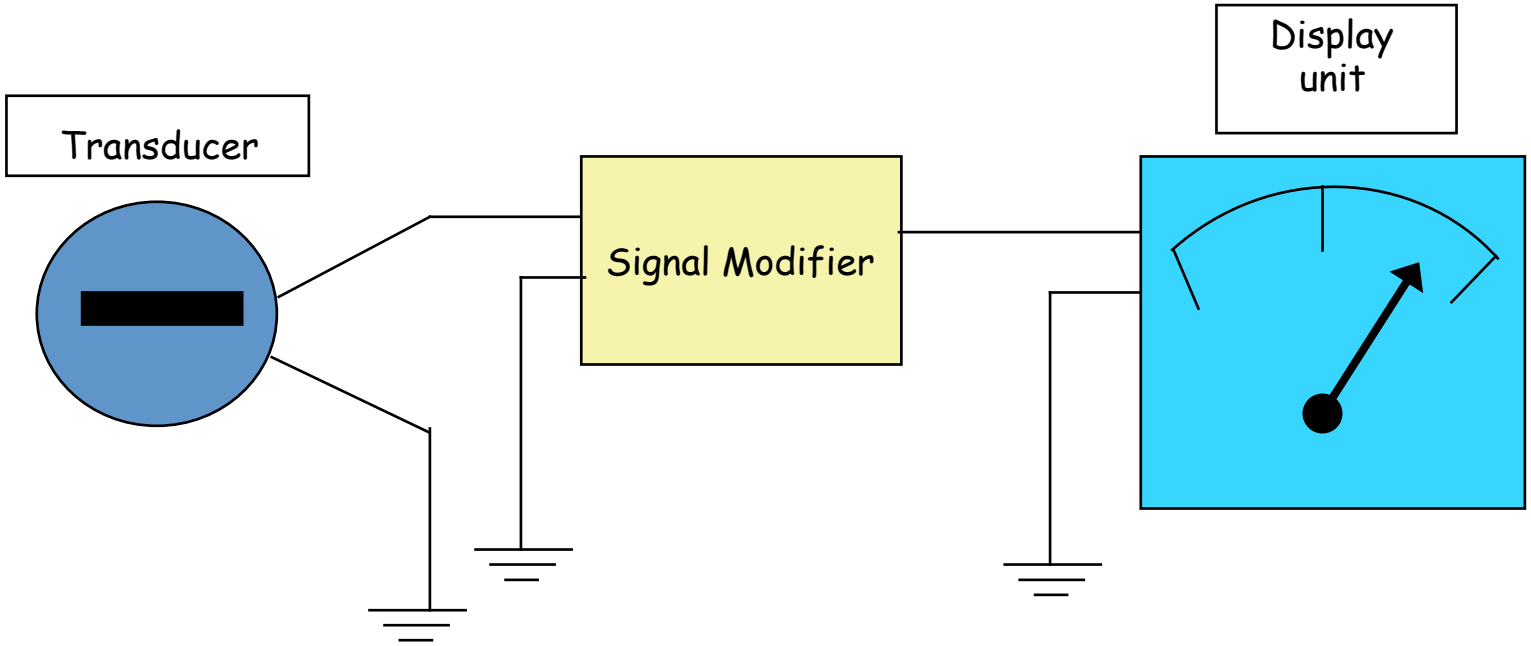
SKN3022
PROCESS INSTRUMENTATION
CHAPTER II

