



UNIVERSITA' DEGLI STUDI DI BERGAMO
Facoltà di Ingegneria

Informatica Industriale

Prof. Davide Brugali

1.5 – Macchine e periferiche

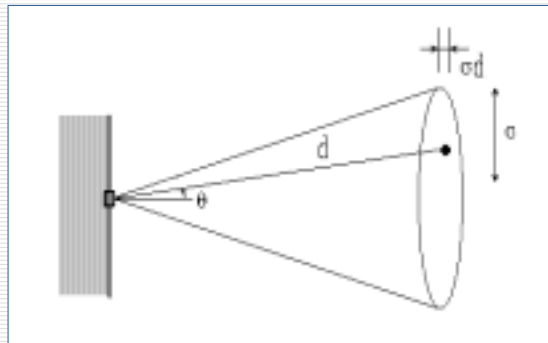
Sensori e Attuatori

- ☐ Sensors for measuring continuous and discrete process variables
- ☐ Actuators that drive continuous and discrete process parameters
- ☐ Devices that convert continuous analog signals to digital data
- ☐ Devices that convert digital data into analog signals
- ☐ Input-output devices for discrete data

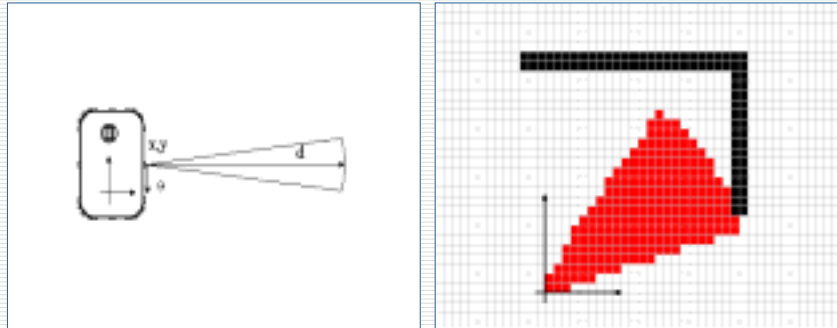
Sensori

Measuring Device	Description
Accelerometer	Analog device used to measure vibration and shock. Can be based on various physical phenomena
Dynamometer	Analog device used to measure force, power, or torque. Can be based on various physical phenomena (e.g., strain gage, piezoelectric effect).
Fluid flow sensor	Analog measurement of liquid flow, usually based on pressure difference between flow in two pipes of different diameter
Optical encoder	Digital device used to measure position and/or speed, consisting of a slotted disk separating a light source from a photocell. As disk rotates, photocell senses light through slots as a series of pulses. Number and frequency of pulses are proportional (respectively) to position and speed of shaft connected to disk. Can be adapted for linear as well as rotational measurements.
Thermocouple	Analog temperature-measuring device based on thermoelectric effect; in which the junction of two dissimilar metal wires emits a small voltage that is a function of the temperature of the junction. Common standard thermocouples include: chromel – alumel, iron-constantan, and chromel-constantan.
Ultrasonic range sensor	Time lapse between emission and reflection (from object) of high-frequency sound pulses is measured. Can be used to measure distance or simply to indicate presence of object.

Sensori sonar



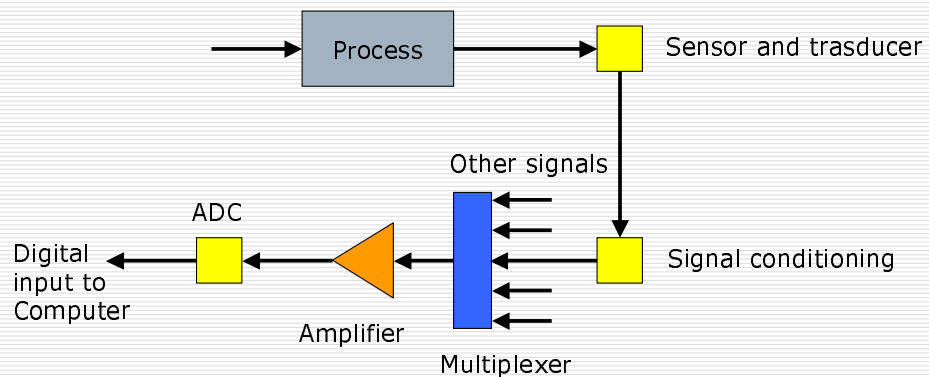
Sensori sonar



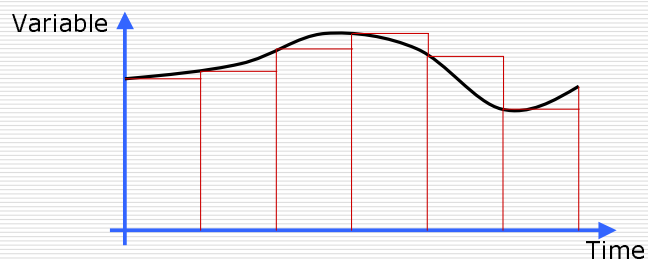
Attuatori

Actuators	Description
DC Motor	Rotational electromagnetic motor. Input is direct current (dc). Very common servomotor in control systems. Rotary motion can be converted to linear motion using rack-and-pinion or ball screw.
Hydraulic piston	Piston inside cylinder exerts force and provides linear motion in response to hydraulic pressure. High force capability.
Relay switch	On-off switch opens or closes circuit in response to an electromagnetic force.
Stepping motor	Rotational electromagnetic motor. Output shaft rotates in direct proportion to pulses received. Advantages: high accuracy, easy implementation, compatible with digital signals, and can be converted to linear motion using rack-and-pinion or ball screw.

Conversione Analogico / Digitale



Sampling (Campionamento)



Dispositivi di Input-output (discrete)

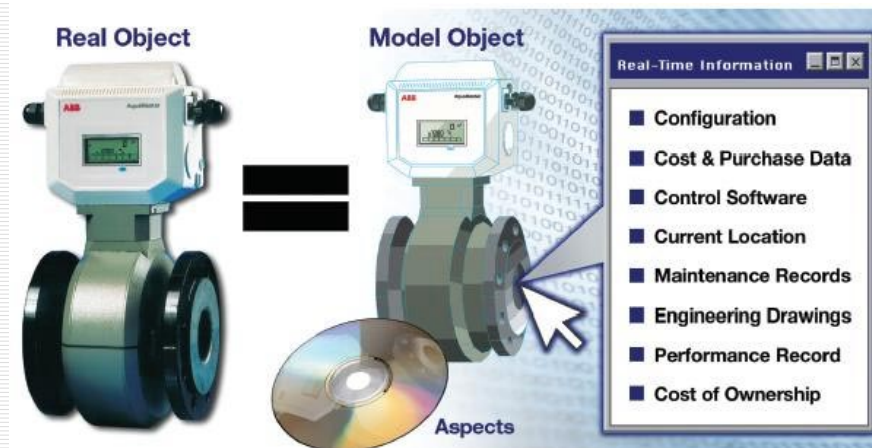
□ Contact input-output interfaces

These interfaces read binary data from the process into the computer and send binary signals from the computer to the process.

□ Pulse Counters and Generators

Discrete data can also exist in the form of a series of pulses generated by digital transducers such as optical encoders. Pulse data are also used to control certain devices such as stepper motors.

Modelli Software: Dati dai sensori



Modelli Software: Comandi agli attuatori



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