a parameter in one form and report it in another form of energy.

Example: A pressure sensor detects pressure (a mechanical form of energy) and converts it to electrical signal for display.

- A sensor is a device that receives a stimulus (measurand) and responds with an electrical signal.
- A sensor may have several energy conversion steps before it produces and outputs an electrical signal, since most of stimuli are not electrical.

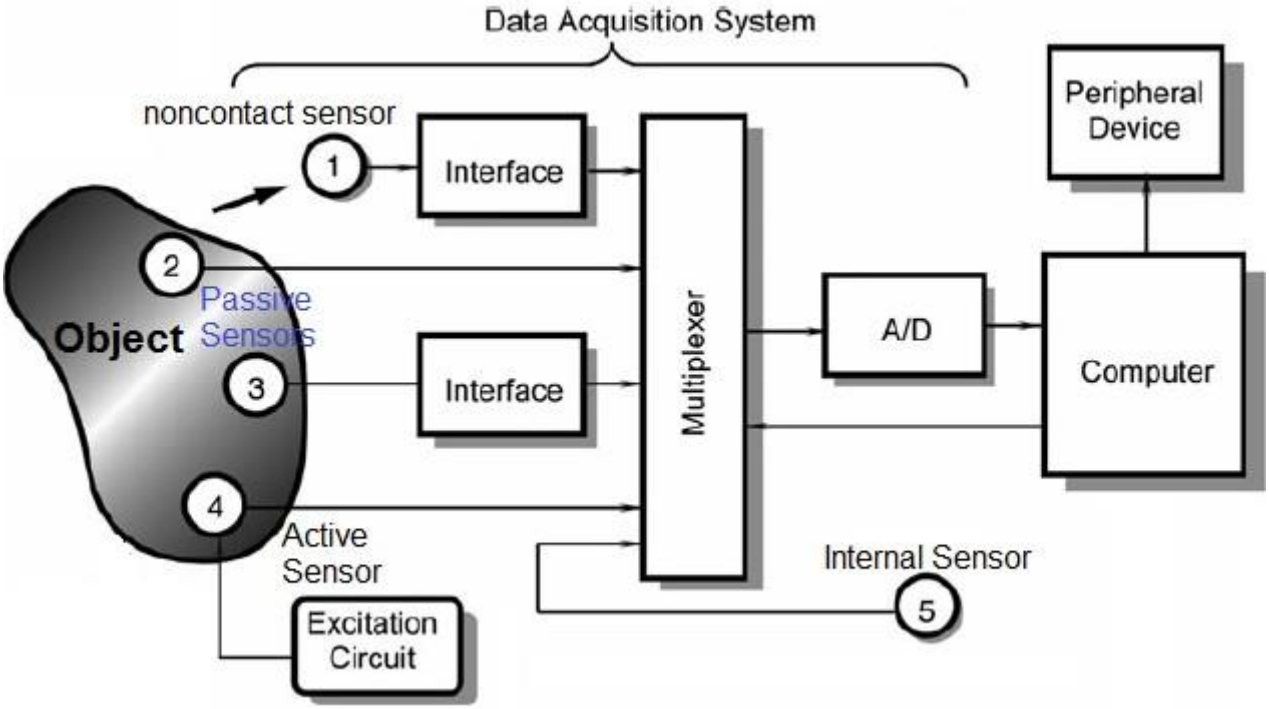


- Any sensor is an energy converter.
- A sensor may incorporate several transducers (S1, S2, S3) are various types of energy.
- The last part is a direct sensor producing electrical output (e).
- Example: a **chemical sensor** produces electrical signal in response to a chemical reagent. The sensor may have two parts; the first one converts the energy of a chemical reaction into heat (transducer) and another part (a thermopile)

- converts heat into an electrical signal.
- There are two types of sensors;

1. Direct sensor: converts the measured variable into an electrical signal or modifies an electrical signal by using an appropriate physical effect.

2. Complex sensor: needs one or more transducers of energy before a direct sensor can be employed to generate an electrical output.



Sensor 1: Noncontact sensor, such as a radiation detector and a TV camera.

Sensors 1, 2, 3: are passive sensors positioned directly on or inside the object.

Sensor 4: Active sensor requires an operating signal, which is provided by an excitation circuit. Thermistor is an example, it a temperature-sensitive resistor. It needs a constant current source, which is an excitation circuit.

Sensor 5: is an internal sensor, monitors internal conditions of a data acquisition system itself.

E-mail:Zeyad.Taha.yaseen@uomus.edu.iq