INTRODUCTION TO ANOLOG AND DIGITAL INSTRUMENTATION

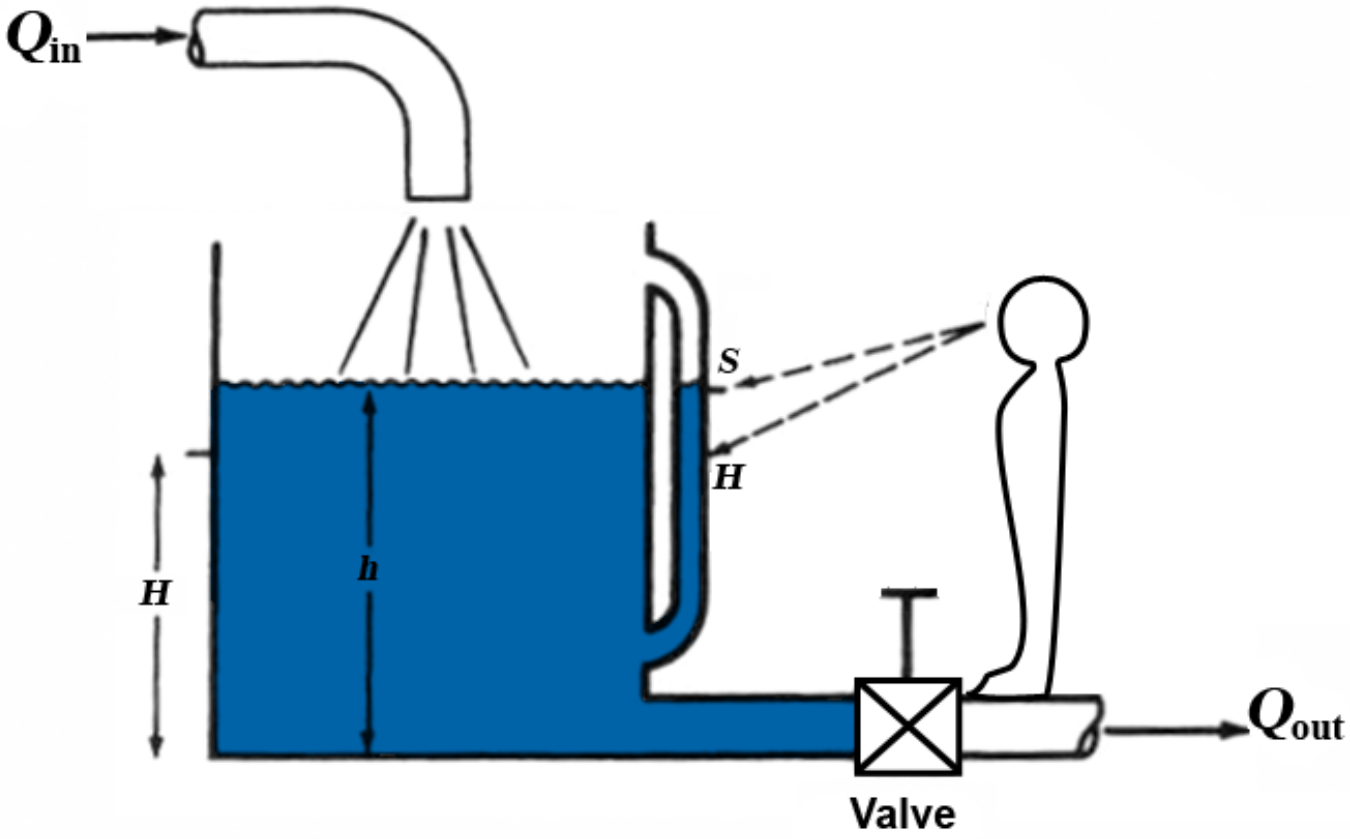
Dr. Saharudin Haron

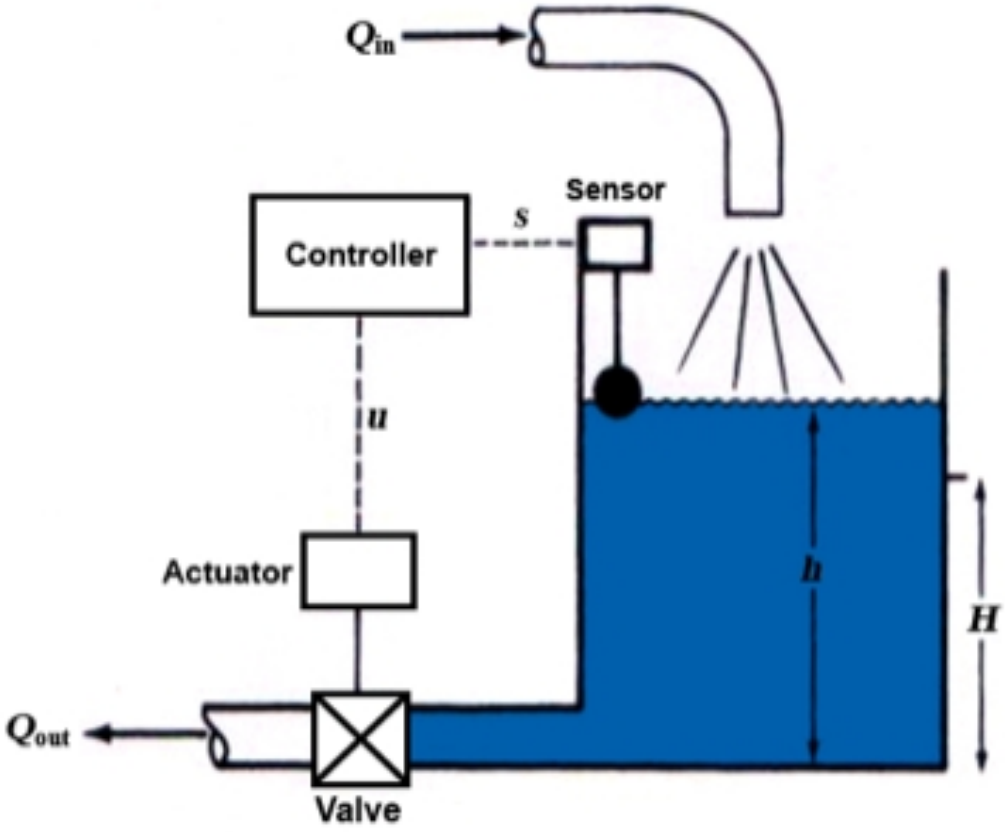
Hanizam Sulaiman

Basic Elements of Instrumentation



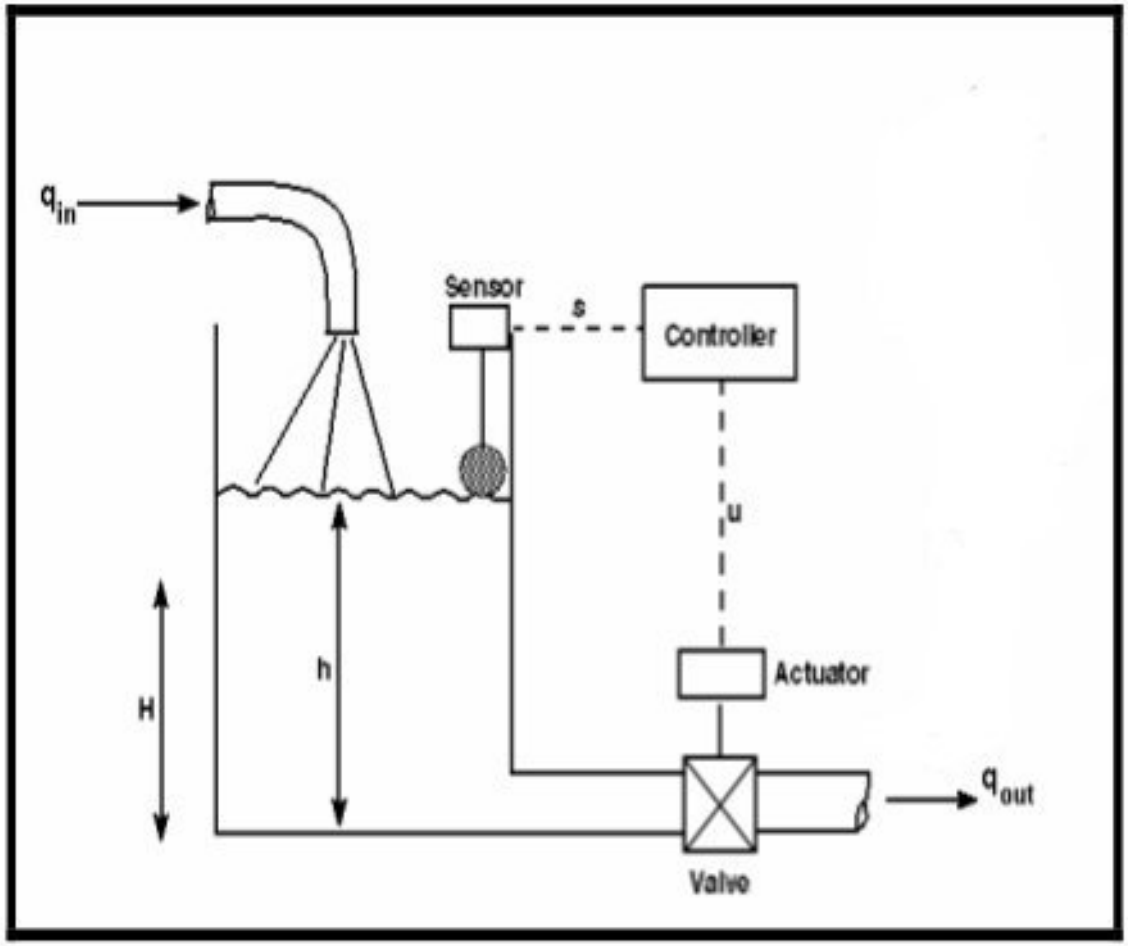
Manual Level Control

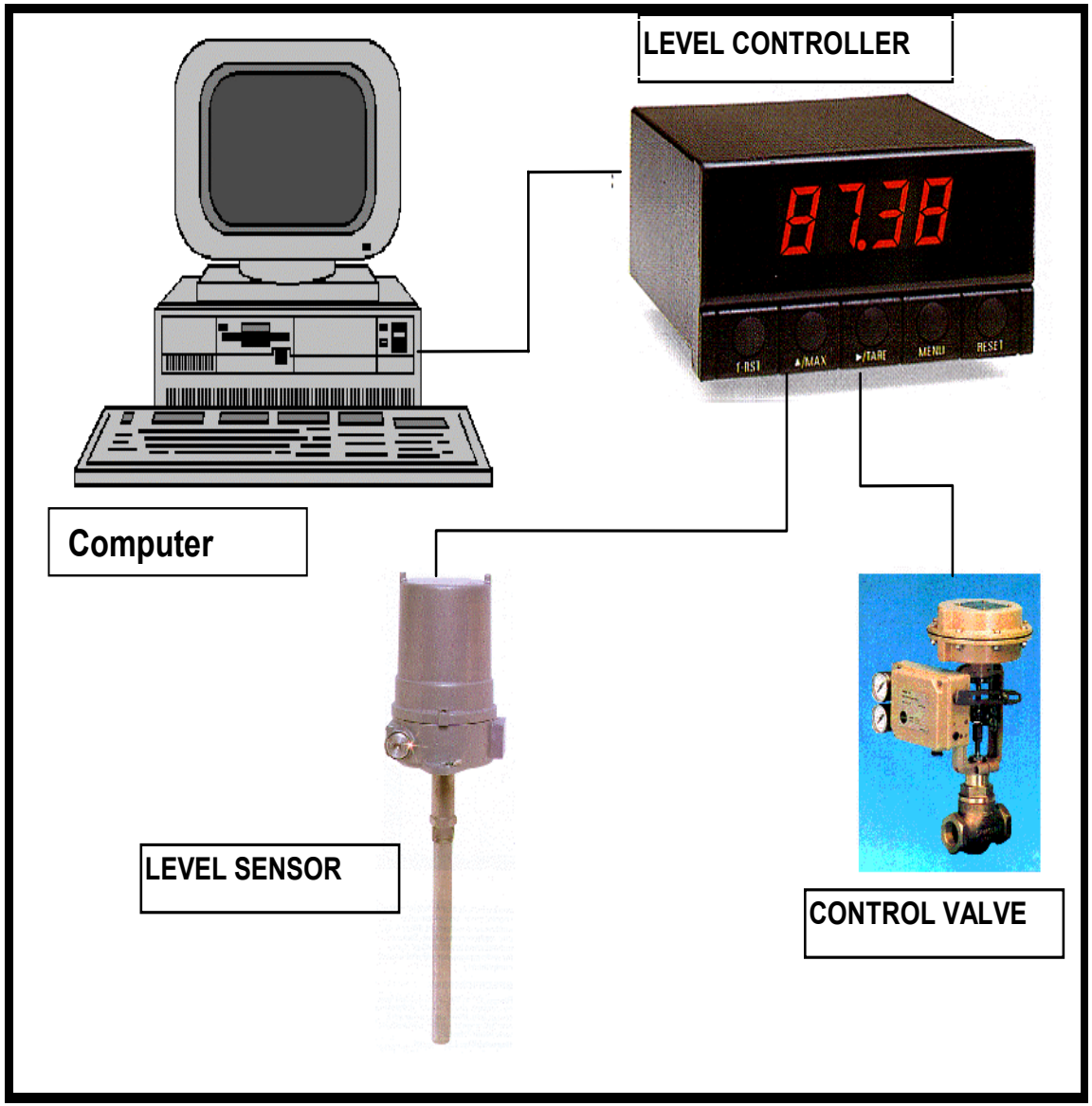




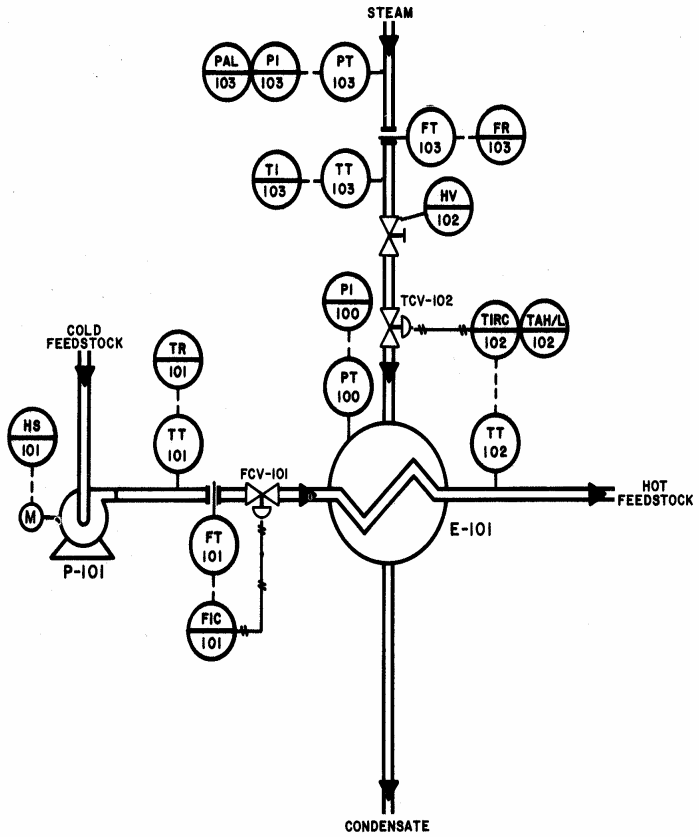
An automatic level-control system replaces the human with a controller and uses a sensor to measure the level.

Automatic level control of a liquid tank




LEVEL CONTROLLER
87.38
Computer
LEVEL SENSOR
CONTROL VALVE

HEAT EXCHANGER



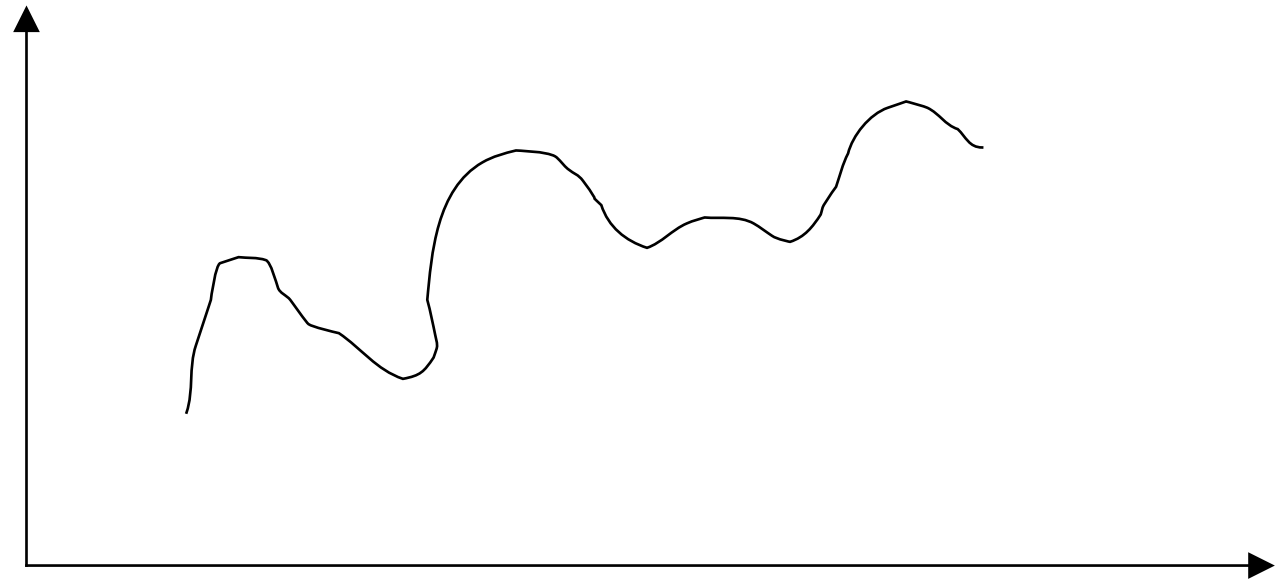
NUMERICAL REPRESENTATION

Consists of ANALOG representation and DIGITAL representation.

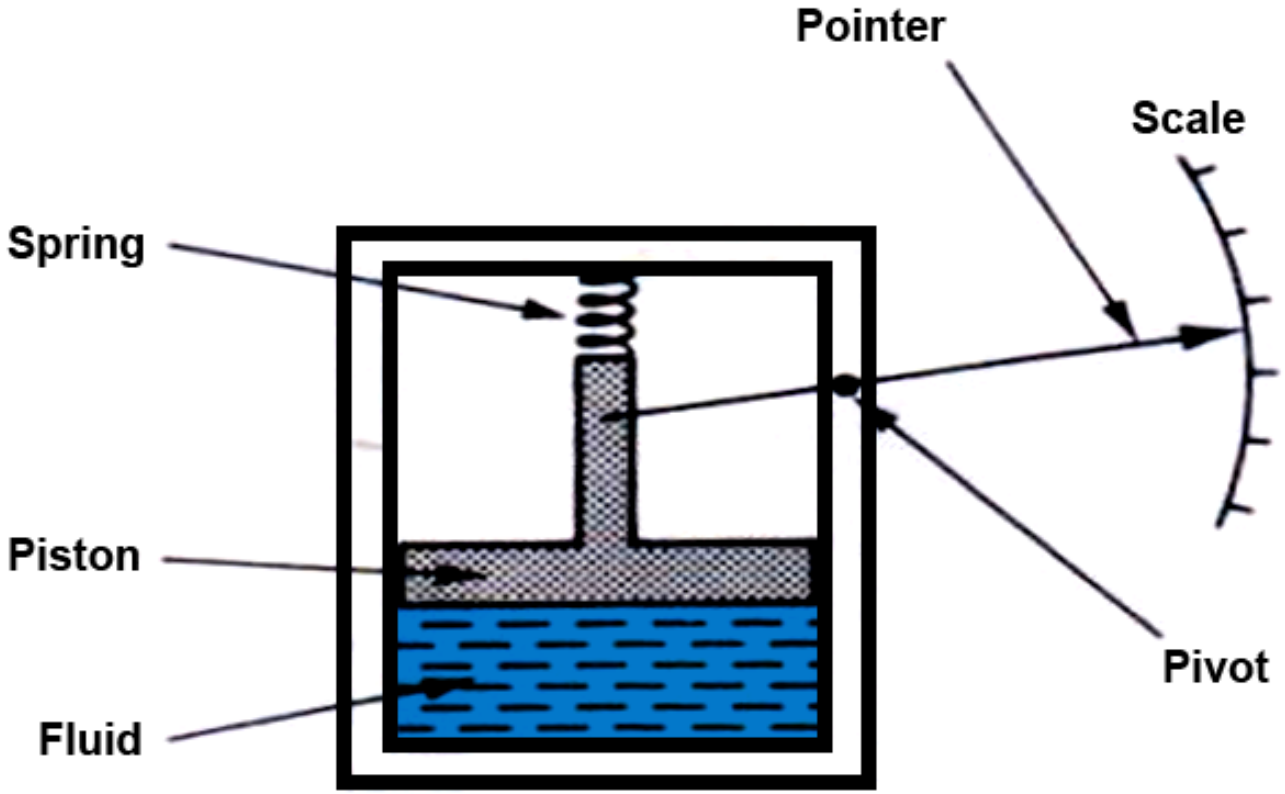
1. Analog Represantation

- **Defined as a quantity which is represented by another quantity and is directly proportionate to the first quantity. Example: a car speedometer where the movement of the needle shows the speed of the car.**
- **One important feature is that an analog quantity can be in a continous range of value. Example: The speed of the car can be anywhere in between 0 to 100 kilometres per hour (km/h).**

Example of An Analog Signal



Instrument classification and characteristics



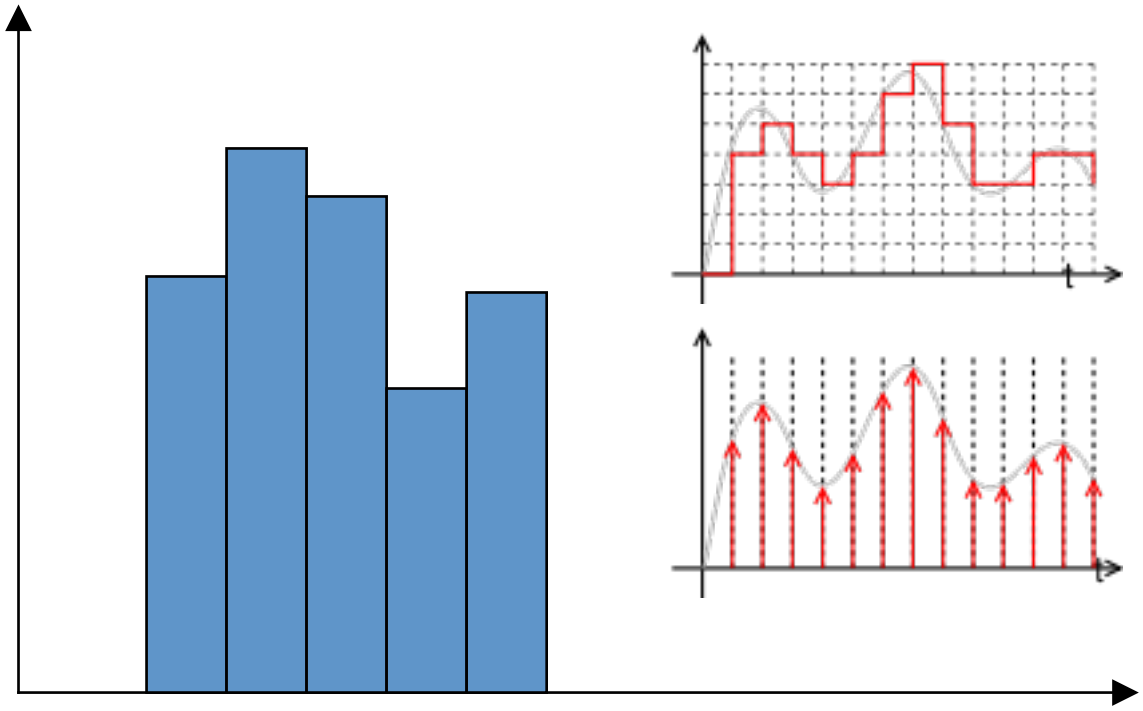
Passive Pressure Gauge

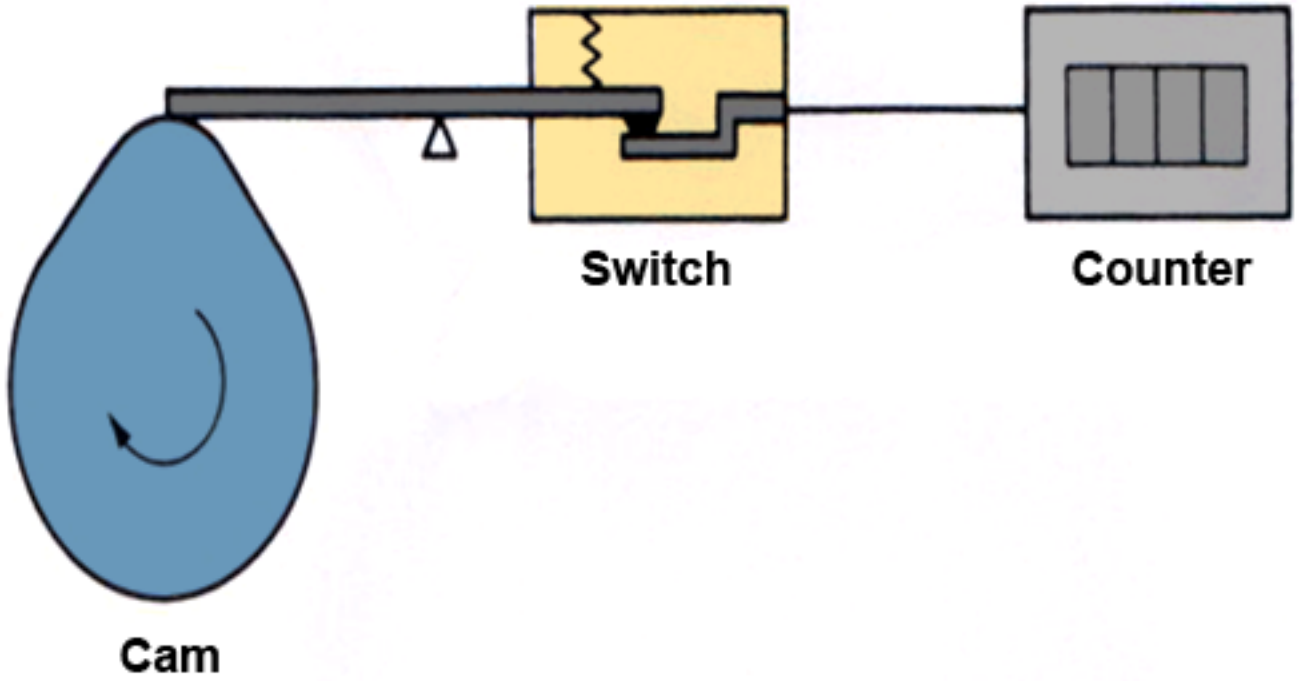
2. Digital Representation

- Defined as a quantity that represents a symbol known as “digit”.
- Digit has two actual values: LOW and HIGH.
  Example: In the form of electrical voltage: The LOW value bears 0 Volt and the HIGH value represents +5 Volt.
- Physical variables for digital quantities change discreetly: Step by step mode.
  Example: A digital watch readout that shows the reading of the second needle changes in terms of a value increment of 1 second.

- **A digital quantity does not show quantities that are part of the value increment that has been pre-set.**
- **The advantage of digital quantity is the convenience in recognising any signal using the dual system where the signal only has two values compared to analog signals which are relatively difficult to determine. Example: analog values in beteween 10.1, 10.0 or 9.99.**

Example of Digital Signal





Rev-Counter

ADVANTAGES OF ANALOG SYSTEM

1. Cheaper priced
2. Easy to repair and maintain
3. Easier element functions
4. Others

ADVANTAGES OF DIGITAL SYSTEM

1. More accurate
2. Faster
3. Easy to read
4. Able to store data in memory
5. Automatic zeroing
6. Higher accuaracy

- **Although there are many advantages of digital system, point has to be taken that most of the quantities used were actually in the analog form**

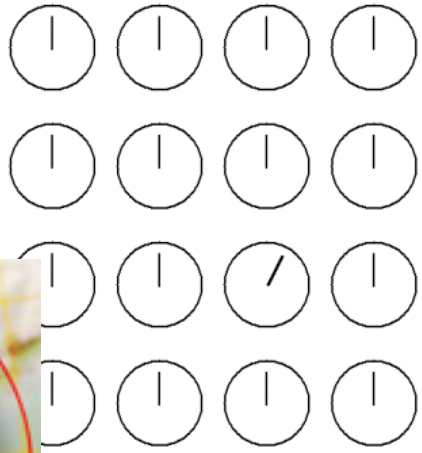
ANALOG INSTRUMENTATION

- Instrument output is in analog form whereby the value changes continously when the input signal changes.
- Consists of a display unit which has a scale and a needle.
- The needle shows the value of quantity to be measured.

DIGITAL INSTRUMENTATION

- **The output of digital instruments are in analog form where the values change discreetly.**
- **Uses logic circuit and digital technique to obtain measured values and to display those values in digital form.**
- **Digital reading usually in the form of LED (*light-emitting diode*) or LCD (*liquid crystal display*).**

APPLICATION EXAMPLES




4.66
4.6
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15.
111.40
112
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0.92
850362
Vorne Industries
976
Vorne Industries
7428
Vorne Industries
6.25
12:45 36
267
OVR 2
14
10:27 Line Down
Conveyor Jam


1
2
3
